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## ANXIETY AND DEPRESSION AFTER SPONTANEOUS SUBARACHNOID HEMORRHAGE

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**OBJECTIVE:** Relatively little attention has been paid to emotional outcome after subarachnoid hemorrhage (SAH). This study assessed levels of anxiety and depression among SAH survivors and related these to clinical indices.

**METHODS:** Seventy SAH patients from a consecutive series of neurosurgical admissions participated in semistructured assessments of functional outcome; 52 of the patients also returned standardized measures of emotional outcome. These data were compared with clinical indices collected during the initial hospital admission.

**RESULTS:** Moderate to severe levels of anxiety were present in approximately 40% of patients 16 months after hemorrhage, with approximately 20% experiencing moderate to severe levels of depression. Although anxiety was more likely to be reported at interview by those with an SAH of Fisher Grade 4, the standardized measures of anxiety and depression were not associated with severity of hemorrhage or any other clinical variables. Both anxiety and depression were significantly associated with outcome indices such as return to work and engagement in social activities.

**CONCLUSION:** Anxiety is a significant and lasting problem for approximately 40% of survivors of SAH. It is suggested that measures taken to prevent or treat such anxiety among survivors of SAH may serve to significantly improve functional outcome.

**KEY WORDS:** Anxiety, Depression, Emotion, Outcome, Subarachnoid hemorrhage

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In recent years, survival rates have improved among patients who have experienced a subarachnoid hemorrhage (SAH), and the incidence of physical disability among survivors has declined (8). As interest has increased in functional outcome among survivors, a number of outcome studies have reported cognitive impairments, particularly memory and concentration deficits, after SAH (2, 9–12, 14, 16, 17). More recently, some studies have reported on the incidence of depressive illness after SAH (2, 11, 15, 22).

Relatively little attention has been paid to other measures of emotional outcome, such as anxiety, despite evidence suggesting that this is an important factor in the functional outcome of these patients (2, 20, 22). A short report has drawn attention to the presence of posttraumatic stress disorder in 32% of SAH patients referred to a behavioral clinic, with anxiety found to be the main presenting problem in another 18% of patients (1). However, few studies have examined anxiety and depression in representative samples of SAH patients or have been able to compare these consequences with clinical indices collected during the initial hospital admission.

## PATIENTS AND METHODS

### Patients

The study group comprised 84 surviving patients with confirmed spontaneous SAH derived from a consecutive series described previously (4). SAH was confirmed by computed tomography or lumbar puncture. No contact could be established with 7 patients, 6 patients either declined to participate or repeatedly did not attend arranged appointments, and 1 patient lived a considerable distance from the unit. Of the 70 remaining patients, 43 (61%) were female, and the mean age was 45.2 years (standard deviation, 15.2 yr; range, 25–74 yr). Mean years of education was 12.21 years (standard deviation, 2.1 yr; range, 9–19 yr). The majority (80%) were married or in a stable cohabiting relationship.

### Procedure

Clinical variables, including World Federation of Neurological Surgeons (WFNS) grade (24, 27) and Fisher grade (5), were

recorded during hospital admissions at the Department of Neurosurgery in Glasgow's Southern General Hospital (Tables 1 and 2). Of the 56 patients with an SAH of confirmed aneurysmal origin, 54 underwent a procedure; of these, 8 underwent endovascular treatment, and the remaining 46 underwent craniotomy with clipping. Surgery was undertaken a median of 5 days after admission (range, 0–52 d), with only 3 cases exceeding 14 days. Information about emotional adjustment after SAH was collected as part of a study of genetic influences on outcome in which the 70 SAH patients were followed up by semistructured interview and cognitive tasks (PG Morris, submitted for publication). The mean time between initial admission to the neurosurgical unit and follow-up assessment was 16.3 months (standard deviation, 2.1 mo; range, 14–23 mo). The extended Glasgow Outcome Scale was also administered as part of the interview (25).

**Questionnaires**

Questionnaires were given to patients at the end of the interview; they were to be completed at home and returned. These questionnaires comprised the following well-standardized measures, each of which has been used previously in studies of outcome after brain injury. Fifty-two patients (74%) returned these questionnaires, most within 1 month of the interview.

