Table 3
Cut-point evaluation of COPD-PS to discriminate between AO and non-AO states.

Cut-point score	Odds ratio	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)	Percent (%) correctly classified	Area under ROC curve
≥1	4.71	98.0	8.7	6.9	98.4	14.4	0.53
2	8.05	96.7	21.5	7.9	99.0	26.4	0.59
3	4.29	74.3	59.7	11.3	97.1	60.6	0.67
4	5.49	67.1	72.9	14.6	97.0	72.5	0.70
5	2.05	34.9	79.3	10.5	94.6	76.4	0.57
6	0.90	13.8	84.8	5.9	93.4	80.2	0.49
7	0.36	5.3	86.5	2.6	93.0	81.3	0.46

suggesting that the COPD-PS is the independent risk factor to detect fixed AO and that subjects with a 4 or greater on the COPD-PS are at increased risk for AO.

A cut-point of 5 was recommended in a previous study using the English version.[9] The reason for this discrepancy is not clear, but backgrounds of the study subjects may affect cut-points. In addition to the difference between Asian and Western populations, the present study is population-based while patients from general practice and specialist sites were involved in the previous report.[9] In this study, a cut-point of 5 resulted in a lower sensitivity of 34.9% and a smaller area under the ROC curve of 0.57 compared with a cut-point of 4.

Although the use of spirometry at all levels of health care might improve diagnosis and detect COPD earlier, widespread spirometric testing for early detection without pre-selection of at-risk patients may result in wasting healthcare resources. Without bronchodilator, 11.2% of adults aged between 40 and 79 years showed an initial $FEV_1/FVC < 0.7$, and this prevalence is in line with the previous Japanese COPD epidemiology study conducted in 2001.[5] Finally, 6.5% had confirmed fixed AO after bronchodilator in this study, and the COPD-PS and its cut-point of 4 resulted in a positive predictive value 14.6%. The prevalence of fixed AO was lower than expected. Aging increases the prevalence of COPD. The chosen target group in our study was aged 40–79 years, and this age limit may affect the prevalence of AO. We also excluded the subjects with physician-diagnosed asthma, which contains current- and former-smokers, and thus may preclude subjects with overlap syndrome of COPD and bronchial asthma.

A PPV of 14.6% at COPD-PS cut-point 4 is lower than the previous report of a hospital/clinic-based study.[16] However, PPV depends on the prevalence, and PPV becomes lower when the prevalence of disease is low.[21] The hospital/clinic-based prevalence will vary by age and smoking prevalence. In contrast, we have evaluated the diagnostic cut-points of the COPD-PS in the general Japanese population. The prevalence of confirmed fixed AO was 38.4% in the previous report,[16] and that was 6.5% in the present study. Despite this limitation, NPV was sufficiently high in this study, suggesting that COPD-PS with cut-point 4 is useful for a screening tool.

The COPD-PS resulted in very few missing data; however, exhibited large floor effects on 3 of the items. Floor and ceiling effects need to be interpreted in relation to the study being investigated. As this study screened a general population rather than patients attending a respiratory clinic, it was expected that many subjects would respond in the lowest category.

This study has limitations that should be acknowledged. Subjects over the age of 60 and have smoked more than 100 cigarettes could reach 4 point without any respiratory symptoms. This could lead to an increase in false positives. As the objective of the COPD-PS is to be a diagnostic triage for spirometry testing, it is important to capture as many true positive COPD patients as possible, while allowing false positives to a certain degree. A considerable percentage of the nonsmoker population may exhibit COPD,[22–24] and future studies evaluating a secondhand smoke item and indoor pollution at home may be of interest. In addition, AO was assessed based solely on the spirometry data, and further evaluations would be needed for the diagnosis of COPD.

In conclusion, the COPD-PS assesses the risk of COPD, and the validity findings show promise in its application for a first-stage screener in the general population, in addition to clinical practice and disease management. The COPD diagnostic questionnaire is easy to score and quick to disseminate. The Japanese version of the COPD-PS would be an adequate measure for large scale screening of possible AO.

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The Hisayama Pulmonary Physiology Study Group

Satoru Fukuyama, Koichiro Matsumoto, Takako Nakano, Atsushi Moriwaki, Yuko Matsunaga, Keiko Kan-o, Naotaka Noda, Yukari Tajiri-Asai, Hiroko Hirai, Yumiko Ishii, Saaka Hamano, Ken Tonai, Nanae Seki, Ayako Hashizume, Makiko Kogo, Misae Awane, Yoichi Nakanishi (Research Institute for Diseases of the Chest, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan); Go Tsukuya, Takuya Samukawa, Hiromasa Inoue (Department of Pulmonary Medicine, Graduate School of Medical and Dental Sciences, Kagoshima University, Kagoshima, Japan); Takako Inoue (NPO START-Kagoshima, Kagoshima, Japan); Makoto Yoshida, Masashi Komori, Yasuko Kaneko (Section of Pulmonary Medicine, Fukuoka National Hospital, Fukuoka, Japan); Shohei Takata, Mikiko Matsuo-Matsumura (Division of Respiratory Medicine, National Fukuoka-Higashi Medical Center, Fukuoka, Japan); Hiroshi Koto (Department of Respiratory Medicine, Kyushu Central Hospital, Fukuoka, Japan).

Conflict of interest

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「COPDに関する啓発と早期発見のための方策に関する研究」
研究代表者　井上 博雅
鹿児島県鹿児島市桜ヶ丘八町目35番地1
鹿児島大学大学院医歯学総合研究科
呼吸器内科学分野　教授
電話 (099) 275-6481

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