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# An Efficient Way to Detect Poststroke Depression by Subsequent Administration of a 9-Item and a 2-Item Patient Health Questionnaire

Janneke M. de Man-van Ginkel, RN, MSc; Thóra Hafsteinsdóttir, RN, PhD; Eline Lindeman, MD, PhD; Huibert Burger, MD, PhD; Diederick Grobbee, MD, PhD; Marieke Schuurmans, RN, PhD

**Background and Purpose**—The early detection of poststroke depression is essential for optimizing recovery after stroke. A prospective study was conducted to investigate the diagnostic value of the 9-item and the 2-item Patient Health Questionnaire (PHQ-9, PHQ-2).

**Methods**—One hundred seventy-one consecutive patients with stroke who could communicate adequately were included. In the 6th to 8th weeks after stroke, depression was measured using the PHQ-9 and PHQ-2 and diagnosed using the Composite International Diagnostic Interview.

**Results**—Of the participating patients, 20 (12.2%) were depressed. The PHQ-9 performed best at a score  $\geq 10$ , a sensitivity of 0.80 (95% CI, 0.62–0.98), and a specificity of 0.78 (95% CI, 0.72–0.85) and the PHQ-2 at a score  $\geq 2$  with a sensitivity of 0.75 (95% CI, 0.56–0.94) and a specificity of 0.76 (95% CI, 0.69–0.83). Administering the PHQ-9 only to patients who scored  $\geq 2$  on the PHQ-2 improved the identification of depression (sensitivity, 0.87; 95% CI, 0.69–1.04).

**Conclusions**—The diagnostic value is acceptable to good for PHQ-9 scores  $\geq 10$  and PHQ-2 scores  $\geq 2$ . Conducting a PHQ-9 only in patients with a PHQ-2 score  $\geq 2$  generates the best results. (*Stroke*. 2012;43:854-856.)

**Key Words:** depression ■ diagnostic value ■ stroke recovery ■ validity

Poststroke depression is a frequent complication that worsens rehabilitation outcomes and quality of life.<sup>1,2</sup> Despite this, poststroke depression is underdiagnosed and undertreated.<sup>3</sup> Increasing evidence shows that treatment leads to a decrease in depression and an improved functional status.<sup>4</sup> To enable treatment, early detection of poststroke depression is essential.

For detecting poststroke depression, the 9-item Patient Health Questionnaire (PHQ-9) and the 2-item Patient Health Questionnaire (PHQ-2) are promising instruments. These instruments are acceptable to patients, brief, and easy to use and administration do not require intensive training.<sup>5,6</sup> In a diagnostic meta-analysis, the performance of the PHQ-9 in different types of patients was good.<sup>7</sup> Although 1 study investigated the performance of the PHQ-9 and the PHQ-2 in a selected stroke population with depression symptoms,<sup>8</sup> no study has been conducted in the general stroke population. In the present study, we determined the diagnostic value of the PHQ-9 and PHQ-2 alone or in combination in patients with acute stroke who are able to communicate adequately.

## Materials and Methods

### Participants

A prospective study was conducted in 3 hospitals. Ethical approval was obtained from the Medical Ethical Committee of the University Medical

Centre Utrecht and the other participating hospitals. In 2010, 460 consecutive patients, admitted to the hospital with a clinical diagnosis of stroke, were approached for participation. Patients (n=171 [37.2%]) were included if they did not present with serious cognitive disorders, defined as a Mini-Mental State Examination score  $\geq 18$ <sup>9</sup> or with communicative disorders based on the Frenchay Aphasia Screening Test with scores of  $\geq 17$  for patients <60 years of age,  $\geq 16$  in patients  $\geq 61$  and  $\leq 70$  years of age, and  $\geq 15$  in patients  $\geq 71$  years of age.<sup>10</sup> After inclusion, 7 patients were lost before follow-up depression data were collected. Therefore, the data were complete for 164 patients (Figure 1).

### Instruments

Depression was measured using the PHQ-9 and the PHQ-2 (index tests).<sup>5,6</sup> The PHQ-9 includes all 9 symptoms of depression, whereas the PHQ-2 includes anhedonia and depressed mood only. Items are rated on a 4-point Likert scale with a total score of 0 to 27 for the PHQ-9 and a total score of 0 to 6 for the PHQ-2.

As a reference test, a diagnosis of depression was made using the Composite International Diagnostic Interview, a structured diagnostic interview for Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition and International Classification of Diseases, 10th Revision psychiatric disorders, showing good diagnostic concordance and reliability.<sup>11</sup> The researcher was trained in administering the Composite International Diagnostic Interview-auto 2.1 version.