**TABLE 2. Fisher grading scale<sup>a</sup>**

Fisher grade	Description
0	No scan available
1	No blood detected
2	Diffuse deposition or thin layer. All vertical layers of blood <1 mm thick
3	Localized clots and/or vertical layers of blood >1 mm thick
4	Intraventricular or intraparenchymal blood present with diffuse or no subarachnoid hemorrhage

<sup>a</sup> Adapted from, Fisher CM, Kistler JP, Davis JM: Relation of cerebral vasospasm to subarachnoid hemorrhage visualized by computerized tomographic scanning. *Neurosurgery* 6:1–9, 1980 (5).

**Hospital Anxiety and Depression Scale**

The Hospital Anxiety and Depression Scale (HADS) (28) is a brief, 14-item scale divided equally into questions relating to anxiety or depression. It uses questions that are designed to minimize the confounding influence of physical health problems and has been used previously in outcome studies of SAH (7), other strokes (3), and traumatic head injury.

**TABLE 1. Clinical variables in different study groups<sup>a</sup>**

	Eligible study group (n = 84)	No. of patients (%)	
		Attended interview (n = 70)	Returned questionnaires (n = 52)
Fisher grade			
0 <sup>b</sup>	1 (1.2)	1 (1.4)	0
1	8 (9.5)	6 (8.6)	5 (9.6)
2	6 (7.1)	6 (8.6)	5 (9.6)
3	43 (51.2)	37 (52.9)	30 (57.7)
4	26 (31.0)	20 (28.5)	12 (23.1)
WFNS grade			
I	58 (69.0)	47 (67.1)	40 (76.9)
II	13 (15.5)	12 (17.1)	5 (9.6)
III	2 (2.4)	2 (2.9)	1 (1.9)
IV	3 (3.6)	3 (4.3)	3 (5.8)
V	8 (9.5)	6 (8.6)	3 (5.8)
Confirmed aneurysm	68 (81.0)	56 (80.0)	42 (80.8)
Negative angiogram	14 (16.6)	12 (17.1)	9 (17.3)
Unknown (no angiogram)	2 (2.4)	2 (2.9)	1 (1.9)

<sup>a</sup> WFNS, World Federation of Neurological Surgeons.

<sup>b</sup> No computed tomographic scan; hemorrhage confirmed by lumbar puncture.

## General Health Questionnaire

The 30-item version of the General Health Questionnaire (GHQ-30) is widely used in health outcome studies and excludes physical health-related items present in the 60-item version (6). Thresholds for the GHQ-30 suggested to be more appropriate for stroke survivors (18) are reported in addition to those suggested by the original authors to allow comparisons with other studies.

## The Beck Depression Inventory

The Beck Depression Inventory is a widely used 21-item measure designed to assess severity of depressive illness in adolescents and adults. It has been used in a number of studies to measure depression after SAH (2, 11, 15, 16) and head injury (26).

## State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory measures state and trait anxiety separately, with trait anxiety referring to relatively stable differences in anxiety proneness and state anxiety referring to anxiety present at a given time (21). It was used in one of the first studies of SAH outcome to include a measure of anxiety (22) and was included here to allow comparison.

## Analyses

Nonparametric tests were used because of the ordinal nature of these measures of emotional outcome. The associations between clinical grades and outcome measures were analyzed with Spearman correlations. For  $\chi^2$  analyses, clinical grades were collapsed into the dichotomized groupings of Fisher Grade 4 versus Fisher Grades 1 to 3 and WFNS Grade I versus WFNS Grades II to V.

# RESULTS

## Reported Symptoms at Interview

Levels of anxiety were reported to have worsened since the hemorrhage by 33 patients (47%) at interview, whereas depression was reported to have worsened by 34 (49%). Anxiety was more likely to be reported by those with a Fisher grade of 4 ( $\chi^2 = 8.33$ ,  $P = 0.004$ ), although there were no associations with WFNS grade or aneurysmal origin, and there were no significant relationships between reported depression and any of the clinical variables. By the time of the interview, 33 (63.5%) of the 52 patients who had been working before the hemorrhage had returned to work, of whom all but 2 had returned to the same job, and the majority believed themselves to be coping as well now as before the hemorrhage. However, those who had not returned to work were significantly more likely to report elevated levels of anxiety (58 versus 18%,  $\chi^2 = 9.13$ ,  $P = 0.003$ ) and depression (64 versus 11%,  $\chi^2 = 15.66$ ,  $P < 0.001$ ) than those who had returned to work.

