Protocol for gender-affirming voice care: a systematic review

Review Article

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Abstract

Objective: Development of a protocol for patients with gender dysphoria related to voice.
Study Design: Systematic review.
Materials and Methods: A literature review was conducted using the PubMed and Google Scholar databases, including publications in English, Portuguese, and Spanish that addressed the clinical evaluation and medical and/or surgical treatment of voice in transgender patients. The systematic review was performed in accordance with the PRISMA 2020 guidelines.
Results: Ten articles were included. The clinical evaluation of transgender patients should include an auditory-perceptual assessment (GRBAS and CAPE-V), an acoustic voice analysis (fundamental frequency, formant frequencies, vocal range, and maximum phonation time), laryngostroboscopy at low, medium, and high pitch, and the administration of questionnaires (Trans Woman Voice Questionnaire – TWVQ and 10-item Voice Handicap Index – VHI-10). In the initial phase of therapeutic management, transgender individuals should be referred to a qualified speech-language therapist. When speech therapy yields insufficient results, surgical options should be considered. As most transgender men are satisfied with the vocal changes achieved through hormone therapy, there are still few studies regarding surgical voice interventions in this subpopulation. For transgender women, Wendler glottoplasty is the preferred surgical procedure.
Conclusions: Given the significant growth of this field, there is a pressing need to establish a standardized approach protocol that synthesizes the best current practices for voice care.

Keywords: Gender-affirming care; transgender; voice care

Introduction

A transgender individual is a person whose gender identity and/or expression differs from the sex assigned at birth, whereas a cisgender individual is a person whose gender identity aligns with the sex assigned at birth. When the incongruence between gender identity

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and sex assigned at birth causes significant psychological distress , it is referred to as gender dysphoria[1]. This condition primarily affects individuals between the ages of 20 and 29 years[2], with an estimated prevalence of 0.5–1.2%[3]. A key contributor to gender dysphoria is the mismatch between an individual's gender identity and the voice, a fundamental element in the social context that can increase the risk of discrimination[4]. The human voice conveys multiples cues that help to identify a person's gender, with pitch, resonance, articulation patterns, and intonation being the most important[3]. The most objective parameter is the fundamental frequency (f_0), which typically ranges between 80–120 Hz in cisgender men and between 180–220 Hz in cisgender women. Gender attribution based on this parameter is less reliable when the value is between 145 and 165 Hz[5]. In 2018, the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) emphasized the need to expand the knowledge on best practices for the care of the transgender population, highlighting the current lack of educational resources in this area[6]. Treatment for gender dysphoria has been associated with reduced suicide attempts, improved quality of life, and better employment opportunities[3]. Given the recent increase in demand for otorhinolaryngology and head and neck surgery services among the transgender population, there is a pressing need to develop a standardized protocol for voice-related care that synthesizes the current best clinical practices.

Materials and methods

This systematic review was conducted in accordance with the 2020 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Search strategy

A literature search was performed in the PubMed and Google Scholar databases using the following keywords in the title and abstract: "[(gender-affirming) OR (gender-diverse) OR (transgender)] AND [(voice care) OR (otolaryngology) OR voice assessment)]." No publication date restrictions were applied, and the last search was conducted on January 3, 2025.

Data selection and collection process

The inclusion criteria were articles on the medical and/or surgical management of voice in transgender individuals published in English, Portuguese, or Spanish. Duplicates or articles unavailable even after contacting the corresponding authors were excluded. In the first phase, two authors independently screened the titles and abstracts to select relevant articles for full text reading. The reference lists of the included studies were also analyzed to identify additional relevant literature. Subsequently, two authors independently read the full texts and extracted the relevant data.

Data categorization

The data were categorized according to voice assessment, medical management, and surgical management of transgender men and women. In the second phase, we developed a protocol for voice-related care of this population, adapted to the resources and context of the Braga Local Health Unit (ULSB).

