ORIGINAL ARTICLE

Validity of the Patient Health Questionnaire-9 in Assessing Major Depressive Disorder During Inpatient Spinal Cord Injury Rehabilitation

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ABSTRACT. Bombardier CH, Kalpakjian CZ, Graves DE, Dyer JR, Tate DG, Fann JR. Validity of the Patient Health Questionnaire-9 in assessing major depressive disorder during inpatient spinal cord injury rehabilitation. Arch Phys Med Rehabil 2012;93:1838-45.

Objective: To investigate the validity of the Patient Health Questionnaire-9 (PHQ-9) depression screening measure in people undergoing acute inpatient rehabilitation for spinal cord injury (SCI).

Design: We performed a blinded comparison of the PHQ-9 administered by research staff with the major depression module of the Structured Clinical Interview for the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (SCID) conducted by a mental health professional.

Setting: Inpatient rehabilitation units.

Participants: Participants (N=142) were patients undergoing acute rehabilitation for traumatic SCI who were at least 18 years of age, English speakers, and without severe cognitive, motor speech, or psychotic disorders. We obtained the SCID on 173 (84%) of 204 eligible patients. The final sample of 142 patients (69%) consisted of those who underwent both assessments within 7 days of each other.

Interventions: Not applicable.

Main Outcome Measures: PHQ-9 and SCID major depression module.

Results: Participants were on average 42.2 years of age, 78.2% men, and 81.7% white, and 66.9% had cervical injuries. The optimal PHQ-9 cutoff (≥11) resulted in 35 positive screens (24.6%). Key indices of criterion validity were as follows: sensitivity, 1.00 (95% confidence interval [CI], .73–1.00); specificity, .84 (95% CI, .76–.89); Youden Index, .84; positive predictive value, .40 (95% CI, .24–.58); and negative predictive value, 1.00 (95% CI, .96–1.00). The area under the receiver operator curve was .92, and κ was .50. Total PHQ-9 scores were inversely correlated with subjective health state and quality of life since SCI.

Conclusions: The PHQ-9 meets criteria for good diagnostic accuracy compared with a structured diagnostic assessment for major depressive disorder even in the context of inpatient rehabilitation for acute traumatic SCI.

Key Words: Depression; Diagnosis; Rehabilitation; Screening; Spinal cord injuries.

A LARGE BODY OF RESEARCH indicates that major depressive disorder (MDD)[1] is a prevalent and disabling secondary condition associated with spinal cord injury (SCI).[2-5] Many measures have been used to identify clinically significant depression in people with SCI.[6] However, only a few have been compared with a standardized diagnostic interview for MDD based on *Diagnostic and Statistical Manual of Mental Disorders* criteria,[6] and none have been shown to meet the Youden Index threshold (sensitivity + specificity – 1 ≥.80) for an adequate diagnostic test.[7] With the use of a cutoff of 18 or more, the sensitivity and specificity of the Beck Depression Inventory among inpatient and outpatient veterans with chronic SCI were 83.3% and 90.8%, respectively.[8] Also, in a sample of 30 inpatients with acute SCI, the Zung Self-Rating Scale (cutoff ≥55) had a sensitivity of 86% and a specificity of 67% compared with a clinical diagnosis based on the *Diagnostic and Statistical Manual of Mental Disorders Revised Third Edition*.[9] Kuptniratsaikul et al[10] reported that the Centers for Epidemiologic Studies–Depression Scale (at ≥19) had a sensitivity of 80% and a specificity of 69.8% compared with a *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV) diagnosis of MDD among people with SCI in Thailand. In addition, none have been tested against a diagnostic interview in a sample restricted to newly injured persons undergoing acute rehabilitation for SCI.

It is critical to promote recognition and treatment of MDD after SCI, especially during inpatient rehabilitation. MDD often

List of Abbreviations

DSM-IV	*Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*
MDD	major depressive disorder
PHQ-2	Patient Health Questionnaire-2
PHQ-9	Patient Health Questionnaire-9
SCI	spinal cord injury
SCID	Structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*
SF-1	Medical Outcomes Study Short Form-1
SF-36	Medical Outcomes Study 36-Item Short-Form Health Survey

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Supported by the Department of Education, National Institute on Disability and Rehabilitation Research, Spinal Cord Injury Model Systems: University of Washington (grant no. H133N060033), Baylor College of Medicine (grant no. H133N060003), and University of Michigan (grant no. H133N060032).

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit on the authors or on any organization with which the authors are associated.

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In-press corrected proof published online on Jun 9, 2012, at www.archives-pmr.org.

0003-9993/12/9310-00007$36.00/0
http://dx.doi.org/10.1016/j.apmr.2012.04.019

emerges soon after SCI, during the acute rehabilitation phase.[9,11-13] During this period, the nonspecific distress of recent SCI, symptoms of normal grief, the direct impact of injury on neurovegetative symptoms, and the disruptive effects of the hospital environment may make identifying MDD more challenging than at any other time.[14] Nevertheless, most medical treatment for depression is initiated during this early, diagnostically challenging period,[3] arguably often without the aid of a thorough diagnostic assessment. Without aggressive treatment, those who are depressed during inpatient rehabilitation are likely to remain depressed up to 2 years after injury.[15] Moreover, symptoms consistent with MDD observed during inpatient rehabilitation are predictors of completed suicide after SCI.[16] Symptoms consistent with MDD are also associated with the development of secondary complications after SCI such as pressure ulcers[17] and poor psychosocial outcomes, including a low rate of return to work.[18] Probable MDD is one of the few modifiable risk factors that is predictive of early mortality in people with SCI.[19] After inpatient rehabilitation, the evidence suggests that MDD is often chronic,[20] undertreated, and probably underrecognized.[21] Therefore, a brief, valid means of identifying those with MDD during inpatient rehabilitation could provide more rational guidance for treatment decisions while conserving resources needed to perform diagnostic assessments.

