

**Title:**

Paediatric Voice Disorder: Who to refer and how to assess? A summary of recent literature.

**Authors:**

Wendy Cohen (corresponding) Speech and Language Therapist, University of Strathclyde,  
Department of Psychological Sciences and Health, 40 George Street, Glasgow, G1 1QE  
[wendy.cohen@strath.ac.uk](mailto:wendy.cohen@strath.ac.uk) 01415483793

David M Wynne, Consultant Paediatric Otorhinolaryngologist, Royal Hospital for Children, NHS  
Greater Glasgow and Clyde. [david.wynne@ggc.scot.nhs.uk](mailto:david.wynne@ggc.scot.nhs.uk)

## **Structured Abstract**

### Purpose of review:

The purpose of this review is to update the reader with recent advances and current opinion on the assessment and management of paediatric voice disorders.

### Recent findings

Access to advanced multidisciplinary paediatric voice clinics has increased over the last decade.

Often the assessment is combined between speech therapy / pathology and ENT surgery. Vocal fold nodules remain the most prevalent diagnosis at a paediatric voice clinic, but significant pathologies will also present e.g. laryngeal papilloma. Recently more consideration of the psychosocial aspect of voice disorders and evaluation of auditory processing disorders have shown how these can have a negative impact. There also appears to be a lack of parental and teacher awareness of paediatric voice disorders and their significance.

### Summary

We would recommend multiparametric assessment and analysis of all children with a voice disorder. Most paediatric voice conditions will respond to skilled voice therapy. However, the exact techniques and dosage requires further evaluation and research. Paediatric voice conditions are common and should not be dismissed as they may represent significant pathology e.g. papilloma, vagal palsy or have a significant psychosocial impact on the child.

### Key words

Voice, Dysphonia, Paediatric, Assessment, Intervention

## **Introduction**

Voice disorders are defined when the voice sounds abnormal for a person's age or gender [1]. Ear Nose and Throat (ENT) and Speech and Language Pathology/Therapy (SLP/T) services have been increasingly offering access to specialist paediatric voice clinics in the last decade largely to match with the recommended assessment for adults [2–4]. We previously recommended that the same approach should be used routinely in the paediatric setting [5, 6]. This is further supported by a recent clinical practice review [7] which recommends including a detailed voice history, subjective impact questionnaire, laryngeal imaging, acoustic and aerodynamic tasks alongside perceptual voice evaluation after providing a useful summary of paediatric voice aetiology and presentations.

When examining the literature about voice disorders in children and young people there is a plethora of information about the growth and development of the larynx [8, 9]. Prevalence of voice disorder in children is often reported around 6-11% [10, 11] depending on whether the assessment is made by parents or clinicians. Common diagnoses in this population are benign lesions that frequently respond to behavioural or medical management [12] but this is offset against a desire to identify rare cases requiring more complex intervention such as Recurrent Respiratory Papillomatosis [13]. The purpose of this article is to summarise recent peer reviewed evidence to reflect on who should be referred and how we should assess voice disorders in children.

## **Method**

In order to identify relevant, recent literature to include in this review, a search was completed of the CINAHL and MEDLINE databases. Only peer reviewed articles published in English language between March 2021 and August 2023 were included in the final literature presented in this paper.

Two search strategies were employed to capture as many publications relating to voice (voice disorder or voice problem or dysphonia or aphonia or hoarseness) in the paediatric (child or young person or pediatric or paediatric) as possible using Boolean operators as follows:

- Search 1 : [TI dysphoni\* OR TI aphoni\* OR TI hoars\* OR TI voice disorder OR TI voice problem AND TI child\* OR TI young person]
- Search 2 : [TI dysphoni\* OR TI aphoni OR TI hoars\* OR TI voice disorder OR TI voice problem AND TI (pediatric or paediatric or child\* or young person or adolescent)]

All resulting publications were initially examined to check if the title and/or abstract referenced children or young people with dysphonia. Where this information was unclear from the abstract the methodology in the article was examined to check if children or young people were included in any way. Figure 1 summaries the search process.

*<insert figure 1 here>*

## **Results**

Following screening for relevance, each identified paper was then assigned to one or more of the following categories: prevalence; clinical experiences in a specific location; single case studies or case series of specific populations; assessment; intervention and publications giving a general clinical practice review each summarised under sub-headings below. Table 1 provides an overview of the papers sourced, presented alphabetically. The country of origin, study design and key findings are provided along with its categorisation for the purposes of this review.

*<insert table 1 here>*

## **Prevalence**

Three prospective epidemiological observational studies used parental report to identify prevalence of hoarseness. This includes two in Finland by the same team reporting two different age groups: <7years ( $n=3721$ , [43]) and 7-13years ( $n=5889$  [44]). The third is from a Saudi Arabian population ( $n=482$ , [19]). Prevalence estimates were 5.6% [43], 6.4% [44] and 7.5% [14] which is close to previous epidemiological studies [10, 11].

Two studies report prevalence of hoarseness in ENT treatment seeking populations, one in Nigeria [14] and one in India [48] with differing prevalence rates (2.97% and 12.5% respectively). There are some challenges in interpreting the findings of both studies study due to the age range ( $n = 102$  with hoarseness, aged 7-78years and  $n=1033$  with hoarseness, aged 10-91years respectively). While there is increased report of hoarseness in the paediatric sample [14], inspection of the data reveals this is only by 1-2 cases compared to three other age groups. The high prevalence value reported in the Indian study [48] is notably higher than reported elsewhere [59] with an unusually higher proportion of hoarseness in males than females which the authors attribute to “perceived lack of importance and limited attention given to non-emergent medical issues in women [in India], regardless of whether the conditions affect quality of life” [48].

### **Clinical experiences in a specific location**

Vocal fold nodules (VFN) continue to represent the highest proportion of retrospectively reviewed diagnosed cases in Turkey (64.2%, [57], Spain (45.9% [20]) and Chile (40%, [45]). In a survey of paediatricians ( $n=368$ ) [41]; while 74.6% would refer for otolaryngological evaluation, some (22.1%) had access to voice evaluation equipment.

### **Single case studies/ Specific populations**

Single case studies highlight the need for either sensitive support (e.g. aphonia/conversion disorder that may [58] or may not [17] follow a traumatic experience; and of the importance of careful differential diagnosis where the initial presentation may be less clear. There is one report of dysphonia subsequently diagnosed with Burkitt’s Lymphoma [53], one where the initial diagnosis of vocal fold palsy following neonatal resuscitation was later identified as Pompe disease [21] and another where an initial diagnosis of LPR and VF paresis was identified as an undiagnosed congenital laryngeal web on second opinion [38].

Hoarseness as a presenting symptom for other conditions is described in four studies, one as a sign of Kawasaki Disease in children <2years [26] and two as a potential phenotypic characteristic of genetic lipoid proteinosis [42] and KBG syndrome [33]. Careful clinical aetiological consideration is necessary, and where there is non-response to conventional management the clinician should consider dysphonia as a symptom of another rare diagnosis [57].

