Published in final edited form as:

J Psychosom Res. 2012 March ; 72(3): 175–179. doi:10.1016/j.jpsychores.2011.11.015.

Comparison of two depression measures for predicting stroke outcomes

Lawson Wulsin^{a,*}, Kathleen Alwell^b, Charles J. Moomaw^b, Christopher J. Lindsell^c, Dawn O. Kleindorfer^b, Daniel Woo^b, Matthew L. Flaherty^b, Pooja Khatri^b, Opeolu Adeoye^{c,d}, Simona Ferioli^b, Joseph P. Broderick^b, and Brett M. Kissela^b

^aUniversity of Cincinnati, Department of Psychiatry, 231 Albert Sabin Way, ML 559, Cincinnati, OH 45267-0559, United States

^bUniversity of Cincinnati, Department of Neurology, 231 Albert Sabin Way, ML 559, Cincinnati, OH 45267-0559, United States

^cUniversity of Cincinnati, Department of Emergency Medicine, 231 Albert Sabin Way, ML 559, Cincinnati, OH 45267-0559, United States

^dUniversity of Cincinnati, Department of Neurosurgery, 231 Albert Sabin Way, ML 559, Cincinnati, OH 45267-0559, United States

Abstract

Objectives—Little is known about the effect of lifetime history of depression on ischemic stroke outcomes. This study compared a measure of current symptoms of depression at the time of the stroke and a measure of lifetime history of depression for their ability to predict quality of life and functioning at 3 and 12 months after stroke.

Methods—A cohort of 460 ischemic stroke patients from the 2005 Greater Cincinnati/North Kentucky Stroke Study was assessed within 2 weeks of the stroke, including the 10-item Center for Epidemiological Studies Depression Scale (CESD) for current symptoms of depression. Lifetime history of depression was also assessed by a 2-question measure at 3 and 12 months after stroke. Two outcome measures, Stroke Specific Quality of Life (SSQOL) and the modified Rankin Scale (mRS) to assess functional status, were also collected at 3 and 12 months.

Results—Of the 322 survivors included in the analysis, 52.2% reported depression on at least one measure. Both current symptoms and lifetime history of depression predicted poor functional outcomes and poor quality of life at 3 and 12 months, after adjustment for age, race, sex, prior stroke, baseline functional status, and stroke severity. The combination of depression measures was a better predictor of poor outcomes than either measure alone.

Conclusion—Depression by either measure was a frequent, substantial, and independent predictor of poor outcomes at 3 and 12 months after stroke. Stroke outcomes studies should further examine the predictive value of assessing both depressive symptoms at the time of the stroke and lifetime history of depression.

Keywords

Depression symptoms; Functioning; History of depression; Quality of life; Stroke; Stroke outcomes

*Corresponding author. Tel.: +1 513 558 5192; fax: +1 513 558 0877. Lawson.wulsin@uc.edu (L. Wulsin).

Conflict of interest

No author reports any conflict of interest.

Introduction

Several prospective epidemiologic studies have shown that depression independently predicts incident stroke [1–3]. Depressive symptoms at the time of the stroke have been shown to contribute to selected stroke outcomes, such as post-stroke depression [4] and mortality [5]. Hackett and colleagues [6] systematically reviewed the observational studies of predictors of post-stroke depression and reported that five of eight studies found that a personal history of depression prior to the stroke predicted post-stroke depression. The authors caution that the number of methodologically rigorous studies is limited and does not allow for multivariate predictive models for post-stroke depression.

More specifically, little is known about the effect of a history of depression prior to the stroke on other stroke outcomes, such as quality of life and functioning. Stroke outcome studies tend to limit the assessment of depression to self-reported measures of depressive symptoms obtained in the immediate post-stroke period [4]. Though one study examined the effect of prior depression on length of stay at the time of the stroke [7], no studies have assessed the importance of prior history of depression on predicting quality of life and functional status in the post-stroke period.

The complexity of the relationship between depression and stroke has contributed to mixed results in the literature and inconsistency in the measurement of depression. As Raskind has noted [5], depression may be both a contributing factor for incident stroke or a consequence of the stroke. Depression and stroke share common risk factors, such as physical inactivity, smoking, and obesity. Post-stroke depression may also complicate the recovery from stroke by interfering with rehabilitation [8], impairing physical [9], social, and cognitive functioning [10], and by adding to the toll on caregivers [11].