More than half of the patients reported that their social and leisure activities were still reduced 16 months after the hem-

orrhage. This reduction in social activities was substantial in 29 patients (41%), with these substantial reductions in social activity significantly more likely in those who reported anxiety (58 versus 27%,  $\chi^2 = 6.71$ ,  $P = 0.01$ ) or depression (65 versus 19%,  $\chi^2 = 14.76$ ,  $P < 0.001$ ).

## Questionnaires

The questionnaires were returned by 52 patients (74%), although 6 patients did not fully complete the GHQ-30. There were no notable or statistical differences in clinical or demographic variables between those who attended the interview and those who returned questionnaires (Table 1). However, those who reported increased anxiety or depression in the interviews were less likely to return the questionnaires. Of those who reported being more depressed, 65% returned questionnaires, relative to 83% of those not reporting depression. Similarly, 64% who reported being more anxious returned questionnaires, relative to 84% who did not report anxiety at interview.

On the HADS anxiety subscale, 16% of the SAH survivors had scores indicating mild anxiety, with another 38% having scores indicating moderate or severe levels of anxiety (Fig. 1). Virtually all of those scoring in the moderate or severe anxiety range reported feelings of panic either quite often or very often. Scores on the State-Trait Anxiety Inventory also demonstrated high levels of anxiety, with 58% of patients scoring above the 80th percentile on trait anxiety and 46% scoring above the 80th percentile on state anxiety. Although 21% of patients had scores on the HADS depression scale indicating mild depression, clinical levels of depression were lower than corresponding levels of anxiety, with only 17% scoring in the moderate or severe depression range. These HADS depression scores are broadly consistent with those on the Beck Depression Inventory, in which 28% of patients scored in the mild to moderate depression range (10–18) and another 22% scored in the moderate to severe depression range ( $\geq 19$ ).

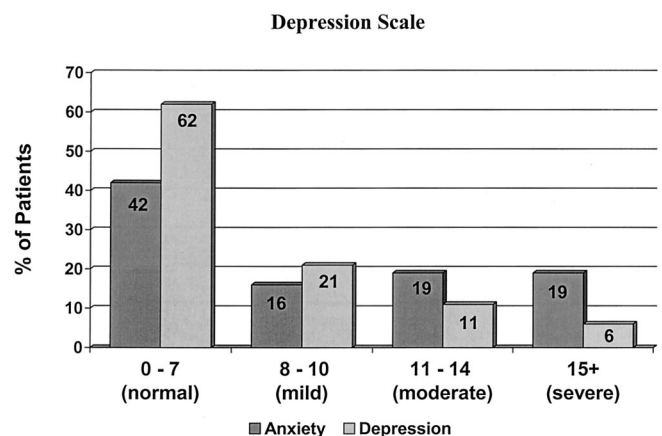


FIGURE 1. Distribution of patients at different levels of the HADS.

### Comparison with Interview Data

Reporting of anxiety or depression at interview was compared with dichotomized HADS groupings (i.e., normal or mild versus moderate or severe). Those who reported anxiety at interview were significantly more likely to have moderate to severe anxiety on the HADS than those who reported no anxiety (68 versus 19%,  $\chi^2 = 11.84, P < 0.001$ ) but were not significantly more likely to have moderate to severe depression (29 versus 10%,  $\chi^2 = 3.12, P = 0.077$ ). In contrast, those who reported depression at interview were significantly more likely to have both moderate to severe anxiety (64 versus 20%,  $\chi^2 = 10.21, P < 0.001$ ) and depression (36 versus 3%,  $\chi^2 = 9.68, P = 0.002$ ). This stronger association between reported depression and measures of anxiety is largely because of seven individuals who, despite reporting depression at interview, scored in the normal to mild range on depression scales and in the moderate to severe range on anxiety scales.

