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REVIEW ARTICLE

**Work-related voice disorder** ☆,☆☆



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**KEYWORDS**

Dysphonia;  
Legislation as topic;  
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medicine

**Abstract**

**Introduction:** Dysphonia is the main symptom of the disorders of oral communication. However, voice disorders also present with other symptoms such as difficulty in maintaining the voice (asthenia), vocal fatigue, variation in habitual vocal fundamental frequency, hoarseness, lack of vocal volume and projection, loss of vocal efficiency, and weakness when speaking. There are several proposals for the etiologic classification of dysphonia: functional, organofunctional, organic, and work-related voice disorder (WRVD).

**Objective:** To conduct a literature review on WRVD and on the current Brazilian labor legislation.

**Methods:** This was a review article with bibliographical research conducted on the PubMed and Bireme databases, using the terms “work-related voice disorder”, “occupational dysphonia”, “dysphonia and labor legislation”, and a review of labor and social security relevant laws.

**Conclusion:** WRVD is a situation that frequently is listed as a reason for work absenteeism, functional rehabilitation, or for prolonged absence from work. Currently, forensic physicians have no comparative parameters to help with the analysis of vocal disorders. In certain situations WRVD may cause, work disability. This disorder may be labor-related, or be an adjuvant factor to work-related diseases.

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**PALAVRAS-CHAVE**

Disfonia;  
Legislação como  
assunto;  
Medicina do trabalho

**Distúrbio de voz relacionado ao trabalho**

**Resumo**

**Introdução:** A disfonia é o principal sintoma de distúrbio da comunicação oral; no entanto os distúrbios da voz manifestam-se além do quadro disfônico, com dificuldade em manter a voz (astenia), cansaço ao falar, variação na frequência fundamental habitual vocal, rouquidão, falta

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de volume e projeção vocal, perda da eficiência vocal e pouca resistência ao falar. Várias são as propostas de classificação etiológica das disfonias: funcional, organofuncional, orgânica e distúrbio de voz relacionado ao trabalho (DVRT).

**Objetivo:** Realizar uma revisão de literatura sobre DVRT e a legislação trabalhista brasileira vigente.

**Método:** Artigo de revisão com pesquisa bibliográfica realizada na internet, nos sites Pubmed e Bireme, com os termos "distúrbio de voz relacionado ao trabalho", "disfonia ocupacional", "disfonia e legislação trabalhista", além de revisão da legislação trabalhista e previdenciária pertinente.

**Conclusão:** DVRT é uma situação que atualmente se mostra frequente, tanto como causa de absenteísmo ou reabilitação funcional, como de afastamento prolongado do trabalho. Atualmente, o médico perito não encontra parâmetros comparativos objetivos que direcionem a análise pericial em distúrbios vocais. DVRT pode causar, em determinadas situações, incapacidade laboral, e muitas vezes, atuar como um fator adjuvante ou estar diretamente relacionado a doenças do trabalho.

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## Introduction

The voice is an essential tool in the lives of many professionals, with approximately 25% of the economically active population considering their voice to be a critical instrument of their job.<sup>1</sup>

The concept of "normal voice" is complex, and there is no consensus on the subject. There is not a pattern of "normal voice", i.e., there are no defined limits of what is considered normal, and from which point it can be said that an individual has dysphonia.<sup>2</sup>

When the voice changes negatively, it is said that it is disturbed or dysphonic.<sup>3</sup> Dysphonia, therefore, can be defined as any difficulty or change in vocal emission that does not allow for a natural voice production,<sup>4,5</sup> preventing momentary or permanent oral communication.<sup>6</sup> Thus, dysphonia causes damage to the individual, since the voice produced exhibits difficulties or limitations in fulfilling its basic role of transmission of verbal and emotional message.<sup>5</sup>

Dysphonia is a symptom, not a disease; it is a manifestation that is part of the speech disorder picture.<sup>2</sup> Dysphonia is the main symptom of the oral communication disorder.<sup>5</sup> However, voice disorders are manifested beyond the dysphonic picture; the patient may experience difficulty in keeping his/her voice (asthenia), vocal fatigue, variation in habitual fundamental vocal frequency, hoarseness, lack of vocal volume and projection, loss of vocal efficiency, and low resistance when speaking.<sup>6</sup>

Thus, all cases of dysphonia constitute a voice limitation; this problem can be classified into one of four levels of intensity. The first is a mild degree, characterized by an eventual or almost imperceptible dysphonia. The worker can perform their usual vocal activities with minimum difficulty, little fatigue and with no interruption. The second is a moderate degree, characterized by a continuously perceived dysphonia; the voice is audible, presenting oscillations; the usual vocal activities are possible, there is an effort (perceived by him/herself or by the audience), showing failure, eventual or frequent fatigue, and the need for interruptions. The intense degree is characterized by

constant dysphonia; it becomes difficult to hear his/her voice; the patient cannot perform his/her activities, or doing so causes great effort, intense fatigue, and major interruptions. Finally, the extreme degree, or aphonia, is characterized by the "near absence" or "total lack" of voice; the voice becomes inaudible, demanding written communication or gestures for the person to be understood; the worker cannot perform his/her activities.<sup>5</sup>

