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Recommendations of SEPAR

Spirometry☆

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ABSTRACT

Spirometry is the main pulmonary function test and is essential for the evaluation and monitoring of respiratory diseases. Its utility transcends the field of Respiratory Medicine, is becoming increasingly important in primary care and applications have even been described outside the field of respiratory diseases. This document is therefore intended to serve as support for all health professionals who use spirometry, providing recommendations based on the best scientific evidence available.

An update of the indications and contraindications of the test is proposed. The document sets out recommendations on the requirements necessary for conventional spirometers and portable office equipment, as well as on spirometer hygiene and quality control measures. Spirometric parameters that must be considered, performance of manoeuvres, criteria for acceptability and repeatability of measurements and their quality control are defined. A proposal is also established for presentation of the results and an evaluation and interpretation is proposed according to information generated in recent years. Finally, lines of adaptation and integration of spirometry in the field of new technologies are considered.

Espirometría

Palabras clave:
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Enfermedades respiratorias

RESUMEN

La espirometría es la principal prueba de función pulmonar, y resulta imprescindible para la evaluación y el seguimiento de las enfermedades respiratorias. Su utilidad trasciende el ámbito de la neumología, adquiere una creciente importancia en atención primaria e incluso se han descrito aplicaciones fuera del campo de las enfermedades respiratorias. Por ello, este documento pretende servir de apoyo a todos los profesionales de la salud que utilicen la espirometría, proporcionando recomendaciones basadas en las mejores evidencias científicas disponibles.

Se propone una actualización de las indicaciones y contraindicaciones de la prueba. El documento establece recomendaciones sobre los requerimientos necesarios para los espirómetros convencionales y los equipos portátiles de oficina, así como sobre las medidas de higiene y de control de calidad de los espirómetros. Se definen los parámetros espirométricos que deben ser considerados, la realización de las maniobras, los criterios de aceptabilidad y repetibilidad de las medidas y su control de calidad. También se establece una propuesta para la presentación de los resultados y se recomienda una evaluación e interpretación acorde a la información generada en los últimos años. Por último, se consideran las líneas de adaptación e integración de la espirometría en el campo de las nuevas tecnologías.

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Introduction

Spirometry is a basic test for the study of lung function, and its performance is necessary for the evaluation and follow-up of respiratory diseases. Its usefulness transcends the field of Respiratory Medicine, and the last few years have seen it gradually incorporated in primary care and other medical disciplines.

Aware of its importance, the first Spanish Society of Pulmonology and Thoracic Surgery (SEPAR) guidelines were dedicated to spirometry.[1] The need to incorporate technological advances and changes in the performance, evaluation and interpretation of the procedure in the time since then has created the requirement for this new version. This document includes analyses and position proposals on the characteristics and requirements of conventional spirometers and currently available portable office equipment, as well as on the required quality criteria and parameters that must be analysed. An assessment and interpretation in line with the information generated in recent years is also proposed, including lines of adaptation and integration of spirometry in the field of new technologies.

The present guidelines are aimed at all healthcare professionals who use this test, which is intended to serve as a reference for decision-making based on the best scientific evidence available.

Applications. Indications and Contraindications

Apart from its usefulness for the diagnosis and monitoring of many respiratory diseases, spirometry has other potential applications. There is evidence that determination of the lung function age can improve the success of smoking cessation,[2] and that spirometry is useful for estimating the risk of lung cancer, cognitive deterioration, all-cause mortality and mortality of cardiovascular origin.[3–5]

The main indications for spirometry are summarised in Table 1.[1,6–9] It is essential for the diagnosis and monitoring of most respiratory diseases. Furthermore, it enables the impact of diseases of other organs or systems (cardiac, renal, liver, neuromuscular, etc.) on lung function to be assessed. Thus, it should form part of any routine health examination, especially in subjects at risk of developing lung diseases. It is recommended that spirometry be systematically performed in persons over the age of 35 with a history of smoking (>10 pack-years) and any respiratory symptom (quality of evidence: moderate; strength of recommendation: strongly in favour).[10]

Spirometry is generally well tolerated, so there are few limitations for its performance in routine daily practice.[1,6–9,11,12] Certain contraindications for spirometry have been established (Table 2) from a more detailed analysis of the frequency of developing complications in certain risk situations and their severity,[13,14] differentiating the absolute contraindications, in which the test is not recommended, and the relative contraindications, which require individualised assessment of the ratio between the potential risks and expected benefits.