### General Health Questionnaire

Nineteen (41%) of 46 patients who returned the fully completed GHQ-30 scored above the 4/5 threshold, with 15 (33%) scoring above the more conservative 8/9 threshold, indicating poor subjective mental health in at least one-third of these patients. Outcome as determined by the extended Glasgow Outcome Scale is shown in Table 3, with 11 (16%) having a severe disability, 28 (40%) a moderate disability, and 31 (44%) a good recovery. All of the anxiety and depression measures were significantly correlated with extended Glasgow Outcome Scale at a value of  $P < 0.001$ .

### Return to Work and Social Restriction

Thirty-six of those who returned questionnaires had been working before the hemorrhage. Ability to return to previous work was reduced both in those with moderate to severe HADS depression (5 of 5 versus 14 of 31;  $P = 0.047$ , Fisher's exact test) and in those with moderate to severe HADS anxiety

(10 of 13 versus 9 of 23;  $\chi^2 = 4.76, P = 0.029$ ) relative to those with normal or mild levels.

Social restriction was also significantly associated with both anxiety and depression, with 9 of 9 patients with moderate to severe HADS depression going out socially substantially less, relative to 12 of 43 patients with normal or mild levels ( $\chi^2 = 16.07, P < 0.001$ ) and 14 of 20 patients with moderate to severe HADS anxiety going out substantially less, relative to 7 of 32 patients with normal or mild levels ( $\chi^2 = 11.84, P = 0.001$ ).

### Relationship with Clinical Indices

Those individuals in the clinical anxiety range on the HADS did not differ significantly in  $\chi^2$  testing from those with lower anxiety scores in terms of Fisher grade, WFNS grade, aneurysmal site, aneurysmal or nonaneurysmal origin, or sex. There were no significant relationships between any clinical or demographic variables and above-threshold GHQ scores. Spearman correlations also found no significant associations between measures of anxiety or depression and either clinical grade, time from admission until surgery (after removal of two outliers), or age at assessment.

## DISCUSSION

This study reports emotional outcomes after SAH in a sample derived from consecutive admissions to a neurosurgical unit. Although mild depression was present in a considerable proportion of these SAH patients, anxiety was present at clinical levels twice as frequently, with approximately 40% of patients having moderate to severe anxiety levels. Thus, although both anxiety and depression were reported by approximately 48% of patients to have increased, anxiety was more frequently present at clinical levels, whereas increases in depression were often mild. Both anxiety and depression were significantly correlated with reduced ability to return to work and reduced social activity. Although causality cannot be inferred from these correlations alone, comments from interviewees suggested that whereas depression was often a consequence of being unable to return to work or of social isolation, anxiety was more frequently a cause for not being able to return to work or participate in social activities.

Because those who reported increased anxiety or depression at interview were equally less likely to have returned the standardized questionnaires, it is probable that these measures may have underestimated the true prevalence of anxiety and depression in this population. This bias, with anxious or depressed individuals being less inclined to participate, is likely to have been even more pronounced in studies that have used opportunity samples rather than being derived from a consecutive series.

It is uncertain whether this emotional disturbance would decrease over time without intervention. One of the few studies to have investigated longer-term outcome after SAH found that more than 15% reported increased anxiety approximately

**TABLE 3. Distribution of patients on Extended Glasgow Outcome Scale<sup>a</sup>**

Outcome	No. of SAH patients	%
Lower severe disability	4	5.7%
Upper severe disability	7	10.0%
Lower moderate disability	9	12.9%
Upper moderate disability	19	27.1%
Lower good recovery	19	27.1%
Upper good recovery	12	17.1%

<sup>a</sup> SAH, subarachnoid hemorrhage.



4 to 7 years later, indicating that these difficulties persist in at least a proportion of survivors (17).

### Comparison with Other Outcome Studies

A recent study of emotional outcome after stroke, which excluded SAH, found that anxiety and depression were present in approximately equivalent proportions, with 16% and 12% scoring above 10 on the respective HADS subscales (3). We report slightly higher levels of depression among SAH survivors. However, far more notable is the strikingly higher rate of anxiety, with more than double the percentage of SAH patients (38%) scoring more than 10 on the HADS relative to that reported for other types of stroke. This figure of approximately 40% of SAH patients experiencing anxiety disorders is also demonstrated by interview and State-Trait Anxiety Inventory data, such that it is unlikely to be an artifact of the measure used. These higher levels of anxiety after SAH relative to other stroke types may relate in part to the younger age at which patients typically experience SAH, with its life-threatening occurrence invariably sudden and unexpected in individuals who are often otherwise healthy.