Methodological quality assessment

The methodological quality and risk of bias of the included studies were assessed independently by two authors, using the tools developed by the Joanna Briggs Institute, adapted to each specific study design. Each question in these tools needs to be answered as follows: "yes" (2 points), "no" (0 points), "unclear" (1 point), or "not applicable." After summing the final scores, the overall quality of each article was classified as high (≥ 70% of the maximum score), intermediate (50–69.9%), or low (< 50%).

Results

Study selection and characteristics

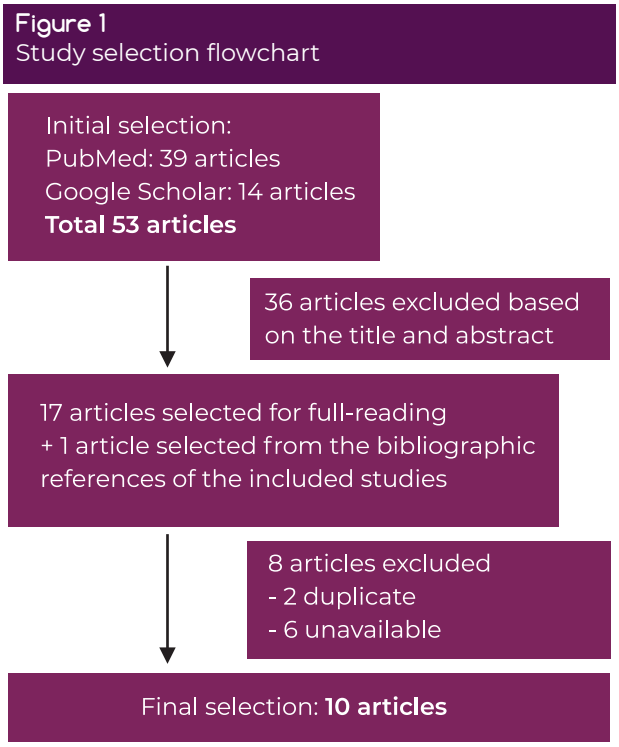
The initial search yielded 53 potentially relevant articles. After reading the titles and abstracts

and applying the inclusion and exclusion criteria, 36 articles were excluded. Analysis of the reference lists of the included studies resulted in the identification of one additional article for full-text reading, resulting in a total of 18 studies. Among these, eight were excluded due to duplication or unavailability. Thus, this systematic review included 10 articles: four narrative reviews, three systematic reviews, two case series, and one retrospective cohort study. Figure 1 shows the study selection flowchart. Table 1 summarizes the characteristics of the articles included in this systematic review. Most of these studies are recent and focus predominantly on transgender women.

Clinical examination

Transgender women and men

During appointments, gender-inclusive language should be used, and the individual's specific vocal goals should be completely understood, as they will determine the future therapeutic approach[6,7]. While there is consensus on the need for auditory-perceptual and objective assessments of the voice during clinical examination[7], there are no established guidelines. For auditory-perceptual evaluation, the Grade, Roughness, Breathiness, Asthenia, and Strain (GRBAS), which enables rapid assessment, or the more sensitive Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) may be used. Both instruments are validated and reliable for analyzing the vocal quality[9]. Acoustic voice analysis in the reviewed studies typically included f_0 measurement through sustained phonation of the vowel /a/, reading of standardized texts, or spontaneous speech. Additional parameters such as the vocal range and maximum phonation time were also assessed[7,9]. A systematic review by Schwarz et al.[9] proposed the inclusion of formant frequency analysis, as it may provide crucial supplementary information regarding gender perception. They[9] also emphasized the importance of evaluating spontaneous speech, as it enables a more accurate evaluation of f_0 variation with the proposed approaches. Young et al.[4] recommended endoscopic evaluation with stroboscopy for all transgender individuals, and reported a 5% incidence of pathology in transgender women during a systematic assessment. This recommendation was supported by McBrinn et al.[7] and Dwyer et al.[5]. Questionnaires are another essential component of the examination to assess the individual's perception of their quality of life. The tools used in the included studies were the Voice Handicap Index[12] (VHI), its short version with 10 questions[13] (VHI-10), and the Transgender Self-Evaluation Questionnaire[14] (TSEQ), all of which can be administered to both transgender men and women. The Trans Woman Voice Questionnaire[15] (TWVQ) was developed specifically for transgender women; and the Transsexual Voice Questionnaire for Female to Male[16] individuals (TVQ^{FtM}) for transgender men. Among these, the TWVQ is the most extensively validated tool for transgender women[7,9].