We selected the Patient Health Questionnaire-9 (PHQ-9)[22] depression scale as our screening measure for several reasons. The PHQ-9 closely parallels the diagnostic symptom criteria that define DSM-IV MDD. The format and temporal framework of the items also correspond to the DSM-IV criteria and will facilitate the follow-up review of symptoms and diagnostic process. At only 9 items, the PHQ-9 is substantially shorter than most depression screening measures. Unlike most other measures of depression, the PHQ-9 was developed, tested, and refined for use with medical patients. This is important because the criterion validity was established in a population with high rates of other physical symptoms and associated nonspecific psychological distress. This instrument has also demonstrated acceptability among nonpsychiatric patients and among busy primary care providers, as well as sensitivity to change.[23,24]

The primary aim of this study was to test the criterion validity of the PHQ-9 by comparing it with an independent diagnosis of MDD based on the Structured Clinical Interview for DSM-IV (SCID)[25] among persons with SCI who were undergoing acute rehabilitation for SCI. We predicted that the PHQ-9 would demonstrate better criterion validity than other depression screening measures that have been tested among people with SCI. A secondary goal was to examine the construct validity of the PHQ-9 during acute rehabilitation. We measured the relationship between the PHQ-9 total score and variables that are known to be correlated with depression symptom severity such as general health state,[2] quality of life,[26] and daily role functioning.[5] We predicted that higher PHQ-9 scores would be associated with poorer general health, quality of life, and daily role functioning.

METHODS

Participants

Participants were recruited between February 2008 and December 2010 from the inpatient rehabilitation units at the University of Washington Medical Center, Seattle, Washington; Harborview Medical Center, Seattle, Washington; the Texas Institute for Rehabilitation and Research, Houston, Texas; and the University of Michigan Health System, Ann Arbor, Michigan. Patients were invited to participate if they met inclusion criteria for the SCI Model Systems; that is, had sustained a traumatic SCI, were 18 years or older, were fluent English speakers, and were admitted for their initial inpatient rehabilitation. Persons were not recruited if they were pending incarceration, did not complete inpatient rehabilitation, or had severe motor speech, cognitive, or psychotic disorders precluding reliable assessment. Subjects were excluded if study staff were unable to complete the PHQ-9 and the SCID depression module within 7 days of each other (n=37). Study procedures were approved by the institutional review boards at each site and followed the Health Insurance Portability and Accountability Act guidelines.

Procedures

Research study assistants monitored all inpatient SCI rehabilitation admissions and approached patients in person regarding potential participation. Those who consented completed self-report questionnaires in an interview format with the research assistant in order to ensure consistency of administration between those with and without upper extremity impairment. The criterion measure, the SCID depression module, was conducted by a mental health professional with all participants regardless of PHQ-9 score. The mental health professionals who performed the SCID were kept unaware of PHQ-9 screening results.

Measures

Depression screening. The PHQ-9 is a self-report measure that asks subjects how often they have been bothered by the following problems in the past 2 weeks: (1) little pleasure or interest in doing things; (2) feeling down, depressed, or hopeless; (3) sleeping too little or too much; (4) feeling tired or having little energy; (5) poor appetite or overeating; (6) feelings of worthlessness or guilt; (7) concentration problems; (8) psychomotor retardation or agitation; and (9) thoughts of suicide. Subjects were asked to rate how often each symptom occurred: 0 (not at all), 1 (several days), 2 (more than half the days), or 3 (nearly every day). The PHQ-9 has excellent internal and test-retest reliability as well as criterion and construct validity in medical samples.[2,22] It also has been validated for administration over the telephone.[23,24]

We examined several scoring methods by which the PHQ-9 can be used as an indicator of major depression. First and most commonly, the PHQ-9 can be summarized by the sum of the 9-item scores, ranging from 0 to 27. Kroenke et al[22] reported an optimal cut point of 10 or more to identify MDD. Alternatively, the PHQ-9 can be scored in a manner parallel to the DSM-IV diagnosis of MDD. With the use of the DSM-IV approach to scoring the PHQ-9, a positive screen is one where at least 5 symptoms are endorsed "more than half the days" (suicidal ideation is considered endorsed at the level of "several days"), with at least 1 being a cardinal symptom, either (1) anhedonia or (2) depressed mood. We also examined the validity of lowering the symptom frequency threshold in the above scheme to "several days." Finally, some investigators have suggested using the sum of the first 2 items, anhedonia and depressed mood, as a screen for MDD (referred to as the Patient Health Questionnaire-2 [PHQ-2]).[27] Therefore, we examined the screening accuracy of this measure as well.

MDD diagnosis. The SCID MDD module was used as the criterion standard to diagnose major depression.[25] With structured questions and a decision-tree approach, it guides clinicians through a diagnostic interview that determines the presence or absence of a DSM-IV diagnosis of MDD during the 2 weeks before the assessment. We chose the SCID because it is