Hellawell et al. (7) reported fewer anxiety problems in their sample of SAH patients also drawn from consecutive admissions and with broadly similar age and admission grades. It is possible that this reflects some as yet unidentified difference in either patient population or after-care practices, although their data at 12 months are based on only 22 (52%) of 42 potential patients, whereas we report interview data at 16 months from 70 (83%) of 84 patients, with questionnaire data from 52 (64%). The study by Hellawell et al. does, however, report that 36% of the relatives of SAH patients considered that anxiety/tension in the patient had increased since the hemorrhage, which is more consistent with the reporting of anxiety by patients in our study.

Hutter et al. (11) reported that 36% of their patients reported feeling strained and insecure socially, a figure that would be broadly consistent with our study. Another study based on patients referred to a clinical psychologist found that anxiety was the main presenting problem in 50% of patients (1). Another 36% had experienced anxiety and memory difficulties at the time of referral that had since resolved. Only 14% of patients presented with cognitive impairment as the primary problem.

### Clinical Variables

There were no consistent associations between reported emotional disturbance and any of the clinical variables measured. Although Fisher Grade 4 was associated with reporting of anxiety in interviews, this association was not present in the standardized measures in which level of anxiety is considered rather than presence alone. Eight Fisher Grade 4 patients did not return questionnaires, although they were no more likely to have reported anxiety in the interview than those who did return questionnaires. It is possible, however, that an effect of Fisher Grade 4 on anxiety remains but that this effect was not

strong enough to be detected in the questionnaire sample. Thus, it would seem that although WFNS and Fisher grades are strongly associated with survival and physical/cognitive outcome (12, 19, 23), they are either less strongly or not at all associated with emotional outcome.

The relative absence of any strong association with clinical grades suggests that the anxiety is likely to be either a consequence of having experienced a sudden life-threatening event or a response to changed circumstances after hemorrhage rather than a direct organic consequence of brain injury.

### Potential for Interventions

The high incidence of anxiety disorders after SAH and their very substantial effects on quality of life are of particular interest because anxiety disorders can generally be treated more successfully than physical or cognitive disabilities. Thus, the identification of these anxiety disorders and referral to a clinical psychologist or other suitably trained professional could potentially improve the functional outcome of these patients.

It is also of interest to know why these anxiety disorders develop in some individuals subsequent to SAH and not in others. Although approximately 40% of patients experienced significant anxiety, the remaining 60% seemed relatively untroubled despite broadly equivalent severity of hemorrhage and comparable clinical grades. Although it is possible that elevated levels of anxiety were present in these patients before the hemorrhage, the majority of anxious patients reported no previous psychological difficulties before the hemorrhage. This suggests that subsequent emotional disturbances are triggered primarily by the hemorrhage.

It is possible that the coping styles adopted by either the patient or the caregiver(s) in response to the SAH may influence subsequent recovery and predisposition toward anxiety-related disorders. The extent and format of information given to patients and their families may also be a factor in influencing emotional outcome. Many of the patients and their caregivers mentioned that they would have appreciated more information in a format that was easy to understand. Relatively simple, low-cost interventions may help to reduce anxiety among both patients and their families.

## CONCLUSIONS

Approximately 40% of surviving SAH patients still experience significant levels of anxiety more than 16 months after SAH. This anxiety seems to reduce the ability of these patients to return to normal levels of social functioning and employment and as such may be a significant factor in their functional outcome. Consequently, interventions aimed at reducing the occurrence of such anxiety or at identifying and treating this anxiety may substantially improve functional outcome among these patients.

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## COMMENTS

The authors examined levels of anxiety and depression among survivors of subarachnoid hemorrhage (SAH) and attempted to correlate these results with clinical indices. They demonstrated moderate to severe levels of anxiety in approximately 40% and moderate to severe levels of depression in 20% of patients 16 months after hemorrhage. In addition, they found no correlation between clinical variables and standardized measures of anxiety and depression but did find significant associations with outcome indices such as return to work and participation in social activities.