Medical management

Transgender women

Hormone replacement therapy (HRT) does not satisfactorily change the vocal pitch in

Table 1
Summary of the articles included in this systematic review

Authors (country)	Year	Study design	Evaluated parameters	Sample	Main conclusions
McBrinn et al.[7] (United Kingdom)	2024	Narrative review	Transgender women - Clinical examination - Medical management - Surgical management	Not applicable	The best vocal outcomes appear to be achieved through a combination of speech therapy and modified Wendler's glottoplasty. Postoperative rehabilitation with speech therapy improves long-term outcomes.
Adessa et al.[8] (United States of America)	2023	Retrospective cohort	Transgender women - Medical management - Surgical management	16 women	Outcomes are similar and favorable regardless of the chosen therapeutic modality.
Dwyer et al.[5] (United States of America)	2023	Narrative review	Transgender women and men - Clinical examination - Medical management - Surgical management	Not applicable	A laryngoscopic evaluation should be conducted prior to any intervention. Ideally, speech therapy should be given both pre- and postoperatively. There are no specific indications for surgery. Summary of the available surgical techniques and complications.
Schwarz et al.[9] (Brazil)	2023	Systematic review	Transgender women - Speech therapy	16 articles	Both speech therapy and phonosurgery have favorable outcomes. However, phonosurgery is associated with a greater increase in f0.
Chang & Yung[3] (United States of America)	2021	Narrative review	Transgender women and men - Medical management - Surgical management	Not applicable	For voice feminization, both speech therapy and surgery (especially Wendler's glottoplasty) have been proven to be effective. For voice masculinization, HRT alone is generally insufficient, and further studies are necessary.
Young et al.[4] (United States of America)	2020	Case series	Transgender women - Clinical examination: stroboscopy results	61 women	5% of transgender women exhibited stroboscopic changes
Dornelas et al.[2] (Brazil)	2019	Narrative review	Transgender women and men - Speech therapy	Not applicable	Speech therapy increases social satisfaction and reduces transphobia
Chaiet et al.[6] (United States of America)	2018	Systematic review	The role of otorhinolaryngology in gender-affirming care	0 articles	A review of the AAO-HNS educational resources on best practices for addressing transgender individuals did not identify any available resource.
Ziegler et al.[10] (United States of America)	2018	Systematic review and meta-analysis	Transgender men - Medical management	19 articles	Most transgender men undergoing at least one year of HRT with testosterone achieve a f0 similar to that of cisgender men. However, it is estimated that one in five individuals will not achieve a satisfactory f0 reduction.
Casado et al.[11] (Spain)	2015	Case series	Transgender women - Wendler's glottoplasty + Speech therapy	10 women	There was a significant f0 increase in all women

Legend: AAO-HNS, American Academy of Otolaryngology-Head and Neck Surgery; f0, fundamental frequency; HRT, hormone replacement therapy

transgender women[3,7]. However, speech therapy empowers them with verbal and nonverbal strategies to reduce the discordance between the gender identity and voice. Recent research recommends targeting oral and nasal resonance, feminine speech patterns, vocal efficiency, and body language[9]. It has been demonstrated that speech therapy is significantly effective in improving both self- and professional-rated auditory perception, acoustic perception of the voice (f_0), quality of life, and gender dysphoria[3,7–9]. Some studies have reported a significant increase in f_0 of approximately 27 Hz in sustained vowel phonation (/a/) and 25 Hz in spontaneous speech, with effects persisting for at least one year post-treatment[7,9]. TWVQ scores also showed an average improvement of 20–25 points[7]. Anatomical changes, such as thinning of the vocal folds, have also been associated with speech therapy[7]. The literature suggests that significant improvements can be

