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Guideline of the Korean Academy of Medical Sciences for Assessing Respiratory Impairment

The presently used impairment rating guidelines in Korea do not accurately reflect the injury in various lung diseases. Therefore, they need to be made more objective and quantitative with new measurements, using indicators to more precisely represent impairment in the major respiratory diseases. We develop a respiratory impairment rating guideline to ensure that the same grade or impairment rating would be obtained regardless of surgeons who determinate it. Specialists in respiratory medicine and thoracic surgeons determined the impairment grades. Moreover, the impairment should be irreversible for more than 6 months. The impairment rating depends on the level of forced vital capacity, forced expiratory volume 1 second, diffusion capacity of carbon monoxide, arterial oxygen pressure, and arterial carbon dioxide pressure. The degree of whole body impairment is defined by each grade: first 81-95%, second 66-80%, third 51-65%, fourth 36-50%, and fifth 21-35%. In conclusion, we develop a respiratory impairment rating guideline for Koreans. Any qualified specialist can easily use it and judge objective scoring.

Key Words : *Disability Evaluation; Respiratory System; Respiratory Function Tests*

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INTRODUCTION

The influence of permanent impairment of the respiratory system is difficult to assess both objectively and reliably. One rating guideline has been prepared by American Medical Association (AMA) (1), in which various respiratory diseases are described, followed by objective examples for users.

An impairment rating guideline was prepared by the Ministry of Health and Welfare (MOHW) and is now being used in Korea (2). However, it is based only on the parameters of oxygen tension and forced expiratory volume in 1 second (FEV_1). To better evaluate the various kinds of respiratory diseases that cause permanent impairment, more parameters should be included, and a new impairment rating system needs to be developed (3-5).

In the case of chronic obstructive pulmonary disease (COPD), FEV_1 and diffusion capacity are the most important factors in an impairment rating, while forced vital capacity (FVC) is the basis of the impairment assessment in restrictive pulmonary diseases. A typical symptom in respiratory diseases is dyspnea, however, to objectively demonstrate it is difficult in an impairment assessment. Additionally, the degree of dyspnea and FEV_1 shows no clear relationship (6).

As respiratory impairment is caused by various diseases and situations, objectively scoring the degree of impairment using only two indicators is difficult. Thus, this study was conducted to make new objective and quantitative ratings using multiple indicators to represent impairment in varied respiratory diseases.

MATERIALS AND METHODS

Organizing committee on respiratory impairment

The committee was supervised by Korean Academy of Medical Sciences. The committee consisted of four members, three recommended by Korean Academy of Tuberculosis and Respiratory Diseases, and one recommended Korean Society for Thoracic and Cardiovascular Surgery. Each member had been treating respiratory diseases for at least 15 yr and had experiences in the determination of respiratory impairment.

Impairment grade determination guidelines

In determining the grade of impairment in a patient with

respiratory disease, the same grade or impairment rating should result, regardless of which surgeon makes the determination. Thus, we established a rule that only objective indicators would be used, excluding subjective symptoms.

Method of determining the impairment grade

First, the various respiratory diseases that cause dyspnea were divided into obstructive and restrictive pulmonary diseases. Then, indicators were determined with which to judge the degree of those conditions.

RESULTS

Determinations of impairment grade

The rating should be conducted at a time when the respiratory impairment is permanent, following those guidelines. First, the treatment term should be more than 6 months, including the term of treatment in other hospitals. Second, in cases of which pulmonary function changes, the 6-month clock should be reset and treatment be continued. Here, a "change" in pulmonary function means over 12% increase in FEV_1 or more than 200 mL with a bronchodilator (7). Third, if the impairment occurs as a result of thoracic trauma or surgery, it should be observed for more than 1 yr to determine whether the impairment is permanent. Typically, respiratory medical specialists determine the impairment grade; a thoracic surgeon should evaluate impairments occurring after surgery or trauma.

Symptoms and impairment ratings

Symptoms and signs that could be used as parameters for evaluating impairment include chest pain, chest wall defects and deformities, a continuous thoracotomy catheter, dyspnea, and decline in exercise capacity. Dyspnea and decline in exercise capacity are subjective concepts and are not suitable as parameters, because of large differences among individuals.

Chest pain, chest wall defects and deformities, and a continuous thoracotomy catheter are used as parameters in the impairment evaluation following thoracic trauma or surgery; concrete guidelines are described below.