In patients with pulmonary embolism, it is recommended that the test is not performed until patients have been adequately anticoagulated (usually after receiving 2 doses of low molecular weight heparin), and in patients with pneumothorax for up to 2 weeks after reaching re-expansion.[13] Current evidence suggests that spirometry is safe 7 days after an uncomplicated myocardial infarction, provided that the patient remains stable.[13] While unstable angina is an absolute contraindication, spirometry is occasionally required in the preoperative assessment of patients with chronic stable angina. In this case, the previous administration of sublingual nitroglycerin should be considered.[13]

In several studies, spirometry has been performed 2 h after thoracotomy, with no notable complications.[14] Nonetheless, the limitation established by the pain may determine the usefulness of data obtained. It is recommended that the test be postponed for at least one week after abdominal surgery and for 3–6 weeks after brain surgery.[13] In the case of eye surgery, the examination should be delayed for 2 weeks following oculoplastic surgery, 2 months after vitreoretinal surgery (vitrectomy or glaucoma surgery) and 3 months for anterior eye segment surgery (cataracts or keratomy).[15] In the case of hypertensive crisis, it is also recommended to postpone the examination until a mean arterial systolic pressure of less than 130 mmHg has been reached.[13]

In any case, complications in forced spirometry are rare. The most common are paroxysmal coughing, bronchospasm, chest pain, dizziness, urinary incontinence or increased intracranial pressure. More rarely, the patient may suffer syncopal symptoms. The competency of the healthcare staff performing the spirometry (hereinafter technician) is essential for detecting problems and

Table 1
Indications for Spirometry.

Diagnostic
Evaluation of respiratory symptoms or signs
Measurement of the effect of the disease on lung function
Screening of subjects at risk of lung disease, mainly:
- Smokers aged over 35 years and at least 10 packs-year
- Persistence of respiratory symptoms, including dyspnoea, cough, expectoration, wheezing or chest pain
- Work or occupational exposure to toxic substances that cause respiratory impairment
Risk evaluation for surgical procedures, especially chest or upper abdominal procedures
Estimation of severity and prognosis in respiratory diseases or diseases of other organs that affect respiratory function
Assessment of health status before beginning strenuous physical activity programmes
Routine physical examination
Monitoring
Evaluation of the effect of therapeutic interventions
Monitoring the course of diseases that affect lung function
Monitoring persons exposed to substances that are potentially toxic for the lungs, including drugs
Evaluation of deterioration/disability
Rehabilitation programmes
Evaluation of dysfunction for medical insurance and legal assessments (social security, expert reports, etc.)
Public health
Epidemiological studies
Generation of reference equations
Clinical research

Table 2
Contraindications of Spirometry.

Absolute
Haemodynamic instability
Pulmonary embolism (until adequately anticoagulated)
Recent pneumothorax (2 weeks after re-expansion)
Acute haemoptysis
Active respiratory infections (tuberculosis, norovirus, influenza)
Recent myocardial infarction (7 days)
Unstable angina
Aneurism of the thoracic artery that has grown or is large in size (>6 cm)
Intracranial hypertension
Acute retinal detachment
Relative
Children under 5–6 years old
Confused or dementia patients
Recent abdominal or thoracic surgery
Recent brain, eye or ear, nose or throat surgery
Acute diarrhoea or vomiting, nausea
Hypertensive crisis
Dental or facial problems that impede or make it difficult to insert and hold the mouthpiece