Despite being one of the main forms of human expression and of being used daily by most people, there is a special group of individuals that present high vocal demand<sup>7</sup>: the voice professionals, including singers, teachers, telemarketing operators, lawyers, clergymen, consultants, salesmen, and healthcare providers.<sup>7</sup>

Conceptually, the professional voice is defined as the form of oral communication used by individuals who depend on it for a full occupational activity.<sup>5</sup> That is, to characterize the professional use of the voice, the individual must make a living through the voice.<sup>8</sup>

There are several proposals for an etiologic classification of dysphonia. The most adopted classification considers some basic factors: functional, organo-functional, and organic dysphonia.<sup>9</sup> To improve the diagnosis and treatment of voice disorders, a movement that brings together different institutions in order to classify a new category of disease, the work-related voice disorder (WRVD), is currently in progress. This movement aims to analyze the relationship of these factors with the environment and the organization of work.<sup>8,10</sup>

The aim of this article is to review the literature on WRVD and the current Brazilian labor legislation.

## Methods

A literature search was conducted in the PubMed and Bireme databases, using the terms "work-related voice disorder", "occupational dysphonia" and "dysphonia and labor legislation". A review of relevant labor and social security laws was also conducted.

## Literature review

### The concept of WRVD

WRVD is any form of vocal change directly related to the use of voice during a professional activity that reduces, compromise, or prevents the performance and/or communication of the worker, with or without some organic alteration of the larynx.<sup>11</sup>

WRVD is manifested by several signs and symptoms that may be present, concurrently or not, varying according to the severity of the clinical presentation.<sup>8</sup> The most common symptoms are: fatigue when speaking (vocal fatigue), hoarseness, dry throat/mouth, effort to speak, voice failure ("breaking of the voice"), loss of voice, hawking up, voice instability or tremor, sore throat/pain when talking, a deeper voice, lack of vocal volume and projection ("weak voice"), loss on vocal efficiency, low resistance when speaking, or neck tension.<sup>7,8,12</sup>

It is important to characterize signs and symptoms with regards to the onset, duration, and improvement and worsening factors.<sup>8</sup>

Usually, the symptoms emerge insidiously.<sup>8</sup> In schoolteachers, vocal dysfunction arises later, after an average of 14 years of work.<sup>13</sup> Conversely, telemarketing operators exhibit dysphonia earlier, and it can be inferred that emotional stress, environmental and organizational factors, and the profile of this functional category favor early changes.<sup>13</sup> It is worth mentioning that physical education teachers exhibit a higher tendency of acute vocal dysfunction, due to the use of abrupt vocal attacks with high intensity.<sup>13</sup>

The symptoms prevail at the end of a working day or at the end of the working week; the symptomatology decreases after an overnight rest or during the weekends.<sup>7,8</sup> Gradually, the symptoms will present themselves continuously during working hours or during the entire day, without recovery even with voice rest. At this stage, the worker can hardly exercise his/her vocal function with the expected efficiency, especially in episodes of severe dysphonia.<sup>8</sup>

The WRVD presentation may also be associated with symptoms of psychological stress and mental suffering, faced with the demands of work organization. The need to respond to these demands, fear of unemployment, lack of information and other contingencies pertaining to the world of contemporary work lead the worker to endure these symptoms and continue working, until his/her condition worsens, necessitating a more complex treatment.<sup>8</sup>

### Risk factors

The development of WRVD is multifactorial; it is associated with several factors that can directly or indirectly trigger or worsen the worker's voice alteration, and there may be an interaction of these factors in the workplace. That is, these factors may act alone or in combination for the development of the voice disorder.

The aggravating and predisposing risk factors of WRVD can be grouped as follows:<sup>2</sup>

#### Risk factors of non-occupational nature

As in all health-disease processes, some individual characteristics may function as aggravating and/or triggering factors, such as age, female gender, inappropriate or excessive (extended) use of the voice, extra-professional activities with high vocal demand (leisure, or working a double shift), respiratory allergies, upper respiratory tract diseases, hormonal influences, medications, alcohol abuse, smoking, poor hydration, stress, and gastroesophageal reflux, among others.<sup>2</sup>

#### Risk factors of occupational nature

- a. Organizational, pertinent to the working process (nature of the organization of the working process): extended workdays, overload, accumulation of activities or functions, excessive vocal demands, lack of breaks and of resting periods during the workday, lack of autonomy, a stressful working pace (pressure to meet targets), and dissatisfaction with work or remuneration.<sup>2</sup>
- b. Environmental (work environment):
  - (b.1) Physical hazards: high level of sound pressure; sudden change in temperature; inadequate environmental ventilation; inadequate luminosity.<sup>2</sup>
  - (b.2) Chemical hazards: exposure to upper airway-irritating chemicals (solvents, metal fumes, poisonous gas); presence of dust and/or smoke in the workplace.<sup>2</sup>
  - (b.3) Ergonomic risks due to the lack of proper planning in relation to furniture (implies postural changes), to equipment and material resources, to the acoustic environment, and to lack of safe drinking water and access to toilets.<sup>2,14</sup>