The importance of early identification and treatment of depression as a risk for poor stroke outcomes is underscored by the reviews of clinical trials for the treatment of post-stroke depression [12, 13], which have found a small but promising benefit from pharmacologic treatment. Whether treatment for the prevention of post-stroke depression improves stroke outcomes is the focus of two trials in progress [14, 15]. Both of these trials limit the assessment of depression to current symptoms around the time of the stroke, omitting assessment of lifetime history of depression prior to the stroke.

The value of expanding the definition of risk conferred by depression on the course of stroke to include past as well as current depression is illustrated by the small group of studies (N=14) that have aimed to prevent post-stroke depression [8]. These studies examined the effect of a pharmacologic or psychotherapeutic intervention on the change in depressive symptoms from within a month of the stroke to follow-up ranging from 2 weeks to 1 year. Though a history of depression is commonly recognized as a risk for recurrence of depression, none of the 14 studies in this Cochrane review specifically assessed for history of depression prior to the stroke.

To examine whether adding a measure of lifetime history of depression to the assessment of depressive symptoms around the time of the stroke improves the prediction of stroke outcomes, in this report we assess the relative merits of two measures of depression: current or recent symptoms of depression at the time of the stroke and lifetime history of depression. Our assessment compares their ability to predict two stroke outcomes—quality of life and functioning—at 3 and 12 months after stroke. We hypothesized that both depression measures would predict poor stroke outcomes and that the combination of measures would predict stroke outcomes better than either depression measure alone.

Methods

Study sample

This work was undertaken as part of the Greater Cincinnati/Northern Kentucky Stroke Study (GCNKSS), a 5-county population-based study that tracks the regional incidence of stroke and case fatality. This study was approved by the Institutional Review Boards at all participating institutions, and detailed methods have been previously described [16–18].

As part of Phase IV of the GCNKSS, a cohort of ischemic stroke patients was prospectively identified from the larger stroke population. After a potential subject was identified as having had an ischemic stroke, the subject's treating physician was contacted for permission to approach the patient for informed consent. Informed consent was obtained either from the patient, or from a proxy for patients who were unable to supply reliable information or were unresponsive, aphasic, or confused. All ischemic stroke patients during 2005 at any of the 15 adult hospitals in our study area were eligible for enrollment; the primary reason for not enrolling was discharge before contact for consent. At the baseline interview 95 (19%) participants with stroke-induced language difficulties completed interviews and self-report measures through proxy responders (usually spouses or close family members). Those with language difficulties who had no one to serve as a proxy were not enrolled.

Initially, 502 patients were prospectively enrolled into an arm of the study that involved extensive interviews at baseline and at 3 and 12 months post stroke (see Fig. 1). Ninety five percent were enrolled within 2 weeks of their stroke. After the patients' medical records were reviewed by a study physician, it was determined that 42 patients did not definitively have acute ischemic strokes at the time of enrollment. Some patients were hospitalized for sequelae of previous strokes, and others did not have definitive evidence of current stroke; one case was a transient ischemic attack. Thus, the study cohort consisted of 460 patients, of which 322 completed both measures of depression.

Independent variables

The current symptoms of depression measure consisted of the 10-item version of the Center for Epidemiological Studies Depression Scale (CESD-10) [19, 20], which was completed at baseline. Participants were asked to rate their depressive symptoms during the 2 weeks prior to the stroke. The CESD-10 total score ranges from 0 to 30. Among five studies that have reported on the CESD-10, there is no established standard cutoff for clinical depression: three studies used 10 [20–22], one used 8 [19], and one based their analysis on continuous scores rather than a specific cut point [23]. For this study we used a score of 10 or greater to classify clinical depression, but we also analyzed the data using the CESD as a continuous variable. Because the results for the continuous variable (available on request) were similar to those for the dichotomous variable with respect to statistical significance, we only report the dichotomous variable data here.

