

Table 3 2 × 2 tables of the two-question instrument using a cutoff point of 1 or 2

Two-question instrument score	CESD-10 score		Total
	≥10	<10	
Total	15	37	52
Cutoff point of 1			
1 or 2	11	10	21
0	4	27	31
Cutoff point of 2			
2	9	4	13
0 or 1	6	33	39

Data are presented as number

in Japanese patients with COPD, and whether the scores of the two-question instrument were related to HRQOL as determined by the SF-8. With the cutoff point of the two-question instrument set at 1, sensitivity in detecting depressive symptoms as defined by the CESD-10 score was 73 %, negative likelihood ratio was 0.37, and area under the ROC curve was 0.73. With the cutoff point set at 2, sensitivity decreased to 60 %, whereas negative likelihood ratio increased to 0.45 and area under the ROC curve rose to 0.75. We assume these test characteristics as reference, because CESD-10 is the assessment tool of depression. In this study, these test characteristics of the two-question instrument in the detection of depressive symptoms were calculated to compare the past articles for other patient populations [16, 23]. The prevalence of depressive symptoms diagnosed by CESD-10 of 28.9 % is consistent with other studies in which almost 20 % were judged to be depressed using the same scale [24, 25]. Interestingly, none of our present patients had been clinically diagnosed with depression. In the present study, we did not undertake definite diagnosis of depression by psychiatric interview using the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* [26]. But we used the CESD-10 to define the depressive symptoms. It is uncertain whether the diagnosis of depression using the CESD-10 is accurate or not. However, it was suggested that depressive symptoms assessed by CESD-10

were associated several risk factor of depression, there was a similar trend in the assessment of the two-question instrument. We believe that the concise instrument helps physicians to assess depressive symptoms in patients with COPD. Therefore, the result of this study, which suggested that the two-question instrument would be useful for detecting depressive symptoms, would be meaningful for initial assessment of depression in busy outpatient settings.

Another significant outcome of this study is that the two-question instrument was associated with HRQOL. When the study population was divided into two groups by a cutoff value of the two-question instrument of 1 point, SF-8 score tended to be lower by 1 point or more in the higher two-question score group. Furthermore, among subscales of the SF-8, not only the mental but also the physical component declined. Moreover, when the two-question instrument score was 2, all subscales except bodily pain of the SF-8 statistically declined. These results suggest that the score of the two-question instrument was related not only mental health but also physical burden. In fact, these associations of depressive symptoms with physical burden have been reported in previous studies [3–5, 8, 13, 14]. HRQOL is an important outcome in patients with COPD [27, 28]. Depressive symptoms are a treatable and clinically important comorbidity. In a previous small, randomized, controlled study, treatment of depressive symptom by tricyclic antidepressants was associated with an improvement in depression and HRQOL [29]. These findings show that HRQOL could be influenced substantially by depressive symptoms. Because the two-question instrument was associated with HRQOL in current study, it was suggested that the two-question instrument may be useful as assessment tool of depressive symptoms in patients with COPD.

Several limitations of our study warrant mention. First, sample size was small, leading to the relatively poor statistical power. Second, the patients of this study were biased toward older and smoking status was also high. Smoking status and age are important factors for depressive symptoms [30, 31]. Furthermore, we were unable to control for other confounding variables, such as duration of

Table 4 Test characteristics of the two-instrument using a cutoff point of 1 or 2

	Cutoff point	
	1	2
Sensitivity, %	73.3 (51–95.7)	60 (35.2–84.8)
Specificity, %	73 (58.7–87.3)	89.2 (79.2–99.2)
PPV, %	52.4 (31–73.7)	69.2 (44.1–94.3)
NPV, %	87.1 (75.3–98.9)	84.6 (73.3–95.9)
LR+	2.71 (2.24–3.28)	5.55 (3.29–9.37)
LR–	0.37 (0.25–0.53)	0.45 (0.37–0.55)
Area under ROC curve	0.73 (0.59–0.87)	0.75 (0.61–0.88)

95 % Confidence intervals are shown in parentheses
 PPV positive predictive value, NPV negative predictive value,
 LR+ positive likelihood ratio, LR– negative likelihood ratio

Table 5 Association of depressive symptoms with SF-8 score using the norm based scoring method