The voice disorder can be triggered or exacerbated by an occupational vocal demand; therefore, it is necessary to establish the connection with the function or activity performance.<sup>2</sup>

It is believed that the main triggering factor for occupational dysphonia is related to overuse of the voice (vocal abuse).<sup>1</sup> Professionals who use their voices are subject to a process of frequent "collision", due to repetitive movement of the vocal folds, causing trauma (friction) of these vocal folds, with appearance of an acute laryngeal inflammatory process.<sup>1,15</sup> Concurrently, there is tension in the vocal cords, usually as a result of an incorrect compensation in cases of laryngitis, particularly of viral etiology.<sup>1</sup>

Importantly, the lifestyle of these professionals (smoking, unhealthy diet with increased risk of pharyngolaryngeal reflux) also plays an important role in the genesis of vocal disorders.<sup>1</sup>

### Diagnosis of WRVD

For the diagnosis of WRVD, the following should be obtained:<sup>8</sup>

- Medical, occupational/working and epidemiological history.
- Clinical assessment (preferably performed by an ENT physician) and, if necessary, additional tests (especially laryngoscopy).

- Phonoaudiological assessment of voice.
- Occupational survey: assessment of the conditions and of the environmental and organizational risk factors of the workspace.
- Survey of relevant behaviors and habits.

Specifically, in the elaboration of a clinical and occupational history, it is essential to investigate in detail the clinical aspects of the disease (signs, symptoms, and laboratory tests), as well as aspects relating to the environment and work routine.<sup>8</sup>

The diagnostic impression should consider the intersection of the above described sub-items, with special attention to occupational history. It is important to remember that all adjuvant tests should be interpreted in light of clinical reasoning.<sup>8</sup>

The disease should be considered as of the occupational type when there is a relationship to work, even with concomitant factors not related to the work activity.<sup>8</sup> The principle of co-causality underlies this assertion, considering the possibility of coexistence of antecedent, concurrent, and subsequent causes to the voice disorder, without this preventing the establishment of a relationship with the patient's work.<sup>16</sup>

An early diagnosis and prompt treatment of WRVD enable a better prognosis. This depends on several factors, such as the worker's level of information, the effectiveness of the prevention program and medical control of the company, of its management, and the opportunity of the worker to express his/her health complaints without suffering explicit or implicit reprisals.<sup>8</sup>

## WRVD therapeutics

After a diagnosis of WRVD, treatment should be offered, which may involve a multidisciplinary team consisting of a physician, speech therapist, physiotherapist, psychologist, and occupational therapist.<sup>8</sup>

In assessing WRVD, all determinants of the worker's health status should be included; if necessary, his/her treatment should focus on biological, environmental, and personality factor changes, and not simply on the reduction of the occupational vocal load.<sup>15</sup>

The treatment and rehabilitation program should be specific to each case, seeking the recovery of the worker's health.<sup>8</sup>

Obviously, treatment depends on the identified etiology, with options for medical or surgical treatment. When indicated, any surgery must be performed. However, most vocal disorders are resolved without surgical intervention.<sup>7</sup>

Vocal speech rehabilitation is often used concomitantly, and this usually allows for a better vocal adaptation and the earlier return of the worker to his/her work environment.

Commonly, in the presence of a case of acute dysphonia, vocal hygiene and rest are indicated.

## Vocal hygiene (vocal health)

Vocal hygiene encompasses a set of vocal preventive and curative measures, such as: guidance by a qualified professional about the vocal functioning, avoidance of smoking, avoidance of alcohol abuse, avoidance of inadequate body

postures, treatment of infectious and allergic respiratory diseases, adequate nutrition with excellent hydration, avoidance of dry air environments, avoidance of using medications without prescription, and practice of physical activities.

The patient should always increase significantly the water intake, in small sips at room temperature. An excessive intake of dairy products should be avoided; these foods increase the production of mucus in the vocal tract and cause it to become thicker.<sup>7</sup> Singing lessons help voice professionals.<sup>7</sup>

## Vocal rest

During treatment, the patient may continue to work; if necessary, he/she should be temporarily removed from his/her duties, in order to not exacerbate the vocal problem or cause any harm during the exercise of his/her function. This removal should be considered as a work leave caused by an occupational disease. In this case, the worker can temporarily be re-adapted into another function, in which the use of the voice does not occur as often. If the re-adaptation is not possible, the worker should be referred to the National Social Security Institute (Instituto Nacional do Seguro Social INSS) for a paid work leave.<sup>8</sup>

Vocal rest, either relative or absolute, is important in any type of laryngitis. It should be suggested that the worker not only rest from the professional occupations, but also from leisure activities, as it is often in social and leisure activities that the individual commits greater vocal abuse.<sup>7</sup>

The vocal rest associated with absence from work implies two situations that can potentially improve dysphonia. The first situation is the obvious reduction of inflammation by decreasing the friction between the vocal folds. The second is associated with the decrease of a possible condition of occupational stress, which can result in reduction of the contraction with muscular relaxation.