Functional outcome measures continue to assume increasing importance in analyses of outcome in patients who have sustained an SAH. The authors have systematically analyzed important indices of outcome after SAH that have received considerably less attention in the existing body of literature.

The traditional focus of neurosurgical follow-up has been on physical well-being in these patients. However, as emphasized by this study, neuropsychological status is deserving of special attention. Implementation of routine preventive measures and vigilance in the screening and treatment of these disorders in the care of SAH patients may ultimately translate into improved overall functional outcomes.

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The aim of this study was to assess the level of late clinical anxiety and depression in consecutive patients treated for SAH in one neurosurgical unit. Seventy of 84 patients with confirmed spontaneous SAH were interviewed a mean of 16 months after the bleeding, but only 52 patients also filled out four semistructured questionnaires at home and returned them later. The tests included the Hospital Anxiety and Depression Scale (HADS), Beck Depression Inventory (BDI), State-Trait Anxiety Inventory (STAI), and General Health Questionnaire (GHQ-30). Of the 52 patients, 42 had an aneurysm; in 10 patients, no aneurysm was found. The study

showed that moderate or severe anxiety was present in approximately 40% (38% and 46%) of patients and moderate to severe depression in approximately 20% (21% and 22%), but the authors concluded that the symptoms were not associated with any clinical variables during the treatment, such as the severity of bleeding. Problems in returning to work and social activities were strong indices of depressive symptoms and anxiety. It was concluded that these symptoms often could have been prevented or treated if they had been found early.

According to the interviews, social and leisure activities were reduced substantially, especially in patients with anxiety (58%) and depression (63%). At least 33% of the patients showed poor subjective mental health, and 56% had either severe or moderate disability on the extended Glasgow Outcome Scale. Anxiety and depression correlated significantly with grade on the extended Glasgow Outcome Scale. Although Fisher Grade 4 was more often recorded in patients, however, there was no correlation between standardized measures of anxiety, depression, and quality-of-life test scores and Fisher grade, World Federation of Neurosurgical Societies grade at arrival, origin of SAH, site of the aneurysm, timing of the operation, or sex or age of the patient.

The message of the study is clear: after SAH with satisfactory neurological recovery, many patients are not doing well; they have psychosocial problems, anxiety, and depression. The authors conclude that these symptoms are not caused by vascular, mechanical, or ischemic injury per se but, rather, are related to the experience of a life-threatening event in relatively young patients, perhaps without the possibility of adequate counseling. This is a reasonable explanation, and certainly more information, care, and prospective follow-up are needed to prove it.

There is increasing interest in research on this subject; two other articles on the topic have recently been published in *Neurosurgery* (1, 2), and there is no doubt that the late psychosocial and emotional complications of SAH have been undervalued in many outcome studies of SAH. Buchanan et al. (1) found that the majority of their patients with good surgical outcome reported elevated levels of psychological stress, and the authors emphasized that the patients' relatives reported even more severe problems. Both groups viewed the quality of life as worse than as assessed by the operating neurosurgeon. In the follow-up of their 89 consecutive aneurysmal SAH patients, Carter et al. (2) found symptomatic late depression in 36%. The important series of studies from Lund on neuropsychological outcome after early aneurysm surgery in the mid-1980s also showed psychosocial maladjustment after good neurological recovery in more than 30% (3, 4). The results of the present study confirm and define the magnitude of the disturbed quality of life.

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The present study assesses levels of anxiety and depression in survivors of SAH and attempts to relate these to various clinical parameters. Follow-up assessment was performed by interview of 70 SAH patients derived from a consecutive series of neurosurgical admissions, and 55 of these 70 patients also returned standardized measures of emotional outcome. The mean time between initial admission and follow-up assessment was 16.3 months (range, 14-23 mo). Interestingly, this study found that moderate to severe levels of anxiety were present in 40% of patients, and 20% experienced moderate to severe levels of depression. The standardized measures of anxiety and depression were not associated with severity of hemorrhage or other clinical variables, although anxiety was reported more frequently at interviews by those patients with a Fisher Grade 4 hemorrhage. Not surprisingly, both anxiety and depression were significantly associated with outcome indices, including decreased return to work and reduced engagement in social activities.

