

Abstract

Rationale: Spirometry is essential in the diagnosis and monitoring of respiratory diseases. To extend and facilitate the diagnosis of these diseases, electronic spirometers were introduced on the market and are specially adapted to the practice of general medicine. The performance of spirometers is often measured only in ideal conditions with a mechanical simulator reproducing expiratory standard ATS curves generated by a computer. Studies have questioned the value of these results in real conditions.

Methods: We have tested 5 office spirometers (PocketSpiro, Spirobank, SpiroStar, MicroLoop, SpiroScout). We studied the basic spirometric parameters (FVC, FEV1 and PEF) by subjecting the devices to a HansRudolph simulator in both ATPS and BTPS conditions. In addition to testing the flow-volume curves recommended by the ATS, we also submitted the spirometers to the curves obtained in real patients.

Results: The reproducibility of the office spirometers complied with the requirements of the ATS – ERS societies but significant differences were observed mainly in the curves of patients with severe COPD. The limits of agreement between the simulator and spirometers were always lower for FEV1 than FVC. The accuracy of most spirometers significantly decreased when submitted to low flow rates like those from COPD patients. We were able to design a "critical curve" taking into account the errors found with the real curves mimicking a COPD GOLD 4. The SpiroScout presented a large difference on the FVC compared to the simulator, underestimating the low flows (table). The device with the best performances in terms of accuracy and precision, and the only one in which all curves tested met the ATS recommendations was the Microloop.

Table: differences between simulator and spirometers (%)

	FVC	FEV1
PocketSpiro	-1.96	0.19
MicroLoop	-2.91	2.56
SpiroScout	-24.56	-0.76
SpiroBank	-2.64	6.36
SpiroStar	2.12	1.14

Conclusion: The overall quality of most spirometers is acceptable for screening lung diseases but the standard curves of the ATS are not sufficient to certify the accuracy of the office spirometers tested with severe COPD. New tests should be implemented using flow-volume curves obtained in real patients.