Although a great deal is known about the epidemiology of acute stroke, including risk factors for occurrence and subsequent mortality, less is known about the long-term physical, social, and emotional dysfunction that may ensue. Recent studies suggest that between one-fourth and one-third of stroke patients experience persistent dependency in one or more activities of daily living (ADL's) by 6 months after their strokes. Information about social and emotional disabilities is less readily available, but these are probably more prevalent.

Despite conflicting evidence, elderly stroke patients seem to experience greater functional losses than do their younger counterparts, with as many as one-half suffering permanent loss of function. Since the incidence of stroke increases rapidly with age and since the elderly are major consumers of long-term care, it is critically important that we understand patterns of functional disability among this group of stroke patients as well as its effects on their families.

As part of a larger project examining the effects on family caregivers of providing home care for their elders with stroke, we sought to answer questions about the social and functional consequences of this illness: 1) How frequently do patients discharged to home enter nursing homes in the first year after hospital discharge, and conversely, how frequently do patients discharged to nursing homes return home in the first year? 2) What factors predict discharge to home after hospitalization for acute stroke? 3) To what extent does physical dysfunction persist after stroke?

Subjects and Methods

The study methods have been previously described. Briefly, all patients 65 years of age or older suffering a stroke were identified through a medical record review at 3 university-affiliated hospitals serving central North Carolina. To be eligible for the study, patients had to have suffered an acute cerebrovascular accident, have been community-dwelling prior to hospitalization, and have been discharged alive from the hospital. Once eligibility was established, we abstracted the following information from the hospital records of all eligible patients: demographic characteristics (age, race, sex, and marital status), comorbidity (other medical conditions), stroke severity (based on mental, speech, and physical deficits), functional status (Katz activities of daily living) discharge disposition (home or nursing home), and identity of the primary family caregiver.

Family caregivers were considered to be those who had primary responsibility for the care of the elder with stroke and who could be interviewed in their homes. They were given a structured interview an average of 11 months after patient discharge (SD = 2.8). Since maximum functional recovery has usually occurred by 6 months after a stroke and since adjustments to disability on the part of the patient, and to caregiving on the part of the family caregiver, should also have taken place by this time, the length of followup seemed adequate for the study's objectives.

We attempted to interview all family caregivers to examine the social and functional history of stroke during the year following hospitalization. The family caregiver interview included items covering 6 areas: 1) attributes of the caregiver and the caregiving setting, 2) health and functional status of the patient, 3) use of formal services, 4) quantity and quality of social sup-
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giving experience on caregivers, and 6) perceptions
about the caregiving process.

Chi-square analysis and, where necessary because of
small cell sizes, Fisher's exact test were used to test
for associations between categorical variables, with
p < 0.05 considered significant. Odds ratios were cal-
culated to determine the strength of associations.
Stratified analysis was also employed to examine
associations between two variables within a third.

To answer the question about predictors of dis-
charge disposition, we classified patients as inde-
pendent if they could independently perform all
ADLs. We also used the three-level variable as sug-
gested by Katz et al.11 Age (< 75 years vs. ≥ 75 years),
race (white vs. nonwhite), sex (male vs. female), and
stroke severity (mild vs. moderate−severe) were all
treated as dichotomous variables in our analyses. Fi-

nally, logistic regression was used to develop a best-
fitting multivariable model to predict functional status
of patients at hospital discharge on the basis of infor-
mation available at hospital admission.

Results

Of 147 stroke patients studied, 83 (56%) were men
and 64 (44%) were women. Their mean age was 75
years. There were 70 whites (48%) and 77 nonwhites
(52%), all of whom were black except 1, a Native
American. Seventy-six (52%) were married, while 71
(48%) were widowed, divorced, separated, or never
married. Prior to hospital admission the majority had
married. Prior to hospital admission the majority had
lived with others: 76 (52%) lived with their spouse
with or without others, 21 (14%) lived with their chil-
dren, 12 (8%) lived with other relatives, and 9 (6%)
lived with unrelated persons. Only 29 patients (20%)
lived alone.