The time of rest is variable, depending on the etiology and associated factors. Usually, a work leave not exceeding seven days suffices, because the maintenance of working routine is required to promote an adequate adaptation to real working conditions and for an effective treatment.<sup>13</sup> Even in the case of a complete rest, a period exceeding seven to 10 days should be generally avoided, because of the risk of muscular atrophy.<sup>7</sup> In general, three days are sufficient.

Ortis et al. concluded that, if the vocal hygiene and treatment are followed properly, the patient can keep his/her working practice during the treatment period without risk of worsening, since it is known that when the voice is adjusted, there is no impairment of the phonatory organ. Moreover, even if there are small structural changes, the professional can perform the interventions without organic and phonatory impairment.<sup>13</sup>

Obviously, this approach can, in principle, differ from the prevailing legal legislation, which recommends the removal of the worker from risk agents when he/she presents a disease that was triggered or is worsened by his/her work. However, in the case of dysphonia of occupational origin, this rule may often be inadequate.<sup>13</sup>

Nonetheless, when there is an indication of a longer restriction of phonation, an early return to work, with a



shorter recovery time, will certainly constitute a risk factor for occupational laryngopathy.<sup>1</sup>

## Preventive measures for WRVD

Prevention presupposes the identification of a risk situation to the worker's health. The role of the occupational physician, as well as of the other members of the health team and of the insurance company, is critical for: the control of risk factors, the inclusion of the worker removal from the work environment, appropriate rehabilitation, and functional redeployment.<sup>8</sup>

Preventive measures should be adopted in the comprehensive care of the voice professional.<sup>13</sup> However, the worker usually receives no information about the functioning of the vocal folds in order to decrease the risk for dysphonia.<sup>13</sup> It is observed that many voice professionals do not receive specific training (vocal technique) or any type of orientation for such an intensive use of voice in often unfavorable circumstances, and are thus subject to injury.<sup>7</sup> To make an analogy with any other physical activity, an athlete must spend years training the specific muscles involved in his/her activity, as well as undergo cardiopulmonary preparation in order to attain good performances; poorly trained or physically unprepared athletes are subjected to injuries that are specific to their physical activity.<sup>7</sup> Just as the training of an athlete requires specific knowledge about the physical activity practiced, the care of the voice professional also requires special knowledge.<sup>7</sup> This vocal care is properly disseminated between singers and artists, but unfortunately this is not true among other professionals.<sup>13</sup>

Considering that WRVD has great social, economic, professional, and personal impact, it is essential that preventive actions that may prevent the onset of this event are prioritized. Preventive measures include the adoption of protective and preventive actions for vocal health, which must meet the specificities of the different working environments. Among them, we can mention:<sup>8</sup>

- Educational and therapeutic actions of health promotion aimed at the proper use of the voice, through notions of anatomy and physiology of the vocal tract, vocal care (vocal hygiene), vocal warming and cooling down, and vocal expressiveness.
- Identification and reduction/elimination of existing vocal health risks in the environment and/or work organization, and educational activities aimed at promoting vocal health and vocal complaint/disorder prevention, such as participation in an internal accident-prevention week, lectures, campaigns, workshops, and specific training.
- Early identification of complaints and voice changes through medical assessment and periodic phonoaudiologic evaluation.

## Laryngoscopy and WRVD

Videolaryngoscopy can reveal abnormalities from a laryngitis irritation process with edema of the vocal folds, to nodules, bleeding, and polyps.<sup>12</sup>

In laryngoscopy studies, laryngitis (inflammation of the laryngeal mucosa) is the most common finding.<sup>1</sup>

There is evidence that vocal fold nodules are also common in voice professionals. However, there is a variety of other organic (polyps, Reinke's edema) and functional changes in the larynx and respiratory tract that can cause dysphonia.<sup>4</sup>

It is important to note that the clinical manifestations of functional dysphonia can result in laryngoscopic studies with normal laryngeal morphology.<sup>17</sup>

## Dysphonia and labor legislation

The prevalent epidemics in the work environment are subject to changes, in a similar way to what occurs with the techniques of prevention, diagnosis, and prognosis. In the context of occupational health, the changes in the legal sphere regarding the recognition of occupational diseases must also be included.<sup>18</sup>

The occupational use of the voice cannot be disregarded as a contributing factor to the development of vocal dysfunction. However, the history, physical examination, laryngoscopic study, and the perceptual voice analysis must be carefully assessed in order to establish their relationship with work.<sup>13</sup>

Laryngopathy can relate to the loss of labor capacity, loss in quality of work, absenteeism, employees's replacement and turnover, with financial loss to the worker.<sup>12</sup>

Dysphonia is not listed as an occupational disease, and there are no clearly established legal rules that relate vocal change with work. There is no defined standard to establish the causal relationship of dysphonia with work, which makes it extremely difficult to relate dysphonia directly to labor.<sup>13</sup>

So far, there are three specific Brazilian legislative situations with respect to WRVD.

