



Expanding Frontiers in Voice Health & Care - Applications for India

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Abstract

Speech and hearing as a profession has existed over the last five decades in India. Speech pathologists have made considerable and consistent difference to their practice in line with the growing trends in knowledge base and technological advances in the field. These have provided scope to apply refined assessment and management strategies to communication disorders. It would not be an overstatement to claim that 'voice health and care' has potential to emerge as a sub-speciality in the practice of speech pathologists in India (Boominathan & Desai, 2012). Voice care provided by speech pathologists has undergone several transformations recently to establish itself from a modest ancillary support (if and when available) to ENT specialists to a sophisticated (more refined and precise) and an essential aspect of patient care. This article highlights a few changing trends in the field, identifies gaps in clinical practice and suggests potential research ideas that could be explored to improve patient care and service.

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Vocology: A redefined orientation to the study of voice and its disorders

The study of vocalization is now referred to as 'vocology' (Titze & Verdolini, 2012). Vocology encompasses the science and practice of voice habilitation. This includes activities performed by a speech pathologist in traditional voice rehabilitation (assessment & management) and also those borrowed from singing teachers and voice coaches for public speaking. This more inclusive term provides scope for a speech pathologist to broaden the gambit of their function to promote the art of speaking and singing (vocal communication). Vocology has also necessitated relooking at the traditional boundaries of voice assessment and therapy.

Proponents of vocology advocate identifying the strength in an individual's voice to combat voice problems. Indices and metrics are guided through conceptual and technological advances to solve clinical dilemmas and provide therapeutic and pedagogical directions to help alleviate vocal weaknesses. Vocal profiles are used to explain an individual's general capacity of vocal ability and fitness. The goal in intervention is to nurture developing an "ideal voice" for a person based on his/her abilities in a given situation and a chosen vocation. The individual is encouraged to exercise "optimal control" over the organs and parameters

of speech/song/voice. A "feel good" factor while communicating and "longevity" to the voice that is comfortable to the speaker are the desired outcomes of intervention. This philosophy enhances the scope to enrich a voice for personal and professional purposes, with or without obvious voice pathologies.

Vocometry: Standardised, reliable and easily accessible diagnostic methods

Epidemiological estimates (Roy, Merrill, Thibeault, Gray, & Smith, 2004; Verdolini & Ramig, 2001), and impact studies on voice and related problems have clearly identified the importance of early identification and intervention of voice disorders. However, road blocks to early identification and intervention exist. These include delayed referral (Cohen, Kim, Roy, Asche, & Courey, 2012), limitations of diagnostic tools, and challenges in accessing professional services (Boominathan, Rajendran, Nagarajan, Seethapathy, & Gnanasekar, 2008). Currently, advanced instruments with enhanced precision, and innovative intervention methods have helped offer easy and accessible solutions to individuals with voice problems.

Multi dimensional comprehensive voice evaluation is accepted as a standard method of voice metrics. Protocols (Boominathan, Samuel, Arunach-

lam, Nagarajan, & Mahalingam, 2014; Dejonckere et al., 2001) delineate basic set of measures that can reliably be used to generate valid test measures. Detailed case history using a structured interview, a standardised psychoacoustic evaluation of voice, laryngeal imaging, aerodynamic assessment, acoustic voice analysis, and subjective self evaluation of voice are essential components of a comprehensive voice evaluation protocol. These standard protocols offer inter clinic comparison and replicability of data, more face validity and increased reliability of findings. They also help streamline trans-disciplinary communication between professionals involved in voice diagnostics.

World over, the current gold standard in laryngeal imaging is laryngeal stroboscopy. Stroboscopy is being replaced by High-Speed Video (HSV), an advanced imaging technology with enhanced temporal resolution upto 8000 frames per second (Barkmeier-Kraemer & Patel, 2016). This more sophisticated imaging method is applied to assess voices with severe dysphonia and rapid transient fluctuations that is normally difficult to assess through a stroboscope (Patel, Liu, Galatsanos, & Bless, 2011; Olthoff, Woywod, & Kruse, 2007). HSV has gained potential clinical applications in evaluation of effects of hydration (Patel, Walker, & Sivasankar, 2015), altered vibratory dynamics due to laryngeal growth (Patel, Donohue, Unnikrishnan, & Kryscio, 2015; Patel, Dubrovskiy, & Dolinger, 2014), monitor treatment outcomes in physiologic voice therapy (Patel, Pickering, Stemple, & Donohue, 2012) or phono micro surgery (Mehta, Deliyiski, & Zeitels, 2010). However, in India, it is expected that stroboscopy will become the standard of laryngeal imaging in voice clinics. HSV may become available to more advance tertiary medical facilities in future.