Two studies outline the importance of information gathering to ensure the voice is well supported during other medical care: one in children with multisystem syndrome following SARS-CoV-2 infection [27] leading to recommended admission questions to identify dysphonia and dysphagia; and the other in children attending for adenotonsillar problems [34]. Several studies describe the presence of voice problems in Downs Syndrome [30]; Pompe Disease [24, 40] and Cleft lip/palate [22, 25] all of which provide helpful insight for appropriate clinical management.

### **Assessment**

Some studies provide information supporting multiparametric paediatric voice evaluation, with some suggesting that laryngeal examination using videolaryngostroboscopy offers more nuance than fibre-optic nasendoscopy – for example the former may lead to an increased diagnosis of cysts compared to VFN in one clinical population [45] and this requires more investigation. There is further evidence from a detailed literature review that the nature of the family/home environment and the child's personality and hobbies/interests contribute to presence of paediatric dysphonia [56].

Informal methods for gathering spontaneous speech for perceptual voice evaluation may not yield utterances of a sufficient duration (e.g. >10s) determined from an experimental study analysing speech recordings from a cohort ( $n=20$ ) of dysphonic pre-term children [46]. Thus SLP/Ts may need to consider a more standardised approach for capturing connected speech for paediatric voice evaluation to ensure sufficient data is gathered during assessment.

The importance of measuring quality of life is outlined in a Spanish population [20] which routinely captures all elements of the multiparametric evaluation protocol. An additional translation of the PVRQOL [60] to Serbian is now available [49] who also report that there remains a proportion of unreferral children whose parents identify voice related quality of health impact when asked. The same team propose an additional question about hoarseness following organised activities [50] – though this latter addition requires wider validation. Notwithstanding that there is lack of parental awareness of voice problems, the same can be said of teachers in a small study identifying low knowledge of children's voice disorders leading to reduced awareness of referral pathways [15]. Given that teachers represent a large population in the adult voice clinic [61] there is clearly an opportunity for awareness raising with this population.

The sourced literature also identifies some aspects of voice evaluation that are not routinely included in paediatric voice clinics. Detailed examination of auditory processing using two methods (Frequency Pattern Test [62] and Duration Pattern Test [63]) yields significantly weaker judgments of pitch and auditory stimuli in dysphonic children ( $n=331$ ) compared to age matched non-dysphonic children ( $n=213$ ) [51].

The findings of two experimental phonetic investigations [28, 29] explore the contribution of phonatory and articulatory maturation as a factor in paediatric dysphonia. While both studies defined presence of dysphonia on perceptual judgement from audio recordings alone (neither had included laryngeal examination confirming presence or absence of laryngeal pathology), they each propose how different approaches to acoustic analysis might supplement objective evaluation of voice in children under 7 years of age. While one study used traditional evaluation techniques (e.g. maximum phonation time and traditional acoustic analysis) to describe vocal characteristics in children ( $n=115$ ) across 4 age groups [29], the other proposed a technique to differentiate children with transient voice changes ( $n=28$ ) associated with typical development from consistent dysphonia ( $n=19$ ) using measurements of phonetic variability associated with phonatory and articulatory

maturation [28]. This latter study may provide a means for differentiating those children who may benefit from direct intervention though this hypothesis requires further evaluation.

There is also evidence that voice therapists ( $n=88$ ) routinely evaluate a person's ability to modify voice following demonstration (as part of understanding the potential for behavioural change in voice therapy) [52]. It is not clear the extent to which this is routinely the case in paediatric voice clinics, but this may be an additional assessment tool which may be used to predict therapeutic outcome.

### **Intervention**

Of three systematic reviews focusing on VFN, two concluded there is a need for high quality RCTs to determine the efficacy of indirect vs direct voice therapy [18] and to evaluate optimum therapy techniques and dosage [16]. One recent small RCT ( $n=17$ ) [36], provides evidence that a mixture of direct and indirect intervention can lead to significant change in at least one voice evaluation parameter- parent report via the pVHI though this should be caveated by the potential for parental bias. The third systematic review focused on surgical outcomes for VFN incorporating a meta-analysis [55]. While there is evidence of positive surgical outcomes, there is a lack of clarity of whether surgery was offered following voice therapy failure. With a recurrence rate of 19% across studies, future research should explore the efficacy of perioperative voice therapy in children with VFN where surgery is considered.

Some recent studies have explored access to intervention, and these provide an interesting perspective to consider. Older children with severe dysphonia (mean age 9.1yrs) are statistically more likely to attend therapy than younger children (mean age 7.6) particularly if the distance to the clinical site is not overly long [32]. In one cross-sectional observational study, the time delay from initial parental identification of a voice problem to starting voice therapy was 3.5 years [47] by which time any voice problem caused by phonotraumatic behaviours may be intractable. These findings, taken alongside confidence amongst school based SLP/Ts suggest that there remains work to be



done, particularly as a cohort of school-based SLP/Ts ( $n=85$ ) feel they need more skills training and professional management guidelines [35] despite the relatively high prevalence of paediatric voice disorders.

The Covid-19 pandemic led to a significant shift in how services are delivered with voice therapy moving to a telehealth format with some indications of its success with children [31]. SLP/Ts considering setting up a telehealth approach may welcome guidance on equipment, environment, confidentiality, and voice assessment outlined in a clinical focus article [39] while an opinion piece [37] outlines how future technological impacts might influence asynchronous therapeutic options via Artificial Intelligence, smartphone biofeedback, virtual reality and gamification and these areas may see innovation in clinical services delivery.

### **Clinical practice reviews**

Articles which provided a general review signpost a wealth of literature in drawing their conclusions. Current opinion continues to recommend that this should include a detailed voice case history [23, 54]; subjective impact questionnaires [23, 56]; laryngoscopy [23, 54, 56] and there is increasing scope for the use of ultrasound where laryngoscopy is not tolerated [23, 56]. Acoustic analysis continues to provide valuable information for outcome measurement [23, 56] and voice evaluation can be supplemented with specialist evaluation techniques such as laryngeal electromyography [23, 54].

With VFN described as the most common voice disorder [23], voice therapy remains the preferred management [23, 54, 56]. While there are no clear clinical guidelines or consensus on what voice therapy should constitute [56] there is suggestion that this is suitable for more mature children > 7years [54] given there are issues in relation to therapy adherence in younger children [56] supporting findings from a RCT published prior to this literature review [12]. Surgical management remains relevant for other voice disorders such as recurrent respiratory papillomatosis [54].

## **Conclusion**

This review of recent international literature provides support to the consensus that any child or young person who has any voice problem should be referred for ENT and SLP/T assessment. While most diagnoses continue to be benign vocal fold lesions such as VFN, hoarseness can be a symptom of another undetected aetiology and thus multiparametric voice evaluation is paramount.

There remains evidence of good clinical practice utilising a range of voice evaluation methods – typically assessment of every child presenting with hoarseness should at the very least include a detailed clinical history, laryngeal imaging, perceptual voice evaluation, acoustic voice evaluation and subjective impact questionnaires as these assist in both diagnosis and clinical decision making for appropriate management. There are some interesting hypotheses worthy of testing regarding underlying mechanisms leading to dysphonia which may have some bearing on management decisions.