The first situation is the Decree SIT/DSST No. 9, of March 30, 2007 (Official Gazette, April 2, 2007) approving the Annex II of NR-17 (Work and Telemarketing). This Annex establishes rules regarding furniture, control station equipment (headset), and minimum environmental conditions (such as noise levels, temperature index, wind speed, and relative humidity). It also determines that the working time of effective activity must be, at most, of six daily hours, including breaks.<sup>19</sup>

The second situation relates to the brilliant pioneering action, since 2008, of the State Office of Health and Civil Defense of the state of Rio de Janeiro (Secretaria Estadual de Saúde e Defesa Civil do Estado do Rio de Janeiro SESDEC), which recognizes WRVD as a public health issue, establishing that this disease requires notification.<sup>20</sup>

Finally, the third situation is the mobilization aiming the elaboration of a protocol for WRVD. On March 16, 2012, a public consultation for suggestions for the elaboration of a WRVD protocol by the Health Surveillance Office, through the Department of Environmental and Occupational Health (Departamento de Saúde Ambiental e Saúde do Trabalhador DSAST) was concluded. To date, this protocol has not been officially published.

Furthermore, it is known that in a few cases, such as those with hearing loss resulting from occupational hazards, simulations may exist.<sup>13</sup> In cases of dysphonia, evidence for this fact is not clear nor objectively measurable.<sup>13</sup> In fictitious dysphonia, the subjects invent diseases and attend

various hospitals, due to their pathological need to play the sick role.<sup>3</sup> Commonly, these individuals have full knowledge of labor laws and stop the simulation when the situation is no longer advantageous.<sup>3</sup>

### Notification

In recent years, there has been a progressive increase in the number of professionals who use their voice as a working tool. As a direct consequence, a higher incidence of health problems related to the voice can be expected. However, there are no epidemiological data on the magnitude of this health problem in the Brazilian Unified Health System (Sistema Único de Saúde SUS), since voice disorders are not included in the list of notifiable diseases from the Brazilian Ministry of Health (Decree GM No. 104/11).<sup>21</sup>

The notification of the disease is fundamental, in order to measure and qualify its distribution and to allow the planning of preventive and relief actions to be effective.<sup>8</sup>

Although the Brazilian Ministry of Health does not include voice disorders among the compulsory notification injuries to the National Information System for Disease Notifications (Sistema Nacional de Informações de Agravos de Notificações SINAN), the municipalities and states can stimulate this reporting to other information systems of SUS.<sup>21</sup> Since December of 2008, the state of Rio de Janeiro, through SESDEC, took the leadership to recognize WRVD as a public health issue.<sup>20</sup> The Department of Health of that state included the symptom "dysphonia" (CID 10: R 49.0) in the SINAN as of state interest for notification.<sup>20</sup>

### Communication of work-related accident for WRVD

When considering a suspected diagnosis of WRVD, a Notice of Occupational Injury (Comunicação de Acidente de Trabalho CAT) must be issued (NR-7, item 7.4.8, 1994). A CAT should be issued even in cases that do not entail working disability, for recording purposes, not necessarily for work leaves.<sup>8</sup>

The medical certificate of CAT or an equivalent medical report should be completed by the company's occupational physician, assistant physician (public or private health service), or physician in charge of the Medical Control Program for Occupational Health (Programa de Controle Médico de Saúde Ocupacional PCMSO), containing, among other information, the occupational activity and working place description; date of the accident; the probable duration of treatment; necessity, or not, of absence from work for treatment; a description of the nature of the injury; and probable diagnosis.<sup>21</sup>

Cases of worsening or recurrence of disabling symptomatology should be object of a new CAT.<sup>21</sup>

The CAT must be sent by the company to the INSS by the first business day after the date of incapacity onset, in order to establish a causal link, a disability evaluation, and a definition of the social security conduct relating to work. In those cases in which the communication is not made by the company, the statutory terms/deadlines will not prevail.<sup>21</sup>

Once receiving the CAT, the social security benefits department at INSS will register the document, checking whether all fields were filled. If the filling is incomplete, the CAT must be submitted to a correct filling, without impairing the subsequent completion of medical evaluation.<sup>21</sup>

The accident will be technically characterized by the INSS's medical evaluator (Article 337 of Decree No. 3.048/99), who will conduct a technical survey in order to establish the causal connection between: I – the accident and the injury; II – the disease and the work; and III – the cause of death and the accident.<sup>21</sup>