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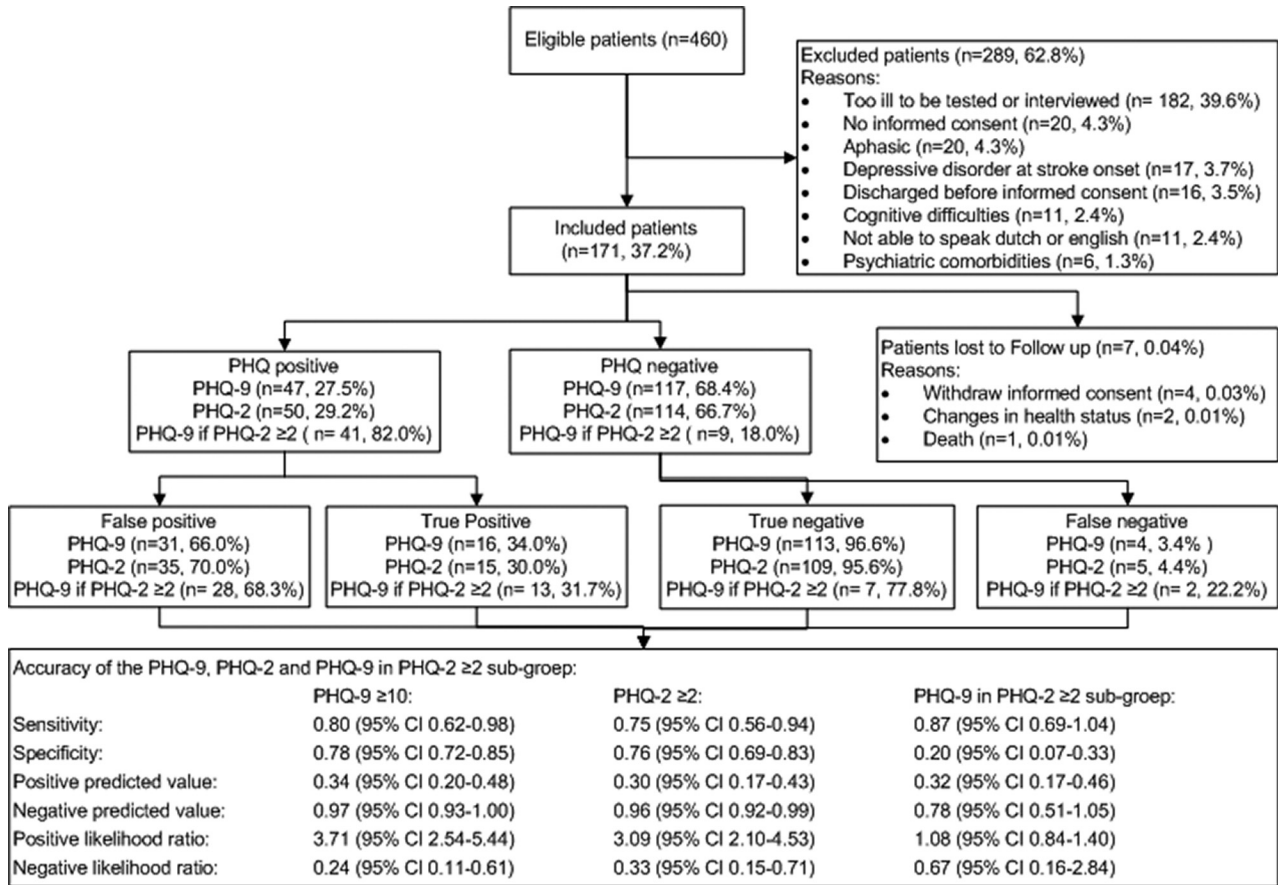


Figure 1. Flow diagram. PHQ indicates Patient Health Questionnaire; CI, confidence interval.

**Procedure**

All patients with stroke admitted to the participating wards were registered. Before discharge (T=0), a research nurse checked whether the patient fitted the inclusion criteria. If that was the case, the nurse asked informed consent and collected the baseline data. After discharge, the research nurse and the researcher visited the patient at 6 to 8 weeks after stroke onset (T=1). The nurse administered the PHQ-9 followed by the researcher who administered the Composite International Diagnostic Interview. To be blinded to the PHQ-9 scores, the researcher left the room at the time the nurse completed the PHQ-9.

**Analysis**

Appropriate parameters based on a 2x2 table were calculated to determine the diagnostic accuracy of the PHQ for different cutoff values. As a summary measure of discriminatory power, independent of cutoff value, the area under the curve was determined.

**Results**

Of 164 patients, 20 (12.2%; 95% CI, 7.2–17.2) were diagnosed with depression (Table). The discriminatory power of the PHQ-9 and PHQ-2 for major depression was good with an area under the curve of 0.87 (95% CI, 0.80–0.93) and 0.82 (95% CI, 0.73–0.91), respectively (Figure 2). The accuracy of the PHQ-9 was best at a cutoff score of ≥10 with a sensitivity of 0.80 (95% CI, 0.62–0.98) and specificity of 0.78 (95% CI, 0.72–0.85). The PHQ-2 showed the best accuracy at a cutoff score of ≥2 with a sensitivity of 0.75 (95% CI, 0.56–0.94) and specificity of 0.76 (95% CI, 0.69–0.83).