The lifetime screen for depression had to be administered at 3 or 12 months after the stroke because this study was initiated as an ancillary study to the GCNKSS soon after it began recruitment. This measure consisted of the first two questions of the depression module of the Composite International Diagnostic Interview (CIDI), the standard structured interview for the diagnosis of current and past mental disorders in epidemiologic samples: [24, 21] “In your lifetime, have you ever been bothered for most of 2 weeks by either 1) feeling down, depressed, or hopeless, or 2) little interest or pleasure in doing things?” A positive screen resulted from a “yes” to either question.

We administered the mood disorders module of the CIDI, which assesses current and past episodes of clinical depression, to a convenience subsample of 23 participants in our study

who screened positive for lifetime history of depression. There were no false positive responses to the lifetime history of depression screen: 21 had had major depression and 2 had had minor depression at some point in their lifetime. Four subjects who attributed their depression to the stroke were included in this group. This result suggests the 2-question screen did not overestimate the frequency of clinical depression in this sample.

Outcomes

This study focused on two outcomes: quality of life and functional status. Quality of life was assessed at 3 months and 12 months with the Stroke-Specific Quality of Life (SSQOL). The SSQOL consists of 12 domains, and the total score is the mean of the domain means. SSQOL scores range from 1 to 5, with 5 being best. The SSQOL is sensitive to change over time [25].

Functional status was assessed with the modified Rankin Scale (mRS) [26]. This scale ranges from 0 to 5, with 2 representing “slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance.” A score greater than or equal to 3 reflects substantial impairment of functioning and disability requiring assistance for activities of daily living; thus, this functional outcome measure is commonly dichotomized into 0–2 vs. 3–5 [27].

Statistical analyses

Initial analysis was descriptive; frequencies and percents, or medians and ranges, were used to describe the data. Multivariable logistic regression was used to test whether current symptoms of depression at the time of the stroke or lifetime history of depression predicted mRS >2 at both 3 and 12 months. We controlled for age, race, sex, baseline mRS, and stroke severity (NIHSS) because these variables have been shown in previous studies to significantly impact post-stroke outcomes [28–30].

We constructed three models for each of the two outcomes. First, we considered whether each depression measure individually predicted stroke outcomes, while adjusting for confounders. Then, we considered whether combining the depression measures into a single variable predicted stroke outcomes, while adjusting for confounders. The combined variable was defined in two different ways. First, patients were grouped as being either negative for depression, positive based on history only, positive based on symptoms only, or positive on both measures. Second, patients were grouped by whether they had any positive measure of depression or not.

Adjusted models were constructed in a single step to include those variables previously found to impact outcomes [16]. Multivariable general linear models were used for SSQOL. Analyses were conducted using SPSS v20.0 (SPSS Inc., Chicago, IL) and SAS v9.1 (SAS Institute, Cary, NC).

Results

The lifetime history of depression screen was administered to 290 participants at 3 months post stroke and to 35 participants at 12 months. Of those not screened, 37 died before they were interviewed, 24 were lost to follow up, 16 refused interview, and 58 received either an abbreviated interview that did not include the lifetime screen or refused to answer the screening questions. Of the 325 screened, three did not complete the baseline CESD, leaving 322 in the final dataset (Fig. 1). Excluded cases were more likely to be older than included cases (median age 71 years v 67 years, $p=0.023$). They also had higher CESD scores (median 8 v 7, $p=0.012$), but were otherwise similar at baseline (all $p>0.05$). Excluded

patients had lower 3 month SSQOL scores than included patients (median 3.3 v 3.8, $p=0.006$) but outcomes were not otherwise different.

Depression measures

Over half of participants (168/322, 52.2%) reported depression on at least one measure. Forty percent reported clinically significant depressive symptoms in the 2 weeks prior to the stroke, as measured by the baseline CESD. Nearly half of these also reported a history of depression. About a third of the sample (32%) reported a history of depression. Patients are described in Table 1, grouped by their depression status.

Depression and functional status

Table 2 shows the logistic regression models for predicting functional status (mRS) at 3 and 12 months. After adjustment for age, race, sex, baseline mRS and stroke severity (NIHSS), each depression measure was independently associated with poorer functional outcomes following stroke. When both depression variables were considered in a combined model, they predicted poor functional outcomes at 3 and 12 months, and the group with both current symptoms and a history of depression showed the greatest odds of a poor outcome.