Although this study is not completely novel, because other groups have examined post-SAH depression and, to a lesser extent, post-SAH anxiety, the present study represents a large series of patients and was rigorously conducted. The results reported may have important implications for treatment of surviving SAH patients. However, further studies will be needed to determine whether treatment of such anxiety or depression in SAH patients improves functional outcome.

**Gary K. Steinberg**  
Stanford, California

Aneurysm surgeons dread the regular reminders we get from both the literature and our own patients' neuropsychologists and psychiatrists on how cognitively impaired our surgical "successes" actually are. This clinical study from Glasgow can now add to our own personal despair because it shows that approximately 40% of consecutive SAH survivors also experienced a significant anxiety disorder more than a year after surgery, and one in five was moderately to severely depressed. Interestingly, these emotional rather than cognitive disorders were not especially associated with severity of hemorrhage, and one could argue that less damaged and cognitively affected patients might worry more about their condition and future, especially if their primary treatment was endovascular coiling! (Perhaps that is why they are less cognitively impaired.)

The results are compelling and probably accurate, although worrisome and discrepant results were that more than 80% of patients had either severe SAH or intra-axial bleeding (Fisher Grade 3 and 4), yet an even greater percentage of the 84



eligible patients were in good neurological condition at presentation (World Federation of Neurological Societies Grades 1 and 2). But the good news is that, unlike memory and concentration deficits arising from brain damage, anxiety and depression may be treatable and reversible. This is an article we should send along to our colleagues who are treating our patients in rehabilitation.

**J. Max Findlay**  
Edmonton, Alberta, Canada

**T**his study shows that emotions may play a substantial role in the outcome of SAH. A considerable proportion of patients experienced moderate to severe anxiety and depression more than 16 months after SAH. The severity of these emotional disorders was not strongly associated with clinical indices of brain damage, suggesting that anxiety and depression result from the life-threatening experience of SAH rather than from direct consequences of brain damage. Anxiety and depression were associated with poor psychosocial recovery. In particular, anxiety seemed to complicate return to work and engagement in social activities.

The authors propose that anxiety and its adverse impact on recovery and quality of life can be treated better than physical or cognitive disabilities with relatively simple and low-cost means. The levels of anxiety and depression were measured with standardized questionnaires, which were returned by 52 of the 70 patients. However, all of the patients were interviewed, and on the basis of this information, the authors inferred that anxious and depressed patients were less likely to return the standardized questionnaires. Consequently, the prevalence of anxiety and depression was probably underestimated in this population, and similar bias has probably affected other studies. Severely anxious and depressed patients may refuse to participate in neuropsychological assessment and other outcome examinations. The findings of this study indicate that further efforts to clarify the role of emotional disorders in recovery are needed for the optimization of treatment, rehabilitation, and outcome after SAH.

**Juhani Vilkki**  
**Juha Hernesniemi**  
Helsinki, Finland

### **Resident Traveling Fellowship in Pediatric Neurosurgery**

The Joint Pediatric Neurosurgery Section of the American Association of Neurological Surgeons and Congress of Neurological Surgeons has established a traveling fellowship for residents in accredited neurosurgical training programs. The fellowship is intended to cover the traveling and living expenses for up to 1 month for a resident who wishes additional experience in pediatric neurosurgery during residency. The 1-month fellowship can be spent at any institution within North America to pursue an activity that broadens the resident's exposure to pediatric neurosurgery, including observation at a clinical or research center, participation in a research project, or any other relevant activity. Two fellowships per year are awarded on the basis of an evaluation by a committee of the Joint Pediatric Section. The maximum fellowship stipend is \$2500.

The application should include:

1. Statements defining the purpose of the proposed fellowship and an estimate of expenses that will accrue to the applicant;
2. Permission from the applicant's residency program director to pursue the 1-month fellowship if it is awarded;
3. A letter of acceptance from the pediatric neurosurgical program where the applicant will seek the fellowship.

The deadline for application submission is October 15, 2004. The completed application should be sent to:

R. Michael Scott, M.D.  
Department of Neurosurgery  
The Children's Hospital  
300 Longwood Avenue, Bader 319  
Boston, MA 02115

(or via email to: michael.scott@tch.harvard.edu)