There remain some gaps in the literature, particularly in relation to high quality RCTs that contribute a stronger understanding of what management approaches are optimum, and for voice therapy, the optimum dosage to achieve satisfactory outcomes.

## **Key points**

1. Paediatric voice disorders are common and should be investigated.
2. Clinicians should be aware that hoarseness presentation may indicate a voice disorder or another undiagnosed condition.
3. Multiparametric evaluation provides detailed analysis of the presenting dysphonia from both the child's and their caregiver's perspective and this assists with management decisions, and potentially supports identification of a wider aetiology.
4. For most children with hoarseness due to benign lesions, voice therapy remains an effective intervention, though more understanding of techniques and optimal dosage is necessary.

## Acknowledgements

For the purpose of Open Access, the authors have applied a Creative Commons Attribution (CC BY) to any Author Accepted Manuscript (AAM) version arising from this submission

## Financial support and sponsorship

There has been no financial support or sponsorship associated with this article

## Conflicts of interest

There are no conflicts of interest for either author associated with this article

## Figure legend:

Figure 1: PRISMA diagram of the search process

## References

- [1] Aronson AE, Bless DM. *Clinical voice disorders*. 4th ed. New York: Thieme, 2009.
- [2] Dejonckere PH, Bradley P, Clemente P, et al. 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 Phoniatics of the European Laryngological Society (ELS). *Eur Arch Otorhinolaryngol* 2001; 258: 77–82.
- [3] Stachler RJ, Francis DO, Schwartz SR, et al. Clinical Practice Guideline: Hoarseness (Dysphonia) (Update). *Otolaryngology–Head and Neck Surgery* 2018; 158: S1–S42.
- [4] Patel RR, Awan SN, Barkmeier-Kraemer J, et al. 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* 2018; 27: 887–905.
- [5] Cohen W, Wynne DM, Kubba H, et al. Development of a minimum protocol for assessment in the paediatric voice clinic. Part 1: Evaluating vocal function. *Logoped Phoniatr Vocol*; 2012;37:33-38. DOI: 10.3109/14015439.2011.638670.
- [6] Cohen W, Wardrop A, Wynne DM, et al. Development of a minimum protocol for assessment in the paediatric voice clinic. Part 2: Subjective measurement of symptoms of voice disorder. *Logoped Phoniatr Vocol*; 2012;37:39-44. DOI: 10.3109/14015439.2011.638671.
- [7] Rickert SM, O’Cathain E. Pediatric Voice. *Pediatr Clin North Am* 2022; 69: 329–347.
- [8] Kishimoto Y. Laryngeal development. *Regenerative Medicine in Otolaryngology* 2015; 128–146.
- [9] Lungova V, Thibeault SL. Mechanisms of larynx and vocal fold development and pathogenesis. *Cellular and Molecular Life Sciences* 2020 77:19 2020; 77: 3781–3795.
- [10] Tavares ELM, Brasolotto A, Santana MF, et al. Epidemiological study of dysphonia in 4-12 year-old children. *Braz J Otorhinolaryngol* 2011; 77: 736–746.

- [11] Carding PN, Roulstone S, Northstone K. The prevalence of childhood dysphonia: a cross-sectional study. *J Voice* 2006; 20: 623–630.
- [12] Hartnick C, Ballif C, De Guzman V, et al. Indirect vs Direct Voice Therapy for Children With Vocal Nodules: A Randomized Clinical Trial. *JAMA Otolaryngol Head Neck Surg* 2018; 144: 156–162.
- [13] Shykhon M, Kuo M, Pearman K. Recurrent respiratory papillomatosis. *Clin Otolaryngol Allied Sci* 2002; 27: 237–243.
- [14] Adeyeye FM, Iseh KR, Abdullahi M. Hoarseness in a nigerian tertiary health facility: Prevalence, aetiology and predisposing factors. *Niger Postgrad Med J* 2022; 29: 341–346.  
*\* This prospective observational study investigated prevalence of hoarseness in an Ear Nose and Throat seeking population in Nigeria.*
- [15] Adriaansen A, Van Oudenhove B, Van Lierde K, et al. Knowledge of the Voice in the Teachers' Population and their Ability to Refer Children with Voice Disorders to a Speech-Language Pathologist. *Journal of Voice*; 0. Epub ahead of print 2022. DOI: 10.1016/j.jvoice.2022.06.035.  
*\* This prospective observational study investigated awareness of voice disorders in teachers highlighting the limited knowledge and the potential impact of this on appropriate identification and onward referral.*
- [16] Adriaansen A, Meerschman I, Van Lierde K, et al. Effects of voice therapy in children with vocal fold nodules: A systematic review. *Int J Lang Commun Disord* 2022; 57: 1160–1193.  
*\*\* This detailed systematic review provides a summary of the effectiveness of voice therapy. The authors outline that further study is required to understand which voice therapy techniques are most effective and what the optimum therapy dosage should be for different paediatric voice diagnoses.*
- [17] Al-Balas HI, Abuhlaweh M, Melhem HB, et al. Conversion disorder with aphonia in 12 years old male patient: A case report. *Int J Surg Case Rep* 2021; 84: 106135.  
*\* This single case study raises awareness of conversion aphonia as a condition that is not unique to female patients.*
- [18] Al-Kadi M, Alfawaz MA, Alotaibi FZ, et al. Impact of Voice Therapy on Pediatric Patients With Dysphonia and Vocal Nodules: A Systematic Review. *Cureus*; 14. Epub ahead of print 24 April 2022. DOI: 10.7759/CUREUS.24433.  
*\*\* This detailed systematic review outlines the positive impact of direct and indirect voice therapy on children with VFN. The authors point out the difficulty that exists in interpreting outcomes due to different evaluation methods, highlighting the importance of a standardised voice evaluation protocol.*
- [19] Alrahim A, Alshaibani AK, Algarni S, et al. Prevalence and Determinants of Hoarseness in School-Aged Children. *International Journal of Environmental Research and Public Health* 2022, Vol 19, Page 5468 2022; 19: 5468.  
*\* This prospective observational study of parents/caregivers in preschool and primary schools in Saudi Arabia found a prevalence rate of hoarseness in children of 7.5%.*