Depression and quality of life

Median SSQOL scores at 3 and 12 months were 3.8 (1.7–5.0) and 3.7 (1.8–5.0), respectively. Table 3 shows the general linear regression models for predicting SSQOL at 3 and 12 months. The beta parameter estimate indicates how much the SSQOL changes with the depression measure compared to without it. Participants with either current symptoms or a history of depression had a decreased quality of life at both 3 and 12 months (the parameter estimate shows the change in SSQOL for those with depression compared to those without). As with functional status, those with both current symptoms of depression and a history of depression reported worse quality of life than those with only one positive depression measure.

Discussion

This is the first stroke outcome study to compare a retrospective measure of recent symptoms of depression at the time of the stroke to a measure of lifetime history of depression with respect to predicting quality of life and functional status. The observed discrepancies between the two measures of depression underscore the necessity for more than one measure. For the prediction of functional status and quality of life, a combination of baseline depression symptoms at the time of the stroke and a brief screen for lifetime history of predicted worse outcomes than either depression measure alone. Depressive symptoms and lifetime history independently more than doubled the odds of a poor functional outcome. Combined, they tripled the odds of a poor functional outcome at 3 months. Similarly, they independently more than doubled the odds of poor 12 month functional outcome and nearly quadrupled the odds of a poor functional outcome in combination. The combined effects of lifetime history and baseline depressive on 3 and 12-month quality of life (SSQOL), were greater than the independent effects. Given that baseline depressive symptoms and lifetime history of depression affect distinct but overlapping subgroups of about half this sample, and that in patients with both symptoms and a history of depression outcomes are worse than for those with one or the other, we suggest that the mechanisms by which baseline depressive symptoms contribute to stroke disability may differ from the mechanisms by which past depression contributes to stroke disability.

The conventional practice in stroke outcome studies of defining depression risk by a single assessment of depressive symptoms around the time of the stroke deserves to be reexamined. This practice may misclassify the people with prior episodes of depression who are in remission at the time of the stroke. The findings of our study lend support to the common sense notion that any condition whose course is predominantly one of recurring episodes alternating with remissions should be measured with both a cross-sectional and a longitudinal view. In this respect, depression is more like epilepsy or multiple sclerosis than acute pneumonia. An established history of the condition may contribute as much to risk as current symptom severity.

This study raises an important challenge to future studies of depression as a predictor of stroke outcomes. Since it may not be sufficient to define clinical depression by current symptoms alone at the time of the stroke, future outcome studies should evaluate whether adding a measure of the lifetime burden of depression also improves the predictive value of depression as a risk factor for stroke outcomes. In addition, studies of post-stroke depression, which traditionally have excluded from enrollment patients with prior depression, should reconsider this exclusion, which likely biases the outcomes toward underestimating the true post-stroke burden.

In our study the clinical history of depression was also assessed by medical record review and patient interview. The patient's medical record was reviewed at baseline by a study research nurse for documented evidence of a history of depression. Also at the baseline interview, the patient was asked "Have you ever been told by a doctor that you have had depression?" (among a list of other medical disorders such as asthma, heart disease, etc.). Documentation of clinical depression in either the medical record review or the baseline interview was scored as a positive "clinical history" of depression. However, reported clinical history of depression by chart abstraction or patient interview provided little useful predictive information, so the data, though available on request, are not presented here.

The two-question lifetime history of depression screen, based on the standard diagnostic interview for psychiatric diagnosis (CIDI) is more specific for a clinical depressive episode than a single interview question or the standard chart review. Because these two questions are derived directly from current diagnostic criteria for major depression, they are more likely to identify clinical depression in the past, whether treated or untreated. False positive responses to the screening questions were not apparent.

The limitations of this study include the screening for lifetime depression on most (65%) but not all participants. The collection of lifetime history of depression data 3 or 12 months after the baseline evaluation allowed the possibility that participant recall would include post-stroke depression in a small number of participants. In addition, the limited number of participants who completed the CIDI structured interview to verify screening results limited our test of the validity of this screen within our sample. A more rigorous test of the lifetime depression screen would involve structured diagnostic interviews with a larger subsample of those screened. We acknowledge that asking participants soon after the stroke to report on depressive symptoms during the 2 weeks prior to the stroke may lead to some confusion about whether the symptoms immediately preceded or followed the stroke. However, for this analysis the important distinction is between depressive symptoms at the time of the stroke and depression well before the stroke. We found that excluded subjects were significantly older, more depressed at baseline, and had lower quality of life at 3 months, suggesting the possibility of a selection bias that may contribute to our findings being an underestimate of the true effect of depression on 12-month outcomes. Since our sample was limited to people with ischemic strokes, our results may not apply to the outcomes of those with hemorrhagic strokes.