No CAT may be refused; they must be recorded, for statistical and epidemiological purposes, regardless of the existence of incapacity for work.<sup>21</sup>

If there is a recommendation of sick leave of over fifteen days, the employer will refer the patient to INSS' medical assessment for a forensic examination, from the sixteenth day of sick leave on.<sup>21</sup>

### Medical inspection procedures with INSS

In a survey conducted by INSS in 2012, from January to November, 2,013,081 security benefits (type 31) were granted, and of these, 2622 were motivated by CATs related to voice disorders (ICDs: J04, J37, J38, R47, R48, R49) (0.13%). In the same period, 282,610 benefits were granted due to occupational accidents or diseases (type 91) and of these, 454 were for voice disorders (0.16%).<sup>22</sup>

In the presence of a voice disorder, various professional groups apply for sick leave due to the inability to perform their functions. A survey conducted by the Worker's Health Department of the city of São Paulo found that employee sick leaves and functional re-adaptations due to voice disorders were more frequent among professionals involved in teaching (teacher, child development assistant, and educational coordinator, among others).<sup>10</sup>

During treatment, the worker can stay on his/her job or, upon the need, step away temporarily. This should be considered as a function removal due to an occupational disease. In this case, the worker can be re-located into another function in which there is no risk in using the voice. If the redeployment is not possible, and the time off-work needs to be greater than 15 days, the person should be referred to the INSS for a work leave with full pay.<sup>8</sup>

According to legal provisions, the work of the Social Security medical expert is to check the worker's inability to work. This statement means that this professional should check for the presence of disease, understand the profession of the insured person (every worker who contributes monthly to social security is called "insured", being entitled to the benefits and services offered by INSS), and how his/her function is executed (these issues include a knowledge of the professional profile, registry of the profession in the Brazilian list of occupations, and notions of hygiene and occupational health).<sup>23</sup>

To identify the disease, the INSS medical expert must consider the medical reports of the insured, assess the clinical features, risk factors of occupational and non-occupational nature and, if necessary, request additional exams. The medical expert should request the cooperation from the physician attending to the insured.<sup>21</sup>

Once the disease is confirmed, the insured is examined to discover whether the disease is disabling to the function performed. For instance, a paraplegic wheelchair user has limitations for many activities, but he/she can be hired by a company as a typist.<sup>23</sup>

Apart from the incapacity checking, it is also the role of the INSS medical expert to characterize this inability – whether it is of the security type, or accidental. To do so, three parameters are taken into account, besides the CAT itself: the Professional or Laboral Technical Nexus (NTP/T), which verifies the relationship between injury and exposure according to the Annexes of Decree 6042/2007; the Technical Epidemiological Social Security Nexus (NTEP), which crosses the occupational data with frequently associated diseases; and the technical nexus by disease compared to work-related accident, which constitutes the assessment of the medical expert and his/her conclusion with respect to the work as a causal factor of the disease presented by the insured.<sup>24</sup>

The conclusions of the medical expert regarding the assessment of working capacity and the establishment of the causal nexus between injury and work, can result in the following situations:<sup>21</sup>

- I No working disability was observed in any occasion; thus, this is a case of rejecting the required sick-leave benefit by accident, regardless of causality.
- II An incapacity to work was identified, but a causal relationship has not been established; the sick leave benefit is granted (species 31).
- III A working disability exists, with an established causal nexus; the sick-leave benefit by accident is granted as required (species 91).

#### Incapacity by WRVD

Although there is no specific legislation to regulate the care of the vocal tract, this does not exempt the employer of the obligation to maintain the vocal health of voice professionals.<sup>12</sup>

Working capacity is the relationship of balance between the demands of a given occupation and the ability to perform it.<sup>25</sup>

Depending on the degree of injury and severity of dysphonia, the laryngeal diseases induced by the professional use of the voice reduce the working capacity of the worker, i.e., lead to a partial or total disability.<sup>12</sup>

Incapacity to work is the impossibility of performing the specific tasks of an activity or occupation, as a result of morphopsychophysiological changes caused by disease or accident.<sup>26</sup>

The personal risk to life or to third parties, and also the risk of deterioration due to the permanence in the activity, are implicitly included in the concept of disability, provided that they are palpable and indisputable.<sup>26</sup> A classic example of this situation is that of a bus driver who, after an accident of any kind, develops uncontrolled seizures. In this case, the bus driver can endanger the lives of the passengers.<sup>27</sup>

The existence of illness or injury does not mean inability. Several carriers of well-defined diseases (such as diabetes, hypertension, etc.) or injuries (sequelae of poliomyelitis, amputation of body parts) can and should work. However, if a worsening of the clinical picture occurs (anatomic, functional, or mental), that hinders the development of the activity, those non-disabling diseases or injuries can become disabling.<sup>25</sup>

The concept of disability should be evaluated by its extent and duration and by the occupation performed.<sup>26,27</sup>

As its degree, the working disability may be partial or total:

- a. A partial disability is a degree of disability that still allows the performance of activity without risk to life or further deterioration, and is compatible with the approximate salary that the person received before his/her illness or accident.<sup>26,27</sup>
- b. The disability is regarded as total if the incapacitation that creates an inability to stay on the job does not allow for the average income achieved under normal conditions by workers in the category under consideration.<sup>26,27</sup>

The duration of the working disability may be of temporary or of indefinite duration (permanent):

- a. A disability whose recovery can be expected within the foreseeable future is considered as temporary.<sup>26,27</sup> Temporary disability disappears during treatment, by convalescence or by the consolidation of lesions, without disabling or derogatory sequelae.
- b. An indefinite (permanent) disability will not change in the foreseeable future with the therapy and rehabilitation resources available at the time.<sup>26,27</sup> This disability arises from more severe accidents or diseases (and, therefore, leaving disabling sequelae after treatment), or from situations that are not amenable to treatment.<sup>28</sup>

With respect to its relation to the profession, the working disability may be:

- a. Uniprofessional: that in which the hindrance reaches only a specific activity.<sup>26,27</sup>
- b. Multiprofessional: that in which the hindrance covers various professional activities.<sup>26,27</sup>
- c. Omniprofessional: that implies the impossibility of the performance of any working activity; this is an essentially theoretical concept, except when of transitory nature.<sup>26,27</sup>

Invalidity may be defined as the total, indefinite, and multiprofessional working disability, not subject to recovery or vocational rehabilitation, corresponding to a general inability of financial gain as a result of illness or accident.<sup>26</sup>

#### Causal and concausal nexus in WRVD

According to social security legislation, for an accident to be characterized as a work-related accident, the causal nexus between the work and the resulting event (injury or disorder) should be established.<sup>27</sup>

The causal nexus or causality corresponds to the connection of the harm caused to the patient (effect or disease, in this case, WRVD), due to his/her employer's conduct (cause or condition of work in company).<sup>29</sup> To establish the causal relationship, it must be ensured that the effect (WRVD) would not have happened without the work, i.e., the work or a work-related situation was the basic condition for establishing the disease (WRVD).<sup>14</sup> It is noteworthy that, even if there is guilt and damage, there is no obligation to repair

if, between them, a relationship of cause and effect is not established.<sup>14</sup>

There are some factors that exclude the responsibility of the causal connection of accidents at work: exclusive guilt of the victim; unforeseeable circumstances or *force majeure* (when the accident occurs due to circumstances or conditions that are beyond any control or diligence of the employer); and third party factor (no direct participation of the employer or of the labor activity exercise for the occurrence of the event).<sup>29</sup>

The evidence in medical inspections should not be evaluated mechanically with the rigor and the cold-heartedness of a precision instrument, but with the rationality of an attentive judge who will combine facts, evidence, assumptions, and the observation of what ordinarily happens, to form his/her opinion.<sup>29</sup> Because of this, when it comes to WRVD, and excluding the social security context, the medical expert should be an otolaryngologist, considering that this professional is the best prepared to assess this situation. The medical expert should follow a systematic standardized procedure, so that no relevant aspect is overlooked: What does the worker do? How does he/she perform his/her job? With what products and tools? Where? Under which conditions? How long? How he/she feels and what does he/she think about the job? Does he/she know other workers with similar problems? What was his/her former occupation?<sup>14</sup>

Importantly, for the investigation of health/work/disease relationships, it is essential to consider the worker's report, both individually and collectively. Despite the advances and sophistication of techniques for the study of working environments and conditions, often only the worker knows how to describe the actual conditions, circumstances, and unforeseen events that occur in everyday life and that could explain his/her illness. However, in the medical expert work, it is of paramount importance to seek information from other parties involved in the compensation process, i.e., the company claimed, for due validation of the information obtained from the complaining party.<sup>14</sup>

The Brazilian Federal Board of Medicine, in the use of its legal attributions, and considering that every physician, when caring for a patient, and in this case the person object of the investigation, must evaluate the possibility that the cause of the alleged disease, clinical change, or laboratory abnormality may be related with the professional activity, as issued the Resolution CFM 1,488/1998, which states in its II article: "*Article 2 – To establish a causal relationship between health disorders and the activities of the worker, in addition to clinical (physical and mental) examination and supplementary tests, when necessary, the physician should consider: I – the clinical and occupational history, decisive in any diagnosis and/or investigation of causality; II – the study of the workplace; III – the study of work organization; IV – epidemiological data; V – the current literature; VI – the occurrence of a clinical or subclinical picture in a worker exposed to aggressive conditions; VII – the identification of physical, chemical, biological, mechanical, stress, and other risks; VIII – the testimony and experience of workers; IX – the knowledge and practices of other disciplines and of their professionals, pertaining or not to the health area.*"<sup>30</sup>

The worker's illnesses that relate to his/her professional activity comprise the classification of occupational diseases,

being regarded, for social security and indemnity purposes, as work-related accidents, in accordance with Article 20 of Law No. 8,213/91.<sup>31</sup>