- [20] Antón Almero M, Doménech Máñez I, Ferrer Ramírez MJ, et al. Dysphonia in Children. Descriptive Analysis of the Factors Involved, Clinical Parameters and Impact on Quality of Life. *Acta Otorrinolaringologica (English Edition)* 2021; 72: 80–84.
- \* In this retrospective case not review, the authors analysed referrals to their service, finding VFN the largest diagnostic category.*
- [21] Arumugam SK, Subbarayan SK. A 14-Week-Old Infant with Respiratory Distress and a Hoarse Cry. *Neoreviews* 2023; 24: e399–e402.
- \* This single case study describes misdiagnosis of an infant based on assumptions regarding the neonatal history and is useful for highlighting the importance of having an open mind when evaluating hoarseness in infants.*
- [22] Braden MN. Voice Disorders in Children With Cleft Lip/Palate and Other Craniofacial Conditions. *Perspect ASHA Spec Interest Groups* 2022; 7: 1769–1781.
- \* This paper provides an overview of aetiologies and presentation of voice disorders associated with Cleft Lip/Palate.*
- [23] Campano M, Cox SR, Caniano L, et al. A Review of Voice Disorders in School-Aged Children. *J Voice* 2023; 37: 301.e1-301.e7.
- \*\* This systematic review of the literature found that VFN are the most reported vocal fold pathology in children giving an overview of approaches to assessment to assist with differential diagnosis and treatment planning. The authors recommend that voice disorders in children are recognised and treated as early as possible alongside enhancing awareness of voice disorders in children.*
- [24] Crisp KD, Neel AT, Amarasekara S, et al. Assessment of dysphonia in children with pompe disease using auditory-perceptual and acoustic/physiologic methods. *J Clin Med* 2021; 10: 3617.
- \* This prospective observational study describes voice characteristics in children with Pompe disease.*
- [25] Fujiki RB, Kostas G, Thibeault SL. Relationship Between Auditory-Perceptual and Objective Measures of Resonance in Children with Cleft Palate: Effects of Intelligibility and Dysphonia. <https://doi.org/10.1177/10556656231162238>. Epub ahead of print 8 March 2023. DOI: 10.1177/10556656231162238.
- \* This retrospective case note review identified a correlation between audio-perceptual ratings and nasometry values in children with Cleft Lip/Palate that weakens in children with increased unintelligibility or moderate dysphonia.*
- [26] Gámez-González LB, Ulloa-Gutierrez R, Murata C, et al. Kawasaki disease presenting with hoarseness: A multinational study of the REKAMLATINA network. *Pediatrics International* 2021; 63: 643–648.
- \* This prospective observational study identified hoarseness as a presenting sign in the absence of viral infection of Kawasaki Disease in children <2 years.*
- [27] Halfpenny R, Stewart A, Carter A, et al. Dysphonia and dysphagia consequences of paediatric inflammatory multisystem syndrome temporally associated with SARS-CoV-2 (PIMS-TS). *Int J Pediatr Otorhinolaryngol* 2021; 148: 110823.

*\* This retrospective cohort study raises awareness of dysphonia in children following SARS-CoV-2 infection recommending the use of a brief inpatient screening tool to identify children who may need additional support.*

- [28] Heller Murray ES, Chao A. The Relationships Among Vocal Variability, Vocal-Articulatory Coordination, and Dysphonia in Children. *Journal of Voice*; 0. Epub ahead of print 2021. DOI: 10.1016/j.jvoice.2021.06.008.

*\* This retrospective analysis of speech data offers a novel technique that may differentiate children with chronic hoarseness from transient periods of hoarseness associated with maturation*

- [29] Hoffmann CF, Cielo CA. Characteristics of the Voice of Dysphonic School Children from 4:0 to 7:11 Years Old. *Journal of Voice* 2021; 35: 664.e11-664.e19.

*\* This prospective cross sectional study describes the vocal characteristics (using MPT and jitter/shimmer) in a group of dysphonic children (aged 4;0 – 7;11).*

- [30] Hseu AF, Spencer GP, Jo S, et al. Laryngeal pathologies in dysphonic children with Down Syndrome. *Int J Pediatr Otorhinolaryngol* 2022; 157: 111118.

*\* This retrospective case note review outlines the dysphonia/laryngeal presentation in a cohort of children with Down Syndrome, where the higher proportion of the cohort have vocal fold immotility or hypomotility that may be associated with history of cardiac surgery.*

- [31] Hseu AF, Spencer G, Jo S, et al. Telehealth for Treatment of Pediatric Dysphonia. *Journal of Voice*; 0. Epub ahead of print 2021. DOI: 10.1016/j.jvoice.2021.11.007.

*\* This retrospective case note review reports effectiveness of voice therapy for children with VFN when conducted via a telehealth platform.*

- [32] Hseu AF, Spencer G, Woodnorth G, et al. Barriers to Voice Therapy in Dysphonic Children. *Journal of Voice* 2023; 37: 410–414.

*\* This retrospective case note review describes common barriers for children attending voice therapy, noting that older children, with a more severe voice disorder who live within reasonable distance to therapy site are more likely to attend.*

- [33] Kutkowska-Kaźmierczak A, Boczar M, Kalka E, et al. Wide fontanelles, delayed speech development and hoarse voice as useful signs in the diagnosis of KBG syndrome: A clinical description of 23 cases with pathogenic variants involving the *ankrd11* gene or submicroscopic chromosomal rearrangements of 16q24.3. *Genes (Basel)* 2021; 12: 1257.

*\* This case series reports a high prevalence of hoarseness (50%) in their 23 cases of children with KBG syndrome proposing this symptom as a potential phenotypic characteristic.*

- [34] Lee JS, Keum BR, Kim JE, et al. Prevalence of Dysphonia in Children with Adenotonsillar Problems and the Impact of Surgery on Voice. *Laryngoscope* 2021; 131: 2369–2375.

*\* This retrospective case note review describes the improvement in voice symptoms post adenotonsillar surgery.*

- [35] Ma EPM, Chow AYT, Lam VWY. Management of Pediatric Voice Disorders: Perceived Knowledge, Confidence, Attitude and Practice Patterns Among School-based Speech-language Pathologists in

Hong Kong. *Journal of Voice*. Epub ahead of print 15 November 2022. DOI: 10.1016/j.jvoice.2022.10.010.

*\* This prospective observational study surveyed SLP/Ts confidence treating dysphonia in children and highlights the need for professional treatment guidelines for the school setting.*

- [36] Ma EPM, Cheung YC, Siu AKY, et al. The Effectiveness of Vocal Hygiene Education With Resonant Voice Therapy for School-Aged Children With Vocal Nodules. *Journal of Voice*. Epub ahead of print 14 November 2021. DOI: 10.1016/j.jvoice.2021.08.015.

*\* This small scale RCT evaluated the effectiveness of vocal hygiene education with resonant voice therapy in school aged children with VFN, where the only significant finding came via parental report using the pVHI.*

- [37] Mallipeddi N V., Mehrotra A, Stan JH Van. Telepractice in the Treatment of Speech and Voice Disorders: What Could the Future Look Like? *Perspect ASHA Spec Interest Groups* 2023; 8: 418–423.

*\* This professional opinion piece outlines what technology of the future may offer in the field of paediatric voice therapy.*

- [38] Mašić EK, Varošaneć-Škarić G, Bašić I, et al. Dysphonia Leading to a Delay in Psychosocial Development. <https://doi.org/10.1177/00099228231193376>. Epub ahead of print 27 August 2023. DOI: 10.1177/00099228231193376.