In our study of this sample of patients with ischemic strokes, both depressive symptoms at the time of the stroke and lifetime history of depression were frequent, and both measures of depression contributed substantially and independently to poor outcomes at 3 and 12 months after stroke. Our findings suggest that stroke outcomes studies should routinely examine multiple measures of depression, including measures of current and past depression. A specific two-question screen for lifetime history of depression appears to predict stroke outcomes better than history of depression as recorded in medical charts or reported during patient interviews. The independent effects on stroke outcomes of depression symptoms at the time of the stroke and of lifetime history of depression require replication. These findings also suggest that future studies should explore the multiple mechanisms by which depression across the life cycle interferes with good stroke outcomes.

Acknowledgments

This study has been funded by a) The University of Cincinnati Neuroscience Institute, b) The Dean's Discovery Fund, University of Cincinnati, c) National Institutes of Health/National Institute of Neurological Disorders and Stroke (NIH/NINDS) NS-45054 d) NIH/ NINDS NS-30678

References

1. Bos MJ, Linden T, Koudstaal PJ, Hofman A, Schoog I, Breteler MM, et al. Depressive symptoms and risk of stroke: the Rotterdam Study. *J Neurol Neurosurg Psychiatry*. 2008; 79:997–1001. [PubMed: 18208858]
2. Jonas B, Mussolino M. Symptoms of depression as a prospective risk factor for stroke. *Psychosom Med*. 2000; 62:463–471. [PubMed: 10949089]
3. Larson S, Owens P, Ford D, Eaton W. Depressive disorder, dysthymia, and risk of stroke. *Stroke*. 2001; 32:1979–1983. [PubMed: 11546884]
4. Hackett ML, Yapa C, Parag V, Anderson CS. Frequency of depression after stroke: a systematic review of observational studies. *Stroke*. 2005; 36:1330–1340. [PubMed: 15879342]
5. Raskind MA. Diagnosis and treatment of depression comorbid with neurologic disorders. *Am J Med*. 2008; 121:S28–S37. [PubMed: 18954590]
6. Hackett ML, Anderson CS. Predictors of depression after stroke: a systematic review of observational studies. *Stroke*. 2005; 36:2296–2301. [PubMed: 16179565]
7. Nuyen J, Spreeuwenberg PM, Groenewegen PP, van den Bos GA, Schellevis FG. Impact of preexisting depression on length of stay and discharge destination among patients hospitalized for acute stroke: linked register-based study. *Stroke*. 2008; 39:132–138. [PubMed: 18063828]
8. Hackett ML, Anderson CS, House A, Halteh C. Interventions for preventing depression after stroke. *Cochrane Database Syst Rev*. 2008:CD003689. [PubMed: 18646094]
9. Parikh RM, Robinson RG, Lipsey JR, Starkstein SE, Fedoroff JP, Price TR. The impact of poststroke depression on recovery in activities of daily living over a 2-year follow-up. *Arch Neurol*. 1990; 47:785–789. [PubMed: 2357159]
10. Robinson RG, Bolla-Wilson K, Kaplan E, Lipsey JR, Price TR. Depression influences intellectual impairment in stroke patients. *Br J Psychiatry*. 1986; 148:541–547. [PubMed: 3779224]
11. Anderson CS, Linto J, Stewart-Wynne EG. A population-based assessment of the impact and burden of caregiving for long-term stroke survivors. *Stroke*. 1995; 26:843–849. [PubMed: 7740578]
12. Hackett ML, Anderson CS, House A, Xia J. Interventions for treating depression after stroke. *Cochrane Database Syst Rev*. 2008:CD003437. [PubMed: 18843644]
13. Chen Y, Guo JJ. Meta-analysis of antidepressant treatment for patients with post-stroke depression. *Stroke*. 2006; 37:1365–1366. author reply 1367. [PubMed: 16645130]
14. Mitchell PH, Teri L, Veith R, Buzaitis A, Tirschwell D, Becker K, et al. Living well with stroke: design and methods for a randomized controlled trial of a psychosocial behavioral intervention for poststroke depression. *J Stroke Cerebrovasc Dis*. 2008; 17:109–115. [PubMed: 18436150]