Barkmeier-Kraemer and Patel (2016) have discussed the potential applications of bioinformatics and artificial intelligence in voice diagnostics. Research on vocal physiology (Lester, Barkmeier-Kraemer, & Story, 2013), vocal fold modelling (Khosla, Oren, & Gutmark, 2014; Erath, Peterson, Zanartu, Wodicka, & Plesniak, 2011), bio markers and bio simulations (Li, Vodovotz, Kim, Hebda, & Abott, 2011) of normal and abnormal voices have helped develop automated diagnostic tools. Translational research and digital technology being 'the buzz words' of recent times, there is tremendous scope to blend clinical data to offer smarter and quicker screening and diagnostic tools through mobile health apps.

ICF and voice health - Scope to look beyond physical impairment

WHO (ICIDH-2/ICF, 2001) guidelines have delineated three domains to explain health. As per ICF multi-dimensional scheme (i) mind and body,

(ii) activities of an individual and (iii) his participation as per societal and personal expectations define one's health. When health is affected, the individual face limitations. Impairments are resultant of limitations in body. For instance in voice, a glottic chink due to bilateral vocal nodules is a limitation in body, hence can be called impairment. An inability to talk soft could be called as limitation of activity. When this body impairment or limitation of function, restrict a person's participation in an activity, it will be called a disability. In the above example, the person's inability to talk soft due to bilateral vocal nodules could become a disability in case he chooses to work in silent zones like a library, meditation centre, hospital, etc.

However, in individuals with voice problems, there could be limitations without any obvious impairment (voice pathology). An example of this condition could be a singer, who is unable to sing a particular high note despite having no physical abnormality in the larynx. A reverse of such a situation could also be common with voice patients. For instance, a person with a unilateral epidermoid vocal fold cyst (physical domain) may not have any restrictions to carry out her job as a clerk in a company.

A medical specialist usually diagnoses voice pathology (physical domain), whereas the speech pathologist evaluates functioning of the system. Self evaluation of the voice use and capacity by the patient determines voice limitations. An intervention becomes essential in case of a vocal pathology when the health is compromised and even if there were no obvious limitation in activity/participation. In a similar way, voice limitation without any pathology may warrant treatment.

It has become important to develop tools and methods to assess occupational limitations of voice in a vocation. A few examples of tools that evaluate functional vocal fitness are Voice Handicap Index (Jacobson et al., 1997), the Voice Activity and Participation Profile (Ma & Yiu, 2001), the questionnaire on quality of life (Smith et al., 1996), the Voice Disability Index (Koschke, 1993), the Therapy Outcomes Measures (Enderby, 1997), the Voice Outcome Survey (Gliklich, Glovsky, & Montgomery, 1999), The Voice - Related Quality of Life Questionnaire (Hogikyan & Sethuraman, 1999), the Voice Disorder Outcome Profile - Kannada (Konnai, Jayaram, & Scherer, 2009), the Voice Disorder Outcome Profile - Tamil (Mahalingam, Boominathan, & Balasubramanian, 2014), and the Voice Disorder Outcome Profile - Hindi (Chauhan, 2015). Of these, the Voice Activity and Participation Profile adopts ICF framework to report voice problems.

Voice problems: Escalation as a public health issue

Since, voice problems are not always related to voice pathologies, and it includes aspects related to day-to-day communication, activities and participation limitations; it offers scope to view vocal problems as a ‘public health concern’. Voice problems can occur at any age and may pose difficulty in socializing, reduced capacity to perform any vocal activity, in person, between individuals, in a group or over phone. So in many ways it can assume a significant health issue to a child going to school, an employed adult or a geriatric person with age related issues. In such case the metrics to evaluate voice problems should vary. Vocal fatigue, vocal endurance and strength, satisfaction in communication/voice, recovery from fatigue, voice strain due to repetitive vocal injury, etc could be some of the measures that assess functionality of voice in vocation and other social/recreational situations. Tools that measure such quality of life determiners are required to assess limitations in performance and satisfaction in a job. Such tools may prove to be very useful in assessing social, emotional, physical and communication functions in a range of vocation like teaching, marketing, counselling, singing, acting, public speaking, etc, who have potential threats of vocal injury and voice fatigue.

For instance, voice problems in teachers are common (Boominathan et al., 2008; de Jong, Kooijman, Thomas, Huinck, Graamans, & Schutte, 2006; Roy, Merrill, Thibeault, Parsa, Gray, & Smith, 2004; Simberg, Sala, & Ronnema, 2004, Smith, Lemke, Taylor, Kirchner, & Hoffman, 1998) due to vocal loading (Titze, Hunter, & Svec, 2007), and insufficient time for recovery. Ryan and Kenny (2009) reported that in many women voice control is reduced during certain days of their menstrual cycle. Russell, Oates and Greenwood (1998) have also noted that women outnumber men in the teaching profession. This is true in India as well (National Data Sharing and Accessibility Policy (NDSAP), Ministry of Human Resource Development, Government of India). In such a scenario, is it reasonable to project voice problems in teachers as a women health issue? Do we need a public campaign to promote voice care and conserve voice? Tailor made vocal health packages (addressing teachers voice use, environment, diet and exercise, and tips to school management) may be useful to promote vocal health in teachers.