With respect to occupational diseases, the legislation has adopted the classification of Schilling, considering whether the disease agent was provocative or contributory. The term "occupational disease" is a generic term that is subdivided into professional diseases and working diseases, that are foreseen in article 20, paragraphs I and II of Law No. 8,213/91.<sup>16</sup>

Schilling (1984) classified the occupational diseases into three groups:<sup>14</sup>

**Group I** (professional diseases, ergopathies, idiopathies or technopathies): diseases that are produced or triggered only by certain professional activities, e.g., silicosis in miners exposed to silica, lead poisoning (saturnism) in workers exposed to lead. The type of causal relation is said "necessary cause" and exempts proof of causation nexus with the work due to its typicality,<sup>26</sup> that is, in such diseases the causation is presumed in Law (*juris et de jure* presumption).<sup>31</sup>

**Group II** (work diseases, "atypical professional illnesses or diseases" or mesopathies): diseases in which the work may be a risk factor, but not necessarily, i.e., the work diseases do not have as sole or exclusive cause the service performed, but are acquired as a result of the special conditions under which the work is performed.<sup>31</sup> There is a kind of causal relationship with a "contributory" risk factor of multifactorial etiology that requires proof of causation nexus with the work performed under these special conditions, usually through inspection of the workplace.<sup>16</sup> WRVD is included in this group.

**Group III** (concausal factor): even if the job execution has not been the sole and exclusive cause of the accident or occupational disease, such casualty will be considered as being a work-related accident for the purposes of Law, when the working conditions directly concur for the occurrence of the misfortune.<sup>31</sup> This "concurrent cause" is called by doctrine as "concausal factor".<sup>31</sup> Very often, WRVD is included in this group (voice disorders). The kind of causal relationship with the work presents a preexisting disease "triggering or aggravating" factor.<sup>14</sup>

As a basic guideline, the positive response to most questions presented below helps to establish an etiologic relationship or causation nexus between illness and work:<sup>14</sup>

Nature of exposure: can the pathogen be identified by occupational history and/or by the information collected in the workplace and/or from people familiar with the worker's environment or workplace?

Specificity of the causal relationship and the strength of causal association: the pathogen or risk factor may be contributing significantly among the causal factors of the disease?

The kind of causal relationship with work is determined according to the classification of Schilling. In the case of type II work-related diseases, were the other, non-occupational, causes duly examined and considered hierarchically in relation to the causes of occupational nature?



- Degree or intensity of exposure: is it compatible with the production of the disease?
- Exposure time: is it sufficient to produce the disease?
- Latency period: is it sufficient for the installation and manifestation of the disease?
- Previous records: are there records concerning the former worker's health state? If so, do these contribute to the establishment of a causal relationship between the current state and the work?
- Epidemiological evidence: is there epidemiological evidence to support the hypothesis of a causal relationship between the disease and the present or previous work of the insured worker?

The pathologies related to the working activity are not only those caused by a labor factor, but also those aggravated by some agent present in the workplace, that is, a concausal factor. Thus, the concausal factor is another cause that, together with the main cause, contributes to the result, not being responsible for initiating the causal process neither for interrupting it – it is just a reinforcement.<sup>29</sup>

The principle of concausality, according to which there is no need that the work be the sole cause of the disabling event, was only adopted by Decree-Law No. 7,036/44. This principle is currently in effect, being considered in Article 21, item I of Law 8,213/91: *"The work-related accident that, although not being the only cause, has contributed directly to the death of the insured person, to the reduction or loss of his/her ability to work, or produced injury requiring medical attention for his/her recovery."*<sup>16</sup>

Within the theory of concausality, antecedent, concomitant and subsequent causes may exist.<sup>16</sup>

An antecedent cause preexists the traumatic event, but is instrumental for the result to happen that way and at that time. For example, an insured diabetic who suffers a minor injury that, if it happened in a healthy worker, would not have major consequences. However, the injury caused heavy bleeding that lead to death. This is a preexisting concausal factor, because without it the resulting "death" would not have happened.<sup>16</sup>

Supervening causes or factors occur after the event. An example is a complication caused by pathogenic microbes after an accident, with an end result of amputation of the affected finger.<sup>16</sup>

Finally, concomitant factors are those that coexist with the accident. For example, a hearing loss that affects a 50 years old worker exposed to noise in the workplace. The hearing loss can be caused by exposure to high environmental noise during 20 or 30 years of work, but this defect may also be a result of the age factor.<sup>16</sup>

## Conclusion

WRVD is a situation that appears frequently as a cause for work absenteeism or functional rehabilitation, or still for prolonged absence from work. Currently, forensic physicians have no comparative parameters to conduct an expert analysis in vocal disorders. In certain situations, WRVD may cause work disability. This disorder may be labor-related, or be an adjuvant factor to work-related diseases.

## Conflicts of interest

The authors declare no conflicts of interest.

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