observed after four to six sessions of speech therapy[5], with McBrinn et al.[7] recommending approximately 12 sessions for sustained results. Furthermore, Schwarz et al.[9] revealed that a higher number of sessions and longer time experienced as a woman may improve speech therapy outcomes. However, McBrinn et al.[7] reported no correlation between f_0 changes and TWVQ outcomes, demonstrating the importance of incorporating this measure to evaluate the success of the approach. Finally, postoperative speech therapy is associated with more pronounced long-term increases in f_0 and improved perception of vocal femininity[7]. As speech therapy addresses multiple aspects of communication beyond pitch and is noninvasive, it is typically regarded as the first-line intervention[3,5].

Transgender men

Although multiple longitudinal studies have confirmed a decrease in f_0 after one year of HRT[3],with most individuals achieving values comparable to those of cisgender men, this decrease is minimal or absent in approximately one in five cases[3,10]. According to a narrative review by Chang & Yung[3], 24% of transgender men undergoing HRT also receive speech therapy due to vocal issues such as fatigue, instability, and tension. Furthermore, vocal outcomes are unsatisfactory in 16–21% of cases [3,10]. The literature on speech therapy for transgender men is quite limited. However, Chang & Yung[3] reported a satisfactory reduction in the pitch in a study involving 10 transgender men, with the results maintained for one year post-speech therapy.

Surgical management

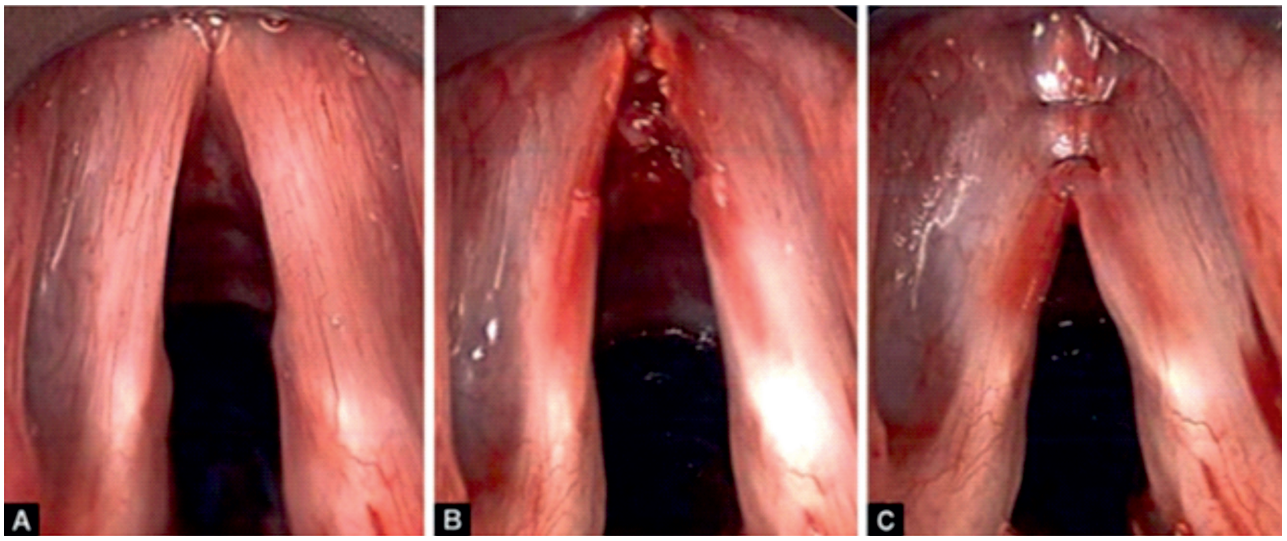
Transgender women

Currently, there are no established guidelines for surgical indications in transgender women. However, the World Professional Association for Transgender Health (WPATH) has suggested that all transgender women should be considered eligible for surgery unless there is a medical contraindication[5]. Both the WPATH and Endocrinology Society recommend that surgical interventions should only be considered after one year of HRT[5]. Surgical candidates generally include transgender women in whom speech therapy had unsatisfactory results, or successful results were achieved but the techniques required to maintain a gender-congruent voice are unsustainable[5].