15. Hill KM, West RM, Hewison J, House AO. The Stroke Outcomes Study 2 (SOS2): a prospective, analytic cohort study of depressive symptoms after stroke. *BMC Cardiovasc Disord.* 2009; 9:22. [PubMed: 19486518]
16. Kissela B, Lindsell CJ, Kleindorfer D, Alwell K, Moomaw CJ, Woo D, et al. Clinical prediction of functional outcome after ischemic stroke: the surprising importance of periventricular white matter disease and race. *Stroke.* 2009; 40:530–536. [PubMed: 19109548]
17. Kissela B, Schneider A, Kleindorfer D, Khoury J, Miller R, Alwell K, et al. Stroke in a biracial population: the excess burden of stroke among blacks. *Stroke.* 2004; 35:426–431. [PubMed: 14757893]
18. Kleindorfer D, Broderick J, Khoury J, Flaherty M, Woo D, Alwell K, et al. The unchanging incidence and case-fatality of stroke in the 1990s: a population-based study. *Stroke.* 2006; 37:2473–2478. [PubMed: 16946146]
19. Irwin M, Artin KH, Oxman MN. Screening for depression in the older adult: criterion validity of the 10-item Center for Epidemiological Studies Depression Scale (CES-D). *Arch Intern Med.* 1999; 159:1701–1704. [PubMed: 10448771]
20. Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *Am J Prev Med.* 1994; 10:77–84. [PubMed: 8037935]
21. Whooley MA, Avins AL, Miranda J, Browner WS. Case-finding instruments for depression. Two questions are as good as many. *J Gen Intern Med.* 1997; 12:439–445. [PubMed: 9229283]
22. Shrout PE, Yager TJ. Reliability and validity of screening scales: effect of reducing scale length. *J Clin Epidemiol.* 1989; 42:69–78. [PubMed: 2913189]
23. Ariyo A, Haan M, Tangen C, Rutledge J, Cushman M, Dobs A, et al. Depressive symptoms and risks of coronary heart disease and mortality in elderly Americans. *Circulation.* 2000; 102:1773–1779. [PubMed: 11023931]
24. Robins LN, Wing J, Wittchen HU, Helzer JE, Babor TF, Burke J, et al. The composite international diagnostic interview. An epidemiologic instrument suitable for use in conjunction with different diagnostic systems and in different cultures. *Arch Gen Psychiatry.* 1988; 45:1069–1077. [PubMed: 2848472]
25. Williams LS, Weinberger M, Harris LE, Clark DO, Biller J. Development of a stroke-specific quality of life scale. *Stroke.* 1999; 30:1362–1369. [PubMed: 10390308]
26. de Haan R, Limburg M, Bossuyt P, van der Meulen J, Aaronson N. The clinical meaning of Rankin ‘handicap’ grades after stroke. *Stroke.* 1995; 26:2027–2030. [PubMed: 7482643]
27. Banks JL, Marotta CA. Outcomes validity and reliability of the modified rankin scale: implications for stroke clinical trials: a literature review and synthesis. *Stroke.* 2007; 38:1091–1096. [PubMed: 17272767]
28. Johnston KC, Li JY, Lyden PD, Hanson SK, Feasby TE, Adams RJ, et al. Medical and neurological complications of ischemic stroke: experience from the RANTTAS trial. RANTTAS investigators. *Stroke.* 1998; 29:447–453. [PubMed: 9472888]
29. Johnston KC, Connors AF Jr, Wagner DP, Knaus WA, Wang X, Haley EC Jr. A predictive risk model for outcomes of ischemic stroke. *Stroke.* 2000; 31:448–455. [PubMed: 10657421]
30. Baird AE, Dambrosia J, Janket S, Eichbaum Q, Chaves C, Silver B, et al. A three-item scale for the early prediction of stroke recovery. *Lancet.* 2001; 357:2095–2099. [PubMed: 11445104]

Fig. 1.
Flow chart of study enrollment.