SF-8	Total (<i>N</i> = 52)	Two-question instrument score		<i>p</i> value
		0 (<i>N</i> = 31)	≥1 (<i>N</i> = 21)	
General health	45.4 ± 7.9	48.8 ± 6.6	40.4 ± 7.2	<0.01
Physical functioning	41.6 ± 10.1	44.8 ± 6.6	37.0 ± 12.5	<0.01
Role physical	41.3 ± 12.3	44.8 ± 10.6	35.8 ± 13	<0.01
Bodily pain	52.2 ± 10	53.6 ± 9.4	50.2 ± 10.7	0.24
Vitality	47.3 ± 8.2	50.2 ± 6.7	43.0 ± 8.5	<0.01
Social functioning	45.4 ± 10.7	48.3 ± 10.3	41.3 ± 10	<0.05
Mental health	50.1 ± 7.9	54.2 ± 5.2	44 ± 7.2	<0.01
Role emotional	46.2 ± 10.7	49.4 ± 8.9	41.3 ± 11.6	<0.01
Physical component summary	43.1 ± 11	46.1 ± 9.5	38.6 ± 12	<0.05
Mental component summary	50.6 ± 9	55 ± 6.2	43.8 ± 8.6	<0.01

Data are means ± standard deviations

COPD, previous exacerbation and admission, academic background, socioeconomic status, or caregiver or family support. Third, the results of this study should be replicated before the cutoff point of the two-instrument can be recommended for general use in patients with COPD. In the present sample, a cutoff point of 1 was more appropriate than 2 for screening purposes. Nevertheless, performance of the two-question instrument in this study was no better than those seen in detecting depressive symptoms in a primary care setting [16] or in detecting postpartum depressive symptoms at 1-month well-child visits [23]. In contrast to these previous reports, sensitivity in the present

study was low. These differences might be related to differences in sex ratio. Laurin et al. [32] reported that women with COPD experienced greater psychological distress than men. In the present study sample with low psychological distress, almost all patients were men, and depressive symptoms might not have been detected accurately by the concise two-question instrument. Fourth, we did not undertake definite diagnosis of depression by psychiatric interview using the DSM-IV, which is one of limitations of the present study design. Future research should include a large observational study using the DSM-IV as reference.

These limitations notwithstanding, the results of this study are valuable because of the importance of physician assessment of COPD patients for depressive symptoms using a concise questionnaire. In conclusion, this study shows that the concise two-question instrument is useful as assessment of depressive symptom in patients with COPD in busy outpatient setting.

Acknowledgments We thank Dr. Toshihiko Ihi of National Hospital Organization Miyazaki Higashi Hospital, Dr. Kiyoshi Matsumoto of Shimin-no-mori Hospital, Dr. Takeaki Hiratsuka of Miyazaki Prefectural Nichinan Hospital, and Dr. Tomohiro Shirahama of Senwakai Chiyoda Hospital for data collection. This work was supported by the Ministry of Health, Labor and Welfare, Japan.

Conflict of interest The authors declare that they have no conflict of interest.

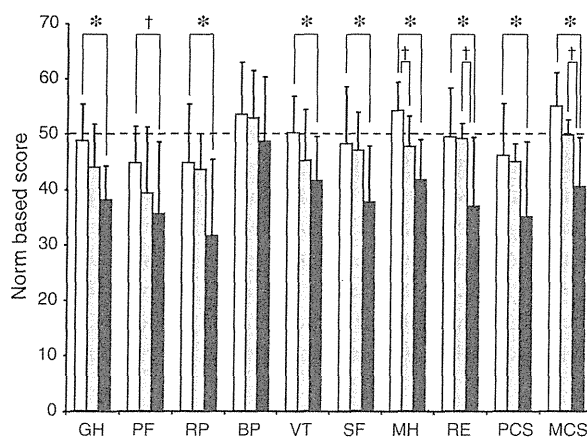


Fig. 1 Comparison of the norm based score of all subscales of the SF-8, physical component summary score and mental health component summary score by scores of the two-question instrument (open bar = 0 point; shaded bar = 1 point; black bar = 2 points). Bars indicate mean score with standard deviation. **P* < 0.01, †*P* < 0.05 (using analysis of variance with Sheffe's procedure). GH General health, PF Physical functioning, RP Role limitation due to physical problems, BP Bodily pain, VT Vitality, SF Social functioning, MH Mental health, RE Role limitation due to emotional problems, PCS Physical component summary score, MCS Mental health component summary score

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