Surgical techniques designed to increase the vocal pitch focus on one of the following principles: increasing vocal fold tension, decreasing vocal fold volume, or shortening the vibratory length of the vocal folds[5,7]. Several approaches have been described in the literature. Cricothyroid approximation (Isshiki type IV thyroplasty) has become obsolete due to the demonstration of pitch regression over time and unsatisfactory results in the medium and long term[3,5]. Laser-assisted voice adjustment (LAVA) is ineffective when performed alone and has been discouraged in a narrative review by Dwyer et al.[5] as it induces fibrosis in the vocal folds. Other procedures, such as anterior commissure advancement and feminization laryngoplasty, are more invasive and lack data on effectiveness[3,5]. Among the available options, Wendler's glottoplasty (Figure 2) and its modifications have demonstrated the highest efficacy in increasing pitch, with favorable short-, medium-, and long- term outcomes[3,5,7,11]. This procedure is considered safe and associated with few complications[5]. Moreover, it significantly improves the quality of life, as assessed by the TWVQ[3,5]. In a narrative review by McBrinn et al.[7], based on their clinical experience, the authors proposed that combining Wendler's glottoplasty with LAVA may enhance the vocal outcomes compared to glottoplasty alone.

Phonosurgery is significantly more effective in increasing f_0 than speech therapy, with average gains of 72 Hz in sustained vowel phonation (/a/) and 39 Hz in spontaneous speech[9]. Recent studies have revealed that the best results are achieved with a combination of speech therapy and surgery[7].

Figure 2
2A–C. Wendler's glottoplasty. (A) Before the incision, (B) after removal of the medial and anterior mucosa of the vocal folds, and (C) after suturing of the anterior vocal folds. Source: Chang & Yung[3].



Transgender men

Surgical procedures for lowering the vocal pitch aim to shorten the vocal folds and reduce their tension[3,5]. The techniques described in the literature include Isshiki type III thyroplasty (relaxation thyroplasty) and its variants, anterior commissure repositioning, and procedures that increase the mass or volume of the vocal folds. Currently, there is no conclusive evidence supporting the effectiveness of these procedures or indicating the superiority of one over the others[5].

Methodological quality assessment

The methodological quality of the included studies was evaluated using the tools developed by the Joanna Briggs Institute for each type of study design (Tables 2–5). Based on this assessment, eight studies were classified as high quality, and two as moderate quality.

Accordingly, we concluded that the overall quality of the studies included in this systematic review was high.

Table 2
Methodological quality assessment of the included case series

Authors	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	General
Young et al.[4]	?	+	+	+	+	?	+	+	+	+	High quality
Casado et al.[11]	+	+	+	-	-	+	+	+	+	+	High quality

Legend: Q = Question; green rectangle with the symbol "+" = yes (2 points); red rectangle with the symbol "-" = no (0 points); yellow rectangle with the symbol "?" = undefined (1 point); gray rectangle = not applicable; the cutoff values were: high quality = 14–20 points; moderate quality = 10–14 points; and low quality = 0–10 points

Table 3
Methodological quality assessment of the included cohort study

Authors	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	General
Adessa et al.[8]	+	?	+	-	-	?	+	+	+	-	+	Moderate quality

Legend: Q = Question; green rectangle with the symbol "+" = yes (2 points); red rectangle with the symbol "-" = no (0 points); yellow rectangle with the symbol "?" = undefined (1 point); gray rectangle = not applicable; the cutoff values were: high quality = 15–22 points; moderate quality = 11–15 points; and low quality = 0–11 points.