Chest pain evaluation after thoracic trauma or surgery should satisfy the following conditions. First, the areas of thoracic trauma or surgery and chest pain should be the same (e.g., areas of rib fractures confirmed by thoracic radiograph or bone scan and the areas of thoracic surgery and chest pain should be the same). Second, the pain should last longer than 6 months after surgery or trauma. Third, the degree of pain should be determined by insomnia or endless emotional pain because of the chest pain, or the impossibility of performing the activities of everyday living (with concrete restrictions, such as an inability to drive or do housework because of pain). Fourth, patients should have taking non-narcotic or narcotic analgesics to ease the pain for at least 6 months. Fifth, pain-related findings should be observed on examination (clear expression of aches or pain, such as a deep respiration moaning sound, excessive self-protection, or a distorted face when being examined).

Tests used as impairment rating parameters

FVC, FEV_1, diffusion capacity of carbon monoxide (DLCO), arterial oxygen pressure (PaO_2), and arterial carbon dioxide pressure ($PaCO_2$) should be determined by standard methods and measured when a patient is in a stable state.

Diseases needing impairment ratings and guidelines for evaluating impairment

The core factors in respiratory disorders arise from deficits in oxygen and carbon dioxide exchange in the alveolus. That is, the most basic evaluation items are hypoxemia and hypercarbia, which can readily be evaluated by arterial blood gas analysis. Ventilatory disorders, which are readily assessed using ventilation-measuring pulmonary function tests such as spirometry or flow-volume curves, can be subdivided into obstructive and restrictive disorders. Additionally, the diffusing capacity of the lung, which generates dyspnea on exertion with exercise-induced hypoxemia, should objectively be evaluated by DLCO measurements.

Evaluation of respiratory conditions in chronic diseases is classified into physiological and functional aspects (Table 1). They can be subdivided into obstructive ventilatory, restrictive ventilatory, hypoventilation, DLCO, and pulmonary arterial hypertension impairments.

The test to quantitatively measure the degree of impairment under each condition is shown in Table 2. The diagnosis of each disease is also outlined.

Table 1. Chronic respiratory diseases causing impairment

Obstructive ventilation disorder
Chronic airway disease; COPD, bronchial asthma, bronchiectasis
Large airway obstruction; tracheal neoplasm, vocal cord paralysis
Restrictive ventilation disorder
Interstitial lung disease; idiopathic pulmonary fibrosis
Chest wall disease; kyphoscoliosis, chest wall demormity
Pleural disease; fibrothorax
Hypoventilation disorder
Sleep-apnea syndrome; central or obstructive
Neuromuscular disease
Diffusion disorder
Interstitial lung disease, emphysema
Pulmonary hypertensive disorder
Primary pulmonary hypertension, chronic thromboembolic disaese

COPD, chronic obstructive pulmonary disease.

Table 2. Tests for diagnosis and grading impairments of chronic respiratory disorders

Classification	Tests for diagnosis	Tests for impairment grading
Ventilatory disorder	Chest roentgenogram, ABGA* Chest CT scan, spirometry	FEV_1, DLCO PaO_2, $PaCO_2$
Restrictive disorder	Chest roentgenogram, ABGA Chest CT scan, spirometry, lung biopsy	FVC, DLCO PaO_2
Pulmonary hypertension	Echocardiogram, chest CT scan, cardiac catheterization	PaO_2
Hypoventilation disorder	Neuromuscular test	FVC, FEV_1, $PaCO_2$

*, denotes arterial blood gas analysis.
FEV_1, forced expiratory volume 1 second; DLCO, diffusion capacity of carbon monoxide; CT, computed tomography; PaO_2, arterial oxygen pressure; $PaCO_2$, arterial carbon dioxide pressure; FVC, forced vital capacity.

Determination of impairment rating

The impairment rating is to be determined by the most severe clinical test results according to the guideline (Table 3). For example, a patient with COPD should be graded 2nd impairment rating if the grade of FVC, FEV_1, DLCO, and PaO_2 was 3rd, 3rd, 3rd, and 2nd, respectively.

With chest pain, the grade is moved to the next high level after satisfying the conditions. Only chest pain cannot be the determinant of impairment grading. For example, the 3rd grade impairment can upgrade to 2nd grade impairment if severe chest pain persists after open thoracotomy.

A patient who has been treated with a chest wall window for cure of a deficit in the chest wall, a distorted chest, pleural emphysema, or bronchopleural fistula is moved to the third grade. Such cases should be reevaluated annually and excluded from the impairment rating soon after the chest wall suturing reconstructive surgery is complete.

A case with an indwelling catheter is rated as fourth grade, and should also be reevaluated annually and excluded when the tube is removed.

A considerable retraction or distortion occurring as a result of multiple rib fractures is in the fifth grade.

Degree of whole body impairment in each grade

The degree of whole body impairment is defined by differences of 15% impairment between grades. Thus, the first grade is 81-95%, the second is 66-80%, the third is 51-65%, the fourth is 36-50%, and the fifth is 21-35%.