*\* This single case study reports a case of misdiagnosis from infancy based on clinical presentation highlighting the importance of detailed evaluation where hoarseness is the presenting symptom.*

- [39] Myers B, Hary E, Ellerston J, et al. Telepractice Considerations for Evaluation and Treatment of Voice Disorders: Tailoring to Specific Populations. *Am J Speech Lang Pathol* 2022; 31: 678–688.

*\* This clinical focus article outlines the key factors for successful telepractice for people with voice disorder.*

- [40] Neel AT, Crisp KD, Kishnani PS, et al. Speech Disorders in Children With Pompe Disease: Articulation, Resonance, and Voice Measures. *Am J Speech Lang Pathol* 2023; 1–16.

*\* This prospective observational study describes the impact of Pompe disease on articulatory precision, resonance and voice quality.*

- [41] Pan Z, Ma T, Gao B, et al. Survey of Referral Patterns in Southwestern Mainland China: How Do Pediatricians Manage Children with Dysphonia. *Journal of Voice*; 0. Epub ahead of print 2022. DOI: 10.1016/j.jvoice.2022.04.017.

*\* This prospective observational study surveyed the experience of paediatricians in diagnosing voice disorder or referring for specialist voice evaluation.*

- [42] Patel N, Nabil A, Alshammari M, et al. Hoarse voice in children as the presenting feature of ECM1-related lipoid proteinosis. *Am J Med Genet A* 2021; 185: 3924–3925.

*\* This case series describes two extended families with initial presentation of hoarseness subsequently diagnosed with a genetic aetiology.*

- [43] Putus TM, Atosuo J, Vilén LK. Hoarseness Among Young Children in Day-Care Centers. *Journal of Voice*; 0. Epub ahead of print 2022. DOI: 10.1016/j.jvoice.2022.08.026.

*\* This prospective observational study determined prevalence of hoarseness via survey of caregivers, finding prevalence of 5.6% in pre school children.*

- [44] Putus T, Vilén L, Atosuo J. The prevalence and risk factors of hoarseness among pupils in elementary schools in the South of Finland. *Logoped Phoniatr Vocol*. Epub ahead of print 2023. DOI: 10.1080/14015439.2023.2187450.

*\* This prospective observational study determined prevalence of hoarseness via survey of caregivers, finding prevalence of 6.4% in school aged children.*

- [45] Ramos PH, Álvarez ML, León NI, et al. Voice Disorders in Children: Experience in the Voice Unit at Universidad Católica Clinical Hospital. *Journal of Voice* 2022; 36: 293.e1-293.e5.

*\*\* This retrospective case note review identified VFN as the highest diagnosis in children and young people up to 18 years. Of note the authors observe however that following a change from fiberoptic nasendoscopy to videolaryngostroboscopy, the differential diagnosis of cysts increased while VFN decreased.*

- [46] Reynolds V, Fleury A. A preliminary exploration of conversation sampling in pediatric voice disorders. <https://doi.org/10.1080/1401543920222102207>. Epub ahead of print 2022. DOI: 10.1080/14015439.2022.2102207.

*\* This prospective observational study analysed utterance length and question type demonstrating that prompt style questions give the optimum utterance length required for auditory-perceptual voice evaluation.*

- [47] Sales NJ, Sampaio ATS, Pimentel D, et al. Pediatric Dysphonia and the Access to Voice Therapy: A Study in Speech Therapy Services Available in a Capital City in the Northeast of Brazil. *Journal of Voice*; 0. Epub ahead of print 2023. DOI: 10.1016/j.jvoice.2023.05.001.

*\* This retrospective case record review revealed that the time between onset of symptoms and treatment for voice disorder (most commonly VFN) can be considerably long (3.5 years).*

- [48] Sheth MC, Paul RR, Karuppusami R, et al. Hoarseness: its spectrum, associations and management in a tertiary care centre in India. *J Laryngol Otol* 2022; 136: 1211–1216.

*\* This retrospective case record review examined hoarseness in a wide range of ENT treatment seeking patients, finding a higher prevalence (12.4%) and gender balance compared to other populations.*

- [49] Stojanović J, Belić B, Erdevički L, et al. Quality of Life in Dysphonic Children Measured on Pediatric Voice-Related Quality of Life (PVRQOL) Scale in Serbia. *Acta Clin Croat* 2021; 60.: 75–81.

*\* This prospective observational study translated the PVRQOL into Serbia and identified a proportion of control participants with parent reported voice related quality of life impact.*

- [50] Stojanovic J, Veselinovic M, Jevtic M, et al. Assessment of Life Quality in Children with Dysphonia Using Modified Pediatric Voice-Related Quality of Life Questionnaire in Serbia. *Children* 2023, Vol 10, Page 125 2023; 10: 125.

*\* This prospective observational study piloted a further question focusing on voice after organised activities as an addition to the PVRQOL.*



- [51] Szkiełkowska A, Krasnodębska P, Miaśkiewicz B. Assessment of auditory processing in childhood dysphonia. *Int J Pediatr Otorhinolaryngol* 2022; 155: 111060.
- \* This prospective observational study found that children with hyperfunctional voice disorders demonstrate difficulty judging pitch and duration of auditory stimuli compared to a control population.*
- [52] Toles LE, Young ED. Understanding the Use and Importance of Voice Stimulability Assessment Among Speech-Language Pathologists Who Treat Voice Disorders: An International Survey. *Journal of Voice*. Epub ahead of print 28 January 2023. DOI: 10.1016/j.jvoice.2023.01.007.
- \* This prospective observational study of SLP/Ts found routine use of voice stimulability in pre-therapy assessment as a means to establish the optimum therapy modality.*
- [53] Tsur N, Apterman A, Sachs N, et al. A Case of a 13-Year-Old Adolescent with Burkitt's Lymphoma Presented With Dysphonia: Common Complaint Yet Uncommon Presentation. *Clin Lymphoma Myeloma Leuk* 2021; 21: e598–e600.
- \* This single case study describes a case of a child with hoarseness who on detailed examination was found to have B-cell lymphoma on a mass in the left ventricular fold.*
- [54] Watson NA, Orton KA, Hall A. Fifteen-minute consultation: Guide to paediatric voice disorders. *Arch Dis Child Educ Pract Ed* 2022; 107: 101–104.
- \*\* This clinical practice review provides an overview of paediatric voice aetiologies. The additional description of assessment and management is a useful guide as an introduction to laryngeal pathology and intervention approaches.*
- [55] Wu SS, Ongkasuwan J, Anne S, et al. Voice outcomes following surgical treatment for pediatric vocal fold nodules: A systematic review and meta-analysis. *Int J Pediatr Otorhinolaryngol* 2023; 166: 111461.
- \*\* This systematic review and meta-analysis identified no surgical complications following VFN surgical removal in 8 studies. While voice therapy reporting was inconsistent, it was unclear if surgery followed voice therapy or voice therapy failure, however, the recurrence rate of 19% may indicate that surgical management should not be the optimum first line approach.*
- [56] Yi S, Yang H. Update on the pediatric adverse vocal behavior voice disorders: a clinical practice review. *European Journal of Pediatrics* 2023 182:6 2023; 182: 2485–2497.
- \*\* This systematic review provides a useful summary of various risk factors for voice disorder in children. Following identification of 196 papers, the authors provide a detailed analysis of 21 papers in relation to therapeutic adherence highlighting risk factors relating to family environment, psychological and behavioural features and excessive participation in extracurricular activities*
- [57] Yıldırım S, Karakaya Gojayeve E, Büyükatalay ZÇ, et al. Pediatric Voice Disorders from the Perspective of Rare Diseases. *Journal of Voice*; 0. Epub ahead of print 2021. DOI: 10.1016/j.jvoice.2021.04.006.
- \* This retrospective case note review describes voice presentations associated with a variety of rare diseases.*
- [58] Zhang Y, Liu C, He X, et al. Post-Operative Conversion Aphonia in a Pediatric Patient: A Case Report. *Laryngoscope* 2023; 133: 1737–1738.

