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**Title:** Multiple dimensional analysis of arterial blood gas and pulmonary function in patients with COPD

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**Body:** Introduction: Blood gas analysis is very important and often used to evaluate the hypoxemia and hypercapnea in chronic obstructive pulmonary disease (COPD) patients, but little attention has been given to the relationship among blood gas analysis, pulmonary function, body composition and symptoms. Objectives: To identify the predictor of dyspnea, hypoxemia, hypercapnea in COPD patients, we investigated COPD patients cross-sectionally on multidimensional aspects. Methods: A total of 369 Japanese COPD patients (334 male), age 71 (64-76), with a smoking history of at least 10 pack-years underwent comprehensive measurements, including medical examination, arterial blood gas analysis, pulmonary function tests, and modified Medical Research Council (MMRC) dyspnea scale. Patients with long term oxygen therapy or non-invasive ventilation were excluded. Possible predictors of MMRC, $PaO_2$ and $PaCO_2$ were analyzed with both univariate and multiple regression methods. Results: All of $PaO_2$, $PaCO_2$, and MMRC associated significantly with age, various pulmonary function, and / or BMI. In addition, multiple regression analysis with stepwise manner revealed that $PaO_2$ was able to be explained by $\%FEV_1$, %Kco, BMI and age ($R^2$=0.20, p<0.0001). PaCO2 could be explained by %IC, %Kco,%RV/TLC and age ($R^2$=0.15, p<0.0001). Then MMRC could be explained by $\%FEV_1$, %Kco, %VC, %IC, age and $PaO_2$ ($R^2$)=0.14, p<0.0001). Conclusion: We showed that $\%FEV_1$, %Kco and age were important to dyspnea and the estimation of blood gas analysis in COPD patients.