DISCUSSION

We set out a respiratory impairment rating guideline for Koreans, that relevant specialists can easily use, by removing the effects of subjective judgments from impairment ratings.

Table 3. Impairment grading according to clinical parameters

	Not impaired	5th	4th	3rd	2nd	1st
FVC (%)	≥61	–	51-60	41-50	36-40	≤35
FEV_1 (%)	>61	51-60	41-50	31-40	26-30	<25
DLCO (%)	>61	–	–	51-60	41-50	<40
PaO_2 (mmHg)	≥66	–	–	61-65	56-60	≤55
$PaCO_2$ (mmHg)	≤44	–	–	45-50	51-59	≥60

FVC, forced vital capacity; FEV_1, forced expiratory volume 1 second; DLCO, diffusion capacity of carbon monoxide; PaO_2, arterial oxygen pressure; $PaCO_2$, arterial carbon dioxide pressure.

The most important issue to consider at the time of determining the respiratory impairment is patient's activity, established by the degree of patient's dyspnea. However, "dyspnea" is difficult to adequately define, although many have tried (8), and it could be argued that none of them is accurate. Dyspnea is subjective, as experienced by patients. Accordingly, dyspnea itself cannot be used to determine the impairment grade. It may seem natural for dyspnea to be included in assessing respiratory impairment, but it plays no part in this guideline for such determination.

It may also be argued that chest pain should be excluded from the rating determination because the degree of chest pain cannot be objectified. However, if the area of chest pain corresponds to thoracic trauma, and radiological and objective evidence exists to take analgesics to ease the pain, then chest pain is appropriately objective. Furthermore, chest pain is not rated alone, but is included in the impairment rating.

The existing respiratory impairment guidelines consider only FEV_1 and PaO_2 values. Thus, they give priority to chronic obstructive pulmonary disease, which is a weakness, because the guidelines do not adequately deal with impairment caused by other major chronic respiratory conditions such as interstitial lung disease, thorax and pleural diseases, and surgical lung resection.

The existing guidelines could be improved by including physiological impairment in patients with interstitial lung disease and emphysema, and by adding the FVC test to rate restrictive pulmonary function impairment, and the DLCO test to rate the exercise-induced hypoxemia. In our guidelines, DLCO was included, whereas DLCO/VA was excluded from the lost part of the lung parenchyma by lung resection and lung parenchymal destruction. A $PaCO_2$ test was added to rate ventilatory defects and physiological impairment caused by pulmonary hypertension. With the additional tests, the new guidelines reflect pathophysiological traits of various major chronic respiratory diseases that can cause respiratory impairment.

As previously stated, FEV_1 is representative of the degree of impairment in the case of obstructive lung disease, however,

it is not completely objective. However, FEV_1 is still used because it is probably the best test available. When applied to some patients (that is, a score below 27), the impairment degree should be upgraded by one grade (data not shown).

Regarding restrictive lung disease, it can be argued that the value of diffusing capacity of the lungs used to determine impairment should be adjusted higher or lower than the value proposed here. For the impairment rating guideline to be applied reliably in the clinic, the values stated here should be used.

The final impairment rating by our guideline is determined by the lowest (most severe) rating among the five rating items. This is because impairment should not be determined by only one factor of respiratory disease. For example, in patients with serious emphysema, they often complain of dyspnea, but the condition might not be considered as one of impairment by only DLCO. Furthermore, the arterial blood gas test or FEV_1 findings may not fit the rating guidelines for serious impairment, and DLCO might have been reduced. For patients with idiopathic pulmonary fibrosis, the arterial blood gas test or FEV_1 may suggest no impairment rating based on spirometry findings. However, in such cases, DLCO will likely be considerably reduced, so that it can be the prime determinant of the impairment rating. In patients with pulmonary hypertension and clearly increased $PaCO_2$, this test alone can be used to make the determination of impairment.

We propose that impairment determinations should be made by specialists in departments of respiratory and thoracic surgery. However, some patients with asthma whose disease does not respond to respiratory relaxants may be treated at a COPD clinic. Thus, specialists in allergy departments treating patients with asthma should perhaps also be included to the list of practitioners who make impairment determinations.

The rating guideline for the disabled which was prepared by the AMA includes impairment guidelines fitted to each disease by defining diseases and describing diagnosis methods for each (1). Accordingly, the grade is determined for each disease, and for airway disease, it is determined by the findings of pulmonary function tests. Of course, it would be ideal to define every disease and to set up the diagnosing methods and guidelines for grading impairments, nevertheless, it is too early to do so for many diseases in an economically effective manner.

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