*\* This single case study reports a case of temporary aphonia post surgery highlighting the importance of careful preparation of children and young people pre surgery.*

- [59] Cohen SM, Kim J, Roy N, et al. Prevalence and causes of dysphonia in a large treatment-seeking population. *Laryngoscope* 2012; 122: 343–348.
- [60] Boseley ME, Cunningham MJ, Volk MS, et al. Validation of the Pediatric Voice-Related Quality-of-Life survey. *Arch Otolaryngol Head Neck Surg* 2006; 132: 717–720.
- [61] Van Houtte E, Claeys S, Wuyts F, et al. The Impact of Voice Disorders Among Teachers: Vocal Complaints, Treatment-Seeking Behavior, Knowledge of Vocal Care, and Voice-Related Absenteeism. *Journal of Voice* 2011; 25: 570–575.
- [62] Musiek FE. The frequency pattern test: A guide. *Hearing Journal* 2002; 55: 58.
- [63] Duration Pattern Sequence-Standard© | Auditec, Inc., <https://auditec.com/2015/09/25/duration-pattern-sequence/> (accessed 16 September 2023).

Authors	Country	Study Design	Key findings	Category
Adeyeye, Iseh, Abdullahi (2022) [14]	Nigeria	Prospective observational study	Prevalence of hoarseness in an ENT seeking population in Nigeria is 2.69%.	<ul style="list-style-type: none"> <li>• Prevalence</li> </ul>
Adriaansen, Van Oudenhove, Van Lierde et al. (2022) [15]	Belgium / South Africa	Prospective observational study	Voice related knowledge is limited in primary school teachers thus reducing capacity for onward referral.	<ul style="list-style-type: none"> <li>• Assessment</li> </ul>
Adriaansen, Meerschman, Van Lierde et al. (2022) [16]	Belgium / South Africa	Systematic review	24 studies examined, with overall adequate quality. There is evidence of effectiveness of voice therapy though it is not clear what voice therapy techniques are most suited, nor the optimum dosage characteristics and these require future investigation.	<ul style="list-style-type: none"> <li>• Intervention</li> </ul>
Al-Balas, Abuhlaweh, Melhem et al. (2021) [17]	Jordan	Single case study	Description of a case of aphonia in a male adolescent that responded positively to SLP/T intervention. The authors point out that this aetiology, though often associated with female patients, can arise in male patients.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Al-Kadi, Alfawaz & Alotaibi et al. (2022) [18]	Saudi Arabia	Systematic review	6 studies examined showing evidence that direct and indirect voice therapies have positive patient outcomes.	<ul style="list-style-type: none"> <li>• Intervention</li> </ul>
Alrahim, Alshaibani, Algarni, et al (2022) [19]	Saudi Arabia	Prospective observational study	Using a questionnaire sent to parents in 21 preschool and primary schools, with a response rate of 50% (n=482). Prevalence of hoarseness found to be 7.5% (9.9% female, 6.4% male).	<ul style="list-style-type: none"> <li>• Prevalence</li> </ul>
Anton Almero, Doménech Máñez, Ferrer Ramírez, et al [20]	Spain	Retrospective case note review	Provides an analysis of epidemiology of the authors' experiences in assessing (n=87) referrals. VFN was largest diagnostic category.	<ul style="list-style-type: none"> <li>• Assessment</li> <li>• Clinical experiences compared to published prevalence data</li> </ul>

Arumugam, Subbarayan (2023) [21]	India	Single case study	Report of a misdiagnosis of a premature infant presenting with hoarseness, with assumption based on neonatal history. The child went on to be diagnosed with Pompe disease.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Braden (2022) [22]	USA	Literature review (not systematic)	Provides an overview of the aetiologies and presentation of voice disorders associated with Cleft Lip/Palate.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Campano, Cox, Caniano et al. (2023) [23]	USA	Systematic literature review	Vocal fold nodules (VFN) were the most reported vocal fold pathology. Although there is variation across services, perceptual voice evaluation using the CAPE-V and laryngeal imaging using endoscopy were the most reported voice evaluation tools.	<ul style="list-style-type: none"> <li>• General review papers</li> </ul>
Crisp, Neel, Amarasekara et al. (2021) [24]	USA	Prospective observational study	Description of vocal function in 21 children (aged 5-18yrs) with Pompe disease. Any voice evaluation data will be restricted by the associated respiratory and laryngeal impairment associated with the disease.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Fujiki, Kostas, Thibeault (2023) [25]	USA	Retrospective case note review	Auditory-perceptual ratings were significantly correlated with nasometry in (n=400) children with CL/P but this is weakened when a child has increased unintelligibility or moderate dysphonia. SLP/Ts need to be aware the impact this may have on clinical evaluation.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Gàmez-Gonzà Ulloa-Gutierrez, Murata, et al (2021) [26]	Mexico	prospective observational study	Provides evidence of hoarseness as a presenting sign of acute Kawasaki Disease in children <2years children. The authors propose routine consideration of hoarseness in cases presenting in the absence of viral infection.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Halfpenny, Stewart, Carter, et al. (2021) [27]	UK	Retrospective cohort study	Provides evidence of dysphonia in children with PIMS-TS with preliminary data highlighting the need for assessment and access to MDT management.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>