Slightly more than half suffered strokes involving
the left cerebral hemisphere (53%). Almost all of the
others had strokes in the right hemisphere (42%) al-
though 7 had brainstem infarcts, and 1 suffered a cere-
bellar hemorrhage. The majority (79%) had no prior
history of stroke. Almost all of the remainder (25 of
31) had suffered only one stroke in the past. By the
time of hospital discharge, which occurred between
2 and 242 days after admission (mean, 28 days; median,
18 days; SD ± 32.5), more than one-third (36%) were
independent in all ADL's.

Patterns of Discharge Disposition

When discharged from the hospital, 119 of the pa-
patients (82%) returned home while only 27 (18%) en-
tered nursing homes or other institutions (1 was trans-
ferred to another hospital and subsequently lost to
followup). Of the entire group, the majority (86%) were
still at their original discharge location at the time
of followup. Of those originally discharged to home,
14 subsequently entered nursing homes. Of these, 2
returned home and remained there and 1 returned
home, reentered a nursing home, and returned home
once again before finally returning to a nursing home
to stay. Thus, a total of 12 from the home group en-
tered institutions seemingly permanently. On the other
hand, 7 patients originally in institutions returned to
their homes and remained there.

Predictors of Discharge Disposition

Based on evidence from the rehabilitation litera-
ture,13,14 we anticipated that patients returning home
would be more functionally independent than those
discharged to nursing homes. In fact, discharge to
home was strongly associated with independence in
ADL's. Only 1 patient completely independent in
ADL's entered a nursing home (he returned home after
1 week), although the majority of those who were
dependent were also discharged to home (Table 1).
Patient age, race, sex, and marital status were not
significantly associated with discharge disposition
(Table 2).

Because functional status was such a strong pred-
ctor of discharge disposition, the relations between pa-
tient characteristics known at admission and predis-
charge functional status were evaluated. Not
surprisingly, in the univariate analysis, stroke severity
and functional status were closely related. Patient age
and race were also significantly related (p < 0.01).
Younger patients and white patients were more often
functionally independent.

Logistic modelling was used to determine a best-
fitting model for factors related to patient functional
status and to evaluate the presence of a significant
interaction between stroke severity and a) age and b)
race. The best model, which explained 22% of the
variance, included only stroke severity and age. None
of the other variables (comorbidity, sex, race, and
marital status) nor the interaction terms remained in the
model.

Lastly, since functional status was such a powerful
predictor of disposition, we stratified patients by this
variable to explore the roles of other important but less
powerful variables. We examined only the function-
ally dependent group because all but 1 independent pa-
nent returned home. In the dependent group there was
a nonsignificant trend for both race (nonwhite) and sex
(female) to be associated with discharge to home (Ta-
Table 1. Relation of Patient Functional Status to Discharge
Disposition

<table>
<thead>
<tr>
<th>Disposition</th>
<th>Patient functional status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent</td>
<td>Independent</td>
</tr>
<tr>
<td>Nursing home</td>
<td>26 (30%)</td>
</tr>
<tr>
<td>Home</td>
<td>67 (70%)</td>
</tr>
</tbody>
</table>

Fisher's exact test, p < 0.01, odds ratio = 20.
Table 3. Relation of Race and Sex to Discharge Disposition Among Functionally Dependent Patients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Odds ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (&lt;75: ≥75 years)</td>
<td>1.32</td>
<td>0.52</td>
</tr>
<tr>
<td>Race (nonwhite: white)</td>
<td>1.50</td>
<td>0.34</td>
</tr>
<tr>
<td>Sex (female: male)</td>
<td>2.04</td>
<td>0.12</td>
</tr>
<tr>
<td>Marital status (married: not married)</td>
<td>1.75</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Elevated risk associated with being <75 years of age, nonwhite, female, and married.

Long-Term Followup

A total of 20 patients (18%) residing at home died, compared to 11 patients (34%) residing in nursing homes. Of the surviving 115 patients, 94 (82%) were residing at home at the time of followup; 21 (18%) lived in nursing homes. The 3-month total mortality rate was 14%; the 6-month rate, 19%. Of the deaths, 87% occurred by 6 months after the stroke; furthermore, 84% occurred in patients who were dependent in 3 or more ADL’s. The cause of death was ascertained from death certificates in 29 of the 31 deaths: 21 were attributed to cerebrovascular or cardiovascular events; 8 to a variety of other conditions such as sepsis or diabetic ketoacidosis.