Voice Therapy: Approaches and service delivery

Addressing issues related to vocal hygiene, modifying vocal behaviours based on Boone’s, voice facilitating techniques (Boone, Mc Farlane, von Berg, & Zraik, 2013), employing clinical methods in psychology to alleviate psychogenic causes for voice

problems and direct modification of vocal physiology through holistic voice therapy programs are the common voice therapy orientations available to any practicing clinician of the current era. A few examples of holistic therapy approaches are: Lessac-Madsen Resonant Voice Therapy (Verdolini, 2000), Vocal Function Exercises (Stemple, 1995), Lee Silverman Voice Therapy (Ramig, Bonitati, Lemke, & Horii, 1994), Stretch & Flow Therapy (Schneider & Sataloff, 2007), Lax Vox Therapy (Denizoglu & Shivo, 2010) using a semi-occluded vocal tract posture (Titze, 2006) to achieve good vocal tract coordination with laryngeal source, and the Accent Therapy (Kotby, 1995). All of the above techniques work on achieving a coordinated balance between the subsystems involved in voice production.

Patel, Bless and Thibeault (2011) proposed a ‘Boot Camp’ model for voice therapy. They advocate a short-term intensive program designed on principles of motor control and learning, neuroplasticity and exercise physiology. Boot camp model provides opportunities for rigorous practice and quick transfer of the newly acquired voice. This approach is believed to be very useful for patients who can dedicate a few days continuously for voice treatment.

Mashimsha, Peters, Syms, Holtel, Burgess and Peters (2003) reported use of tele-practice to deliver voice therapy. Video phone and video conference modes of voice therapy practice could be more cost effective and time economical. MP4 technology (van Leer & Connor, 2011) and self instructional DVD (Boominathan, 2010) modes have also been tried to help voice patients. However, one should take in to cognizance that voice therapy in non-clinical settings (and in un-conventional methods) could have a disadvantage of not being able to provide an instantaneous feedback through an expert clinician. Phone and tablet applications could partly address the feedback issue. It is important that clinicians adept themselves with emerging guidelines, rules and regulations related to tele-practice (http://www.asha.org/PRPSpecificTopic.aspx?folderid=8589934956§ion=Key_Issues) and similar un-conventional service delivery options. Ethical issues such as protection of patient information, encryption and transfer of data, storage and access to personal and medical information are newer challenges to the clinician while adopting such methods.

Voice habilitation: New avatar voice therapy

‘Conventional wisdom’ guided practice to ‘Empirical research based evidence’ in clinical practice is the ‘mantra’ (and probably the need) of the current generation speech pathologists across the globe. Inspired from the work of Titze (1990, 1992, 1994 & 2000), Verdolini (1998), Titze and Verdolini

(2012) and many others, voice care focus is shifting from a traditional 'repair & restore' philosophy to an 'enable & equip' methodology. Rectifying the disease/disorder and bringing back to normal state of system functioning was the goal of 'voice rehabilitation' followed in the past. However, the current trend is towards 'voice habilitation' which focuses on building strength to promote a need specific/tailored capacity and functioning of the individual. A mere 'body and system' correction (removal of lesion, voice rest and vocal hygiene) attempted by clinicians in the yester years will no longer be considered as 'sufficient and complete' by patients seeking a more permanent remedy for voice problems.

Conclusion

The influence of digital signal processing and automated processes through artificial intelligence for diagnostic and treatment purposes of voice disorders is inevitable in the current digital era. Therefore a clinician is expected to have adequate digital literary skills to provide better patient care and keep pace with the growing technology. While it is exciting to learn and apply newer technical methods and scientific innovations in voice practice, it is important to realize that we deal with an important aspect of humanity and personal emotions. Clinicians tend to steer away from 'clinician instinct' and 'patient information' as they increasingly concentrate and rely on lab based voice metrics. Artificial intelligence based diagnostic gadgets, prescriptive web based counselling and software based therapy solutions to voice problems has a potential danger to lessen (if not eradicate) personal humane touch in clinical practice. The clinicians of today are expected to help/ direct an individual to develop and produce an unassisted (typical) voice that meets his /her social (not restricted to occupational & recreational) needs. To keep in pace with time, thought (prevailing scientific & clinical temperament) and technology, it is imperative that practicing voice clinicians constantly update and revise their knowledge, clinical strategies and skills in assessment and management of voice disorders, making all attempts to rely on individual human judgement and interaction.

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