Heller Murray & Chao (2021) [28]	USA	Retrospective analysis of speech data	The rationale for this study relates to the hypothesis that there are transient periods of dysphonia in typical development due to the development of the phonatory and articulatory systems that can differentiate children with chronic hoarseness from those with typical voice change through maturation via specific acoustic analysis techniques	<ul style="list-style-type: none"> <li>• Assessment</li> </ul>
Hoffmann & Cielo (2021) [29]	Brazil	Prospective cross sectional study	This was a study using a variety of acoustic analysis techniques to inform what might be expected in the voices of dysphonic children which could be of value with clinical voice evaluation.	<ul style="list-style-type: none"> <li>• Assessment</li> </ul>
Hseu, Spencer, Jo, Clark & Nuss (2022) [30]	USA	Retrospective case note review	This study reviewed children with Down Syndrome and their dysphonia/laryngeal pathology. Out of 23 cases, the most common presentation (n=16) was vocal fold immotility or hypomotility with 12 of these having history of cardiac surgery.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Hseu, Spencer, Jo, et al (2021) [31]	USA	Retrospective case note review	This study reports an analysis of the feasibility and efficacy of telepractice voice therapy for children with VFN, reporting significant improvements following intervention in 23 children aged 2.4-9.9yrs.	<ul style="list-style-type: none"> <li>• Intervention</li> </ul>
Hseu, Spencer, Woodnorth, et al (2023) [32]	USA	Retrospective case note review	This study explored factors distinguishing children who attend voice therapy with those who do not. Out of 346 records examined there was a significant link between age (older), distance to therapy site and CAPE-V strain value with those who attended therapy.	<ul style="list-style-type: none"> <li>• Intervention</li> </ul>
Kutkowska-Kaźmierczak, Boczar, Kalka, et al (2021) [33]	Poland	Case series	23 patients with KBG syndrome were assessed for presence or absence of hoarseness. The high prevalence of hoarseness (50%) suggests that hoarseness may be an undescribed phenotype characteristic in young children (alongside other characteristics) that might warrant genetic investigation.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>

Lee. Keum, Kim, Park & Kim (2021) [34]	South Korea	Retrospective case note review	12.3% of patients (out of total n=147) present with atypical voice. (n=91) invited for further voice analysis, n=51 attended at 4-6 weeks and n=22 at 3 months post operatively. GRBAS, pVHI and acoustic analysis measures decreased significantly post operatively – related to reduced mouth breathing and increased vocal hygiene.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Ma, Chow & Lam (2022) [35]	Hong Kong	Prospective observational study	This study surveyed (n= 85) SLP/Ts. Although there is high prevalence of dysphonia in children, the numbers treated in schools is small despite pre-registration training. SLP/Ts lack of confidence in paediatric voice management.	<ul style="list-style-type: none"> <li>• Intervention</li> </ul>
Ma, Cheung, Siu & Lo (2022) [36]	Hong Kong	Experimental study with pre/post test and two control groups (small RCT design)	This was a small scale voice therapy RCT comparing a treatment group (n=7), a placebo group (n=5) and no-treatment control group (n=5). The only significant improvement found was in pVHI scores - while there was blind pre and post testing to group, perhaps parents were not as blind to the treatment as the testers?	<ul style="list-style-type: none"> <li>• Intervention</li> </ul>
Mallipeddi, Mehrotra & Stan (2023) [37]	USA	Professional opinion	Proposes potential technological developments that may change voice therapy management, such as Artificial Intelligence as a patient response tool; smartphone biofeedback for regular voice monitoring; Virtual Reality and Gamification to support voice therapy practice.	<ul style="list-style-type: none"> <li>• Intervention</li> </ul>
Mašić, Varošanec-Škarić , Bašić, et al. (2023) [38]	Croatia	Single case study	Report of a misdiagnosis from infancy (based on assumptions about clinical presentation). Despite ongoing SLP/T management the presence of a congenital laryngeal web was not discovered until the child was 6 years old.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Myers, Hary, Ellertson, et al. (2022) [39]	USA	Clinical focus article	Outlines key factors for successful telepractice for voice disorder with recommendations and observation of any limitations.	<ul style="list-style-type: none"> <li>• Intervention</li> </ul>

Neel, Crisp, Kishnani et al. (2023) [40]	USA	Prospective observational study	Provides evidence from (n=15) children with Pompe disease, with impacts on articulatory precision, resonance and voice quality associated with the disease presentation.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Pan, Ma, Gao, Ma, Yu, Qiu & Lu (2022) [41]	China	Prospective observational study	From a survey of (n=368) paediatricians this study identified barriers in either diagnosing voice disorder or referring for diagnosis with implications for awareness raising.	<ul style="list-style-type: none"> <li>• Clinical experiences compared to published prevalence data</li> </ul>
Patel, Nabil, Alshammari & Alkuray (2021) [42]	Saudi Arabia	Case series	Case series presentation describing two extended families with initial presentation of hoarseness that was subsequently identified with an underlying genetic aetiology.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Putus, Atosuo, & L.K. Vilén (2022) [43]	Finland	Prospective observational study	Prevalence estimate from a survey of 157 day care centres with responses from parents (n=3721). Presence of hoarseness = 5.6% and identification of risk factors such as noise, environment (e.g. dust, mould, ventilation).	<ul style="list-style-type: none"> <li>• Prevalence</li> </ul>
Putus, Vilén & Atosuo (2023) [44]	Finland	Prospective observational study	Prevalence estimate from a survey of 51 schools with responses from parents (n=6121). Presence of hoarseness = 6.4% (males 6.7%; females 6.0%).	<ul style="list-style-type: none"> <li>• Prevalence</li> </ul>
Ramos, Álvarez, León, Badía and Napolitano (2022) [45]	Chile	Retrospective case note review	Diagnosis of VFN was highest of the diagnostic categories (40%). Following a change in equipment from flexible nasendoscopy to videolaryngostroboscopy, the proportions of diagnoses changed - hypothesising that where the latter offers increased detail leading to more identification of cysts than VFN.	<ul style="list-style-type: none"> <li>• Assessment</li> <li>• Clinical experiences compared to published prevalence data</li> </ul>
Reynolds & Fleury (2022) [46]	Australia/USA	Prospective observational study	This study examined utterance length in (n=20) voice recordings indicating that 'prompt' questions types give a longer utterance length than 'open-ended' and 'closed questions'. SLP/Ts will need to make sure they capture sufficient data for perceptual voice	<ul style="list-style-type: none"> <li>• Assessment</li> </ul>

			analysis and may wish to use prompt format to do this.	
Sales, Sampaio, Pimentel, et al (2023) [47]	Brazil	Retrospective case record review	This study examined the length of time between first awareness of a voice problem and starting voice therapy. It isn't clear however when participants were assessed and whether the length of time relates to parental awareness of persistency of voice disorder.	<ul style="list-style-type: none"> <li>• Intervention</li> </ul>
Sheth, Paul, Karuppusami, et al. (2022) [48]	India	Retrospective case record review	This study examined prevalence of hoarseness in a wide age range of ENT seeking patients (n=8320) with a higher prevalence (12.4%) than other reports, and a predominance in male vs female patients.	<ul style="list-style-type: none"> <li>• Prevalence</li> </ul>
Stojanović, Branislav Belić, et al. (2021) [49]	Serbia	Prospective observational study	Translation of PVRQOL into Serbian language and validation in a clinical and control population. The study identified a proportion of control participants with parent report of voice related quality of life impact: further identifying the potential unidentified population.	<ul style="list-style-type: none"> <li>• Assessment</li> </ul>
Stojanovic, Veselinovi, Jevtic, et al. (2023) [50]	Serbia	Prospective observational study	This study adds an additional question to the Serbian PVRQOL asking about hoarseness after organised activities; there is a statistically significant difference between the clinical and control populations with this question added and the authors suggest its value as an additional voice related quality of life question.	<ul style="list-style-type: none"> <li>• Assessment</li> </ul>
Szkiełkowska, Krasnodębska & Miaśkiewicz (2022) [51]	Poland	Prospective observational study	There is a statistically significant difference between a clinical (n=331) and control (n=213) paediatric population (aged 7-12 years) on two measures of auditory processing (Frequency Pattern Test and Duration Pattern Test) suggesting that children with hyperfunctional voice disorders have difficulties judging pitch and duration of auditory stimuli. The	<ul style="list-style-type: none"> <li>• Assessment</li> </ul>