Patient characteristics grouped by depression status. Data are given as counts and percentages except as noted. Where the N for a variable is given, this represents the number of subjects with available data.

Table 1

	No depression (N=154)	CESD 10 only (N=65)	History of depression only (N=49)	CESD 10 and history of depression (N=54)
Age at time of stroke (median, range)	69	28-93	70	25-93
Non-black	114	74.0	52	80.0
Female	65	42.2	38	58.5
< 12th grade	32	20.8	30	46.2
Completed 12th grade, GED or HS diploma	54	35.1	18	27.7
Post high school (technical school, college)	68	44.2	17	26.2
Severe periventricular white matter disease	25	16.3	12	18.5
Infarct	150	97.4	65	100.0
Infarct with hemorrhagic conversion	4	2.6	0	0.0
Estimated NIHSS (median, range)	3	0-21	5	0-22
Lesion volume, N=142 (median, range)	2	0-208	1	0-399
TPA administered following onset of stroke	13	8.4	9	13.8
Modified Rankin scale				
mRS at baseline (median, range)	1	0-4	2	0-4
mRS at 3 months, N=318 (median, range)	2	0-5	3	0-5
mRS at 12 months, N=271 (median, range)	2	0-5	3	0-5
mRS at baseline > 2	17	11.0	13	20.0
mRS at 3 months > 2, N=318	53	34.6	41	63.1
mRS at 12 months > 2, N=271	47	33.8	32	62.7
SSQOL at 3 months, N=291 (mean, Standard deviation)	4.13	0.64	3.52	0.61
SSQOL at 12 months, N=209 (mean, Standard deviation)	4.11	0.70	3.40	0.62

Table 2

Odds ratios from logistic regression models predicting decreased 3- and 12-month functional outcome (mRS >2).

	Odds ratio	CI ₉₅ (odds ratio)	C-statistic
3 Month outcome (N=318)			
Individual model, adjusted			
History	2.13	(1.16–3.90)	0.835
CESD	1.94	(1.09–3.44)	0.836
Combined model, adjusted			0.840
History	2.35	1.03–5.35	
CESD	2.04	0.98–4.26	
History+CESD	3.09	1.38–6.94	
Any depression, adjusted	2.42	1.36–4.29	0.839
12 Month outcome (N=271)			
Individual model, adjusted			
History	2.52	(1.35–4.72)	0.790
CESD	2.40	(1.32–4.36)	0.785
Combined model, adjusted			0.803
History	3.33	1.41–7.86	
CESD	2.95	1.36–6.41	
History+CESD	3.80	1.64–8.80	
Any depression, adjusted	3.31	1.82–6.02	0.805

Depression measures are considered individually and combined, and odds ratios are adjusted for age, race, sex, baseline disability and stroke severity.

Unadjusted data available on request.

Table 3

Parameter estimates from general linear models predicting 3- and 12-month SSQOL (the beta parameter estimate indicates how much the SSQOL changes with the depression measure compared to without it.).

	β	$CI_{95}(\beta)$	R^2
3 Month outcome (N=291)			
Individual model, adjusted			
History	-0.46	-0.63 to -0.29	0.245
CESD	-0.53	-0.69 to -0.36	0.270
Combined model, adjusted			0.316
History	-0.38	-0.60 to -0.16	
CESD	-0.46	-0.67 to -0.25	
History+CESD	-0.81	-1.03 to -0.60	
Any depression, adjusted	-0.55	-0.71 to -0.39	0.285
12 Month outcome (N=209)			
Individual model, adjusted			
History	-0.34	-0.55 to -0.12	0.240
CESD	-0.55	-0.76 to -0.34	0.300
Combined model, adjusted			0.320
History	-0.26	-0.54 to -0.01	
CESD	-0.51	-0.78 to -0.25	
History+CESD	-0.77	-1.05 to -0.49	
Any depression, adjusted	-0.51	-0.80 to -0.21	0.289

Depression measures are considered individually and combined, and parameter estimates are adjusted for age, race, sex, baseline disability and stroke severity. Unadjusted data available on request.