Table 4
Methodological quality assessment of the included narrative reviews

Authors	Q1	Q2	Q3	Q4	Q5	Q6	General
Adessa et al.[8]	+	+	+	+	+	+	High quality
Dwyer et al.[5]	+	+	+	+	+	+	High quality
Chang & Yung[3]	+	?	+	+	+	+	High quality
Dornelas et al.[2]	+	+	+	?	+	+	High quality

Legend: Q = Question; green rectangle with the symbol "+" = yes (2 points); red rectangle with the symbol "-" = no (0 points); yellow rectangle with the symbol "?" = undefined (1 point); gray rectangle = not applicable; the cutoff values were: high quality = 8–12 points; moderate quality = 6–8 points; and low quality = 0–6 points

Table 5
Methodological quality assessment of the included systematic reviews

Authors	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	General
Schwarz et al.[9]	+	+	+	+	+	+	+	+	-	+	+	High quality
Chaiet et al.[6]	+	+	?	+	+	-	?			+	+	Moderate quality
Ziegler et al.[10]	+	+	+	+	+	+	?	+	-	+	+	High quality

Legend: Q = Question; green rectangle with the symbol "+" = yes (2 points); red rectangle with the symbol "-" = no (0 points); yellow rectangle with the symbol "?" = undefined (1 point); gray rectangle = not applicable; the cutoff values were: high quality = 15–22 points; moderate quality = 11–15 points; and low quality = 0–11 points.