			authors hypothesis that this difference may add to identification of risk for voice disorders in children	
Toles & Young (2023) [52]	USA	Prospective observational study	Through surveying voice therapy experienced SLP/Ts (n=88) there is routine use of voice stimulability assessment – normally to establish if resonance or semi-occluded vocal tract exercises are most stimuable. While the sample works across the age range of paediatrics and adults, it is unclear the proportion to which this is routine in paediatric contexts.	<ul style="list-style-type: none"> <li>• Assessment</li> </ul>
Tsur, Apterman, Sachs, et al. (2021) [53]	Israel	Single case study	Describes a case initially identified with dysphonia. Through careful laryngeal examination a mass on the left ventricular fold was found to be B-cell lymphoma undetected elsewhere.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>
Watson, Orton & Hall (2022) [54]	USA	Clinical practice review	Provides an overview of aetiologies for paediatric voice disorders, some aspects of voice evaluation and management.	<ul style="list-style-type: none"> <li>• General review papers</li> </ul>
Wu, Ongkasuwan, Anne, et al. (2022) [55]	USA	Systematic review and meta-analysis	In 8 identified studies, there were no surgical complications following VFN surgical removal. Voice therapy reporting was inconsistent, and it is unclear if surgery followed voice therapy or followed voice therapy failure. Recurrence of VFN reported in 4 studies, with a recurrence rate of 19%.	<ul style="list-style-type: none"> <li>• Intervention</li> </ul>
Yi & Yang (2023) [56]	China	Systematic review	Summarise the following risk factors for voice disorder in children: family environment; psychological and behavioural features – active/extroverted/inattentive; excessive participation in extracurricular activities (summer camps/choir/vocal hygiene abuse/misuse).	<ul style="list-style-type: none"> <li>• Assessment</li> <li>• General review papers</li> </ul>
Yıldırım, Gojayev, Büyükatalay & Dursun (2021) [57]	Turkey	Retrospective case note review	The purpose of this paper is to shine a light on rarer presentations, and this is showcased through seven case studies: Lipoid proteinosis (n=4); neurofibroma (n=2) amyloidosis (n=1). The authors highlight that	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>

			these may be missed if the focus is on VFN, polyps or RRP (and response to treatment will therefore differ) thus reinforcing the importance of accurate diagnosis.	
Zhang, Liu, He, Tank, Guo & Huang (2023) [58]	China	Single case study	Reports a case of temporary aphonia following unrelated surgery (otology) – attributed to the unfamiliarity of the clinical surroundings and highlights the importance of careful preparation prior to any surgical event.	<ul style="list-style-type: none"> <li>• Specific populations /Single case studies</li> </ul>

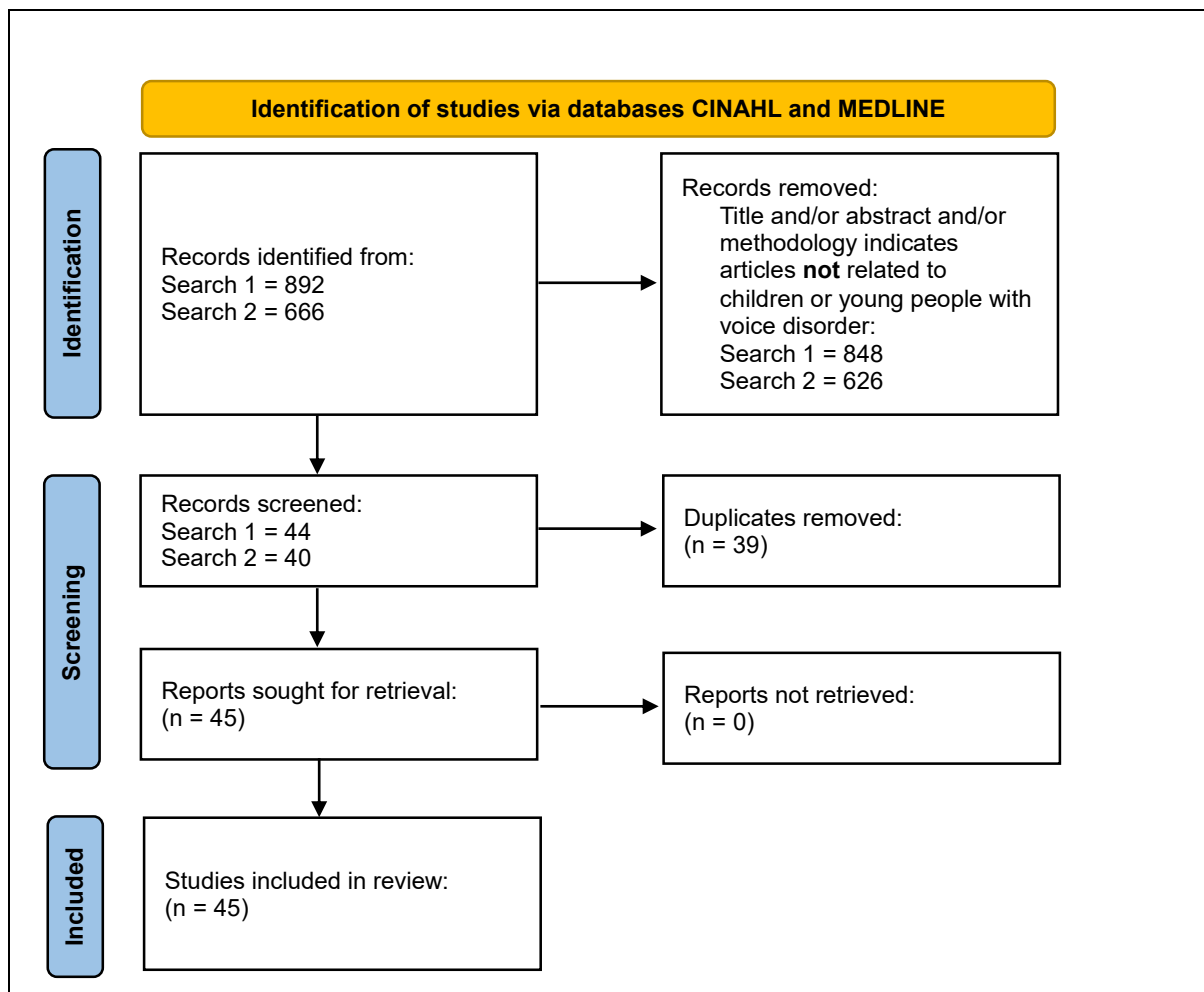


Figure 1: PRISMA diagram of the search process