Since 31 patients had died by the time of followup and another 15 lived too distant or lacked family caregivers, 46 patients and their caregivers were unavailable for further study. Caregivers of the remaining 101 patients were eligible for home interview, and 89 (88%) consented to participate. Thus, more detailed follow-up data for patients are limited to the 89 patients with participating caregivers. Table 6 shows characteristics of the original sample of patients and the follow-up sample. They are remarkably similar.

Caregivers reported that only 36 patients (40%) were functionally independent at followup. Thirty patients (34%) had been independent at hospital discharge. During the follow-up period 12 dependent patients achieved functional independence; 6 declined from independence to dependence.

Additionally at followup, while only about one-third of patients could walk unaided (36%), most could follow directions (74%) and had no difficulty speaking (64%). The health of patients had improved and the amount of care they required had lessened since discharge from the hospital in 52 cases (58%). Following discharge after the stroke 36% had been hospitalized; of these, the majority had been hospitalized only once (65%).

At the time of the interview, 75 patients were living at home and 14 resided in nursing homes. Most (84%) of the 75 community-dwelling patients lived with their family caregivers. Of note, 6 of the 14 in nursing homes had started out at home, but because of increasing debility, institutionalization ensued. Caregivers of stroke victims who had been institutionalized at any time since the stroke said that it was either because they (the caregivers) could not provide care (75%) or because either the physician or other health care personnel felt that this was the correct decision (25%).

When patients living at home were compared with those in institutions, several differences were noted. As expected, nursing home patients functioned poorly, with only 1 of 14 being independent in ADL’s, reflecting differences in functional status at hospital discharge between the institutionalized and noninstitutionalized groups. Although not different in cognitive functioning, the nursing home patients more often had speech impairments.

The majority of caregivers felt that, taking everything into account, the caregiving process was going well for them. For example, almost all (88%) could think of something positive about the experience. Nevertheless, they also reported negative aspects of caregiving that stemmed from changes that caregiving and the stroke had made in their lifestyles; changes that had occurred as a result of changes in the patient’s personality, behavior, and cognitive functioning; or problems that resulted from the patient’s physical limitations. Loss of leisure time activities because of fear, shame, and dysfunction was a central issue.

Discussion

Our findings demonstrate that most elderly patients who suffer a stroke return to their homes after a stay in the acute care hospital and remain there. A higher percent of our patients continued to be community-dwelling than has been reported by others.4,6 This may

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Odds ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonwhite</td>
<td>1 (3%)</td>
<td>10 (22%)</td>
</tr>
<tr>
<td>White</td>
<td>30 (97%)</td>
<td>35 (78%)</td>
</tr>
</tbody>
</table>

Fisher’s exact test, $p = 0.02$, odds ratio = 8.57.

Table 4. Relation of Race to Discharge Disposition Among Married Patients

Table 5. Relation of Sex to Discharge Disposition Among Unmarried Patients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Odds ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonwhite</td>
<td>6 (14%)</td>
<td>10 (37%)</td>
</tr>
<tr>
<td>White</td>
<td>37 (86%)</td>
<td>17 (63%)</td>
</tr>
</tbody>
</table>

$\chi^2$, $p = 0.02$, odds ratio = 3.63.
Table 6. Characteristics of Initial and Follow-up Samples

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Initial sample</th>
<th>Follow-up sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>83 (56%)</td>
<td>50 (56%)</td>
</tr>
<tr>
<td>Female</td>
<td>64 (44%)</td>
<td>39 (44%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>70 (48%)</td>
<td>38 (43%)</td>
</tr>
<tr>
<td>Nonwhite</td>
<td>77 (52%)</td>
<td>51 (57%)</td>
</tr>
<tr>
<td>Initial functional status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent</td>
<td>53 (36%)</td>
<td>30 (34%)</td>
</tr>
<tr>
<td>Dependent</td>
<td>94 (64%)</td>
<td>59 (66%)</td>
</tr>
</tbody>
</table>

reflect variations in setting since many previous reports have been from European countries where cultural values, age structure of the populations, and organization of health care delivery systems are different. Our study was conducted in the rural southern United States during a time when the extended family provided extensive support to patients and caregivers.

Although the incidence of stroke is declining, it is still an important clinical and psychosocial problem for the