The administration of the PHQ-9 only in patients who scored ≥2 on the PHQ-2 improved the identification of

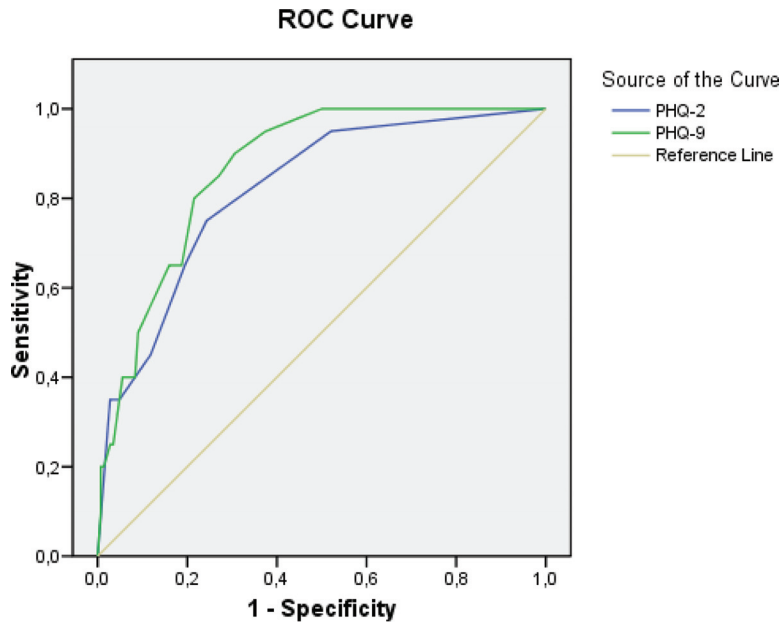
depressed patients, as shown by the sensitivity (0.87; 95% CI, 0.69–1.04). The specificity was 0.20 (95% CI, 0.07–0.33). The other parameters at the different cutoff values are presented in Figure 1.

**Table. Study Population**

Patients	n=164
Gender, no. (%)	
Male	97 (59.1)
Age, y	
Mean (SD) (minimum–maximum)	70.6 (13.99) (20–97)
Type of stroke, no. (%)	
Intracerebral hemorrhage	22 (13.4)
Infarction	142 (86.6)
Localization, no. (%)	
Left	69 (42.1)
Right	67 (40.9)
Others	28 (17.1)
Barthel Index	
Mean (SD) (minimum–maximum)	13.04 (6.2) (0–20)
MMSE score ≥18, no. (%)	164 (100)
FAST score ≥15, 16, or 17, no. (%)*	162 (98.8)
Diagnosis of Depression (CIDI), no. %	20 (12.2)
Time since stroke onset, wk	
Mean (SD) (minimum–maximum)	6.7 (0.9) (5–9)

MMSE indicates Mini-Mental State Examination; FAST, Frenchay Aphasia Screening Test; CIDI, Composite International Diagnostic Interview; SD, standard deviation.

\*Cutoff value: age in y ≤60: ≥17, ≥61 and ≤70: ≥16, ≥71: ≥15.



Diagonal segments are produced by ties.

**Figure 2.** Receiver operating characteristics of PHQ-9 and PHQ-2 vs Composite International Diagnostic Interview scores. PHQ indicates Patient Health Questionnaire; ROC, receiver operating characteristic.

## Discussion

The findings of this study show that the diagnostic value for PHQ-9 scores  $\geq 10$  and for PHQ-2 scores  $\geq 2$  was acceptable to good. The highest sensitivity was found for the PHQ-9 in patients who had a PHQ-2  $\geq 2$ .

Only patients who were able to communicate adequately were selected because the assessment of depression using the PHQ-9 and the Composite International Diagnostic Interview highly depends on verbal and cognitive competence. This limits the generalizability of our results to this subpopulation.

The diagnostic performance of the PHQ-9 was slightly lower than the performance found by Williams and colleagues.<sup>8</sup> In our study, however, patients were not selected on symptoms of depression, which is essential for assessing diagnostic accuracy of a test. Moreover, the diagnosis of depression was made blind to PHQ scores assessment. Selected patients and unblinded diagnoses may have produced too optimistic results in the study of Williams and colleagues.<sup>12</sup> Compared with the results of a diagnostic meta-analysis of the PHQ-9 within different patient groups, some differences were found in the specificity (0.79 versus 0.92 in the meta-analysis), but the sensitivity was comparable.<sup>7</sup> The lowest specificities were found in cardiology, brain injury, and stroke populations. Interestingly, in those studies, it was unclear whether the diagnoses were performed blinded for PHQ-9, possibly leading to overly optimistic results.<sup>12</sup>

Different instruments are available for the screening of depression in patients with stroke.<sup>1</sup> Although their performance in the stroke population is adequate, the PHQ-9 and PHQ-2 are preferable over other instruments, because they are brief and easy to use and are acceptable to patients.<sup>5,6</sup> To save time and limit the burden of patients, it is recommended to conduct the PHQ-2 screening in all patients and only the PHQ-9 in case of a positive outcome of the PHQ-2.

In summary, the results of this prospective study among unselected patients with stroke suggest that the PHQ-9 and PHQ-2 are preferable instruments for the early detection of poststroke depression in the daily care of patients with stroke.

## Disclosures

None.

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