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**Title:** Flow-volume parameters in COPD related to extended measurements of lung volume, diffusion and resistance

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**Body:** Classification of COPD into different GOLD stages is based on forced expiratory volume in 1s (FEV1) and forced vital capacity (FVC). However, these parameters are of limited value in relation to functional ability and quality of life. The aim of the study was to relate spirometry values to more advanced measures of lung function using in COPD patients compared to healthy smokers. The lung function of 65 COPD patients and 34 healthy smokers were investigated using flow-volume spirometry, body plethysmography, single breath helium dilution with CO-diffusion and impulse oscillometry. All lung function parameters, measured by body plethysmography, single breath helium dilution with CO-diffusion and impulse oscillometry, were increasingly affected through increasing GOLD stage, but did not correlate to FEV1 within any GOLD stage. In contrast, they correlated fairly well with FVC%p, FEV1/FVC and inspiratory capacity. Residual volume (RV) measured by body plethysmography increased through GOLD stages, while RV measured by helium dilution decreased. The difference between these RV provided valuable additional information, and correlated to most other lung function parameters measured by body plethysmography and single breath helium dilution with CO-diffusion. Airway resistance measured with body plethysmography and impulse oscillometry correlated within COPD stages. Different lung function parameters are of importance in COPD, and a thorough patient characterization is important for understanding the disease.