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Validation of a time-frequency wheeze detector in cystic fibrosis: A pilot study

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Abstract

Background: Computerised lung-sound analysis can be used to identify and quantify wheezes which are associated with pulmonary diseases. However, this type of analysis requires further validation before it can be implemented routinely in the clinical practice across different respiratory pathologies.

Objective: This pilot study aimed to validate a time-frequency wheeze detector (TF-WD) in the cystic fibrosis disease.

Methods: Recordings were made in a clinical setting from a stable cystic fibrosis adult outpatient with a digital stethoscope following the CORSA guidelines. Several TF-WD algorithms were tested and the best performance was obtained with the Taplidou et al. (2007) algorithm, which was validated in four sound files. The number, duration and type of wheezes were blindly analysed independently by three experienced respiratory physiotherapists. Their evaluation was then compared with the automatic method. The statistics accuracy of the wheezes detection was quantified through sensitivity, specificity and performance measures using MatlabR2007b. True positives/negatives and false positives/negatives were counted by comparing each point of the sound file.

Results: Inter-rater agreement between the physiotherapists was 96.9%. The sensitivity, specificity and performance of the automated method were 77.2%, 98.4% and 87.1%, respectively.

Conclusion: The automated method tested shows sufficient reliability to continue the study and implement a future clinical validation with a larger sample. Wheezes detection through computerised analysis can provide an

objective measure to assess and monitor cystic fibrosis patients, however further research is needed to validate the most robust algorithm.

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