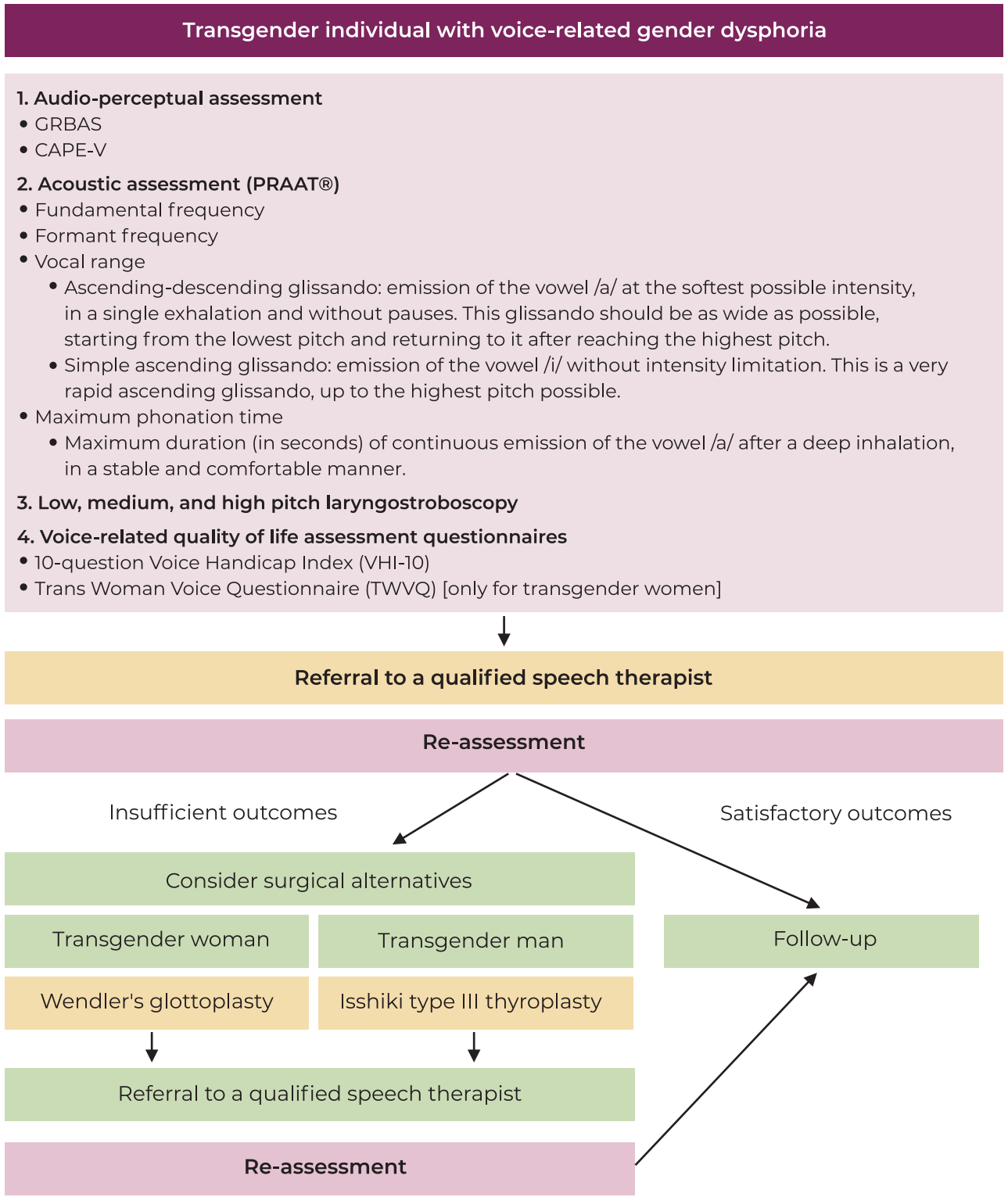
Discussion

To the best of our knowledge, no systematic reviews to date have addressed an approach to gender-affirming voice care that includes clinical examination, medical treatment, and surgical intervention. The primary objective of this study was to develop a protocol for managing voice-related gender dysphoria (Figure 3) based on the best available evidence, adapted to the Portuguese context.

It is essential that otolaryngologists adopt inclusive, gender-affirming language at all times and respect the individual's affirmed pronouns. Moreover, the individual's specific vocal goals must be identified to inform and guide the therapeutic approach. The International Association of TransVoice Surgeons (IATVS) was established in 2022, bringing together laryngologists specializing in gender-affirming voice surgery, with the objective of continuously disseminating the latest evidence in this field.

From an otolaryngologic perspective, the subpopulation of transgender women, individuals assigned male at birth who identify and express themselves as female, has been more extensively studied due to the limited vocal effects of HRT in this group. Since there are no comparative studies in this population, both the GRBAS and CAPE-V audio-perceptual voice assessment scales, which are validated for European Portuguese[17], should be included in the assessment because they complement each other and provide more comprehensive data. For acoustic assessment, high-quality digital recordings should be obtained to enable future comparisons. Using the free PRAAT® software, the physician should determine f_0 and formant frequencies through the sustained phonation of the vowel /a/ and the reading of the phonetically balanced text "O Sol"[18], which is validated for European Portuguese. Although standardized, this text has been recognized by both the validation study group and IATVS to effectively simulate spontaneous speech. Additionally, the vocal range should be evaluated using ascending-descending and simple ascending glissando techniques, and maximum phonation time should be measured using the vowel /a/. All transgender women should undergo endoscopic examination with stroboscopy for anatomical

Figure 3
Protocol for managing voice-related gender dysphoria



and functional laryngeal assessment. For evaluating the voice-related quality of life, the validated Portuguese version of the VHI-10[19] and TWVQ[20] should be administered.

The first-line treatment for voice-related gender dysphoria is speech therapy, which supports transgender individuals by aligning their verbal and nonverbal communication

with their gender identity and expression[21]. Transgender women should be referred to a qualified speech therapist capable of providing the specific care they need. If the vocal outcome remains unsatisfactory after one year of HRT and speech therapy, surgical intervention may be considered. There is a consensus in the literature that Wendler's glottoplasty is the most effective surgical technique, with favorable outcomes in the medium- and long-term. Consequently, it is considered the first-line surgical treatment. In the context of a multidisciplinary approach to voice care for transgender individuals, surgical planning must be integrated with the overall gender affirmation process. Wendler's glottoplasty typically requires a healing period of approximately six months, during which no additional surgeries requiring orotracheal intubation should be scheduled[5]. Given that several transgender individuals may be on the waiting lists for multiple surgical procedures as part of their gender affirmation process, careful and coordinated planning among different medical specialties is essential to avoid compromising the functional outcomes of laryngeal surgery. Postoperative speech therapy has been associated with further increases in f_0 and enhanced perception of vocal femininity. According to the IATVS, stroboscopic evaluation should be performed at multiple pitch levels (low, medium, and high), as vocal folds that have been undergone length or thickness changes may behave differently across the pitch range. Although this examination does not assess the durability of the surgical outcomes, it is critical to confirm complete laryngeal healing within one year postoperatively. Although not directly related to the voice, 32% of transgender women also seek otolaryngology care due to gender dysphoria caused by the prominence of the thyroid cartilage[22], commonly referred to as the "Adam's apple." The procedure used to address this concern is chondrolaryngoplasty, which aims to reduce the laryngeal prominence. Although relatively recent, this surgery has been broadly implemented over the last decade[5,22]. Transcervical and transoral approaches can be used, and both techniques are considered safe and effective[22], with no available data suggesting the superiority of one over the other[22].

For transgender men, individuals assigned female at birth who identify and express themselves as male, the existing evidence is more limited. During the appointment, audio-perceptual and acoustic voice assessments, along with laryngostroboscopy, should be conducted following protocols similar to those used for transgender women. Currently, there are no specific questionnaires for transgender men. However, a study by Sirin et al.[23] demonstrated the applicability of the TVQ^{FtM16} in the Turkish transgender male population, which showed strong correlations with other measures of the voice-related quality of life and perceived vocal masculinity, thereby paving the way for future research. Considering the absence of such evidence in the Portuguese population, only the VHI-10 questionnaire, validated for European Portuguese, should be used in this group[19]. While most transgender men achieve satisfactory pitch alignment with HRT and speech therapy, 21% do not attain f_0 values within the normative range for cisgender men[10,21]. Due to the good effects of medical treatment on the voice, few studies have focused on evaluating surgical outcomes in this subpopulation. The most frequently reported and IATVS-recommended procedure is Isshiki type III thyroplasty[3,5,21]. In 2020, Bultynck et al.[24] reported successful outcomes of Isshiki type III thyroplasty in eight transgender men dissatisfied with their vocal outcomes after one year of HRT, with a f_0 reduction to levels comparable to those in cisgender males.

One of the limitations of this systematic review is the use of inconsistent terminology across studies. This inconsistency complicated the identification of relevant studies, and necessitated the review of reference lists in the included articles. Publication bias is also a common challenge in this type of study, which tends to favor studies with

positive or statistically significant outcomes. Furthermore, due to the recent expansion of knowledge on therapies for transgender individuals, the limited number of published articles and small sample sizes may reduce the robustness of the findings. Another limitation is the differences in the assessment methods among the included studies. The lack of standardized examination protocols prevents the implementation of consistent and comparable criteria across studies, complicating the interpretation of the results. The lack of structured systematic reviews among the included studies is also a significant limitation. Most existing reviews are narrative, implying a less rigorous and more subjective analysis of the data.

Future studies should employ larger sample sizes and homogeneous methodologies; rigorous systematic reviews are also warranted. Adoption of standardized guidelines and efforts to reduce publication bias are essential to enhance the reliability and applicability of scientific findings in this field.

Conclusion

Over the last decade, there has been substantial progress in the understanding of gender-affirming healthcare. This systematic review aimed to synthesize the most up-to-date evidence and propose a protocol for gender-affirming healthcare adapted to the Portuguese context. The proposed protocol includes a comprehensive clinical evaluation involving audio-perceptual and acoustic voice analysis, laryngostroboscopy, and the administration of voice-related quality of life questionnaires. Subsequently, within a multidisciplinary framework, the specific vocal goals of each individual should be identified, and the treatment plan defined. Speech therapy should be the first-line intervention, followed by an evaluation of its outcomes. In case they are insufficient, surgical options may be considered. Among transgender women, surgical voice feminization has been more extensively studied, with Wendler's glottoplasty considered as the most effective technique. Postoperative speech therapy is also recommended to optimize the results. Further research is needed to validate the treatment outcomes and expand the current knowledge, particularly through studies with larger samples and comparative analyses of the different treatment approaches and techniques.

Conflicts of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Data Confidentiality

The authors declare having followed the protocols used at their working center regarding patient data publication.

Protection of humans and animals

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and the 2013 Helsinki Declaration of The World Medical Association.

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Availability of scientific data

There are no datasets available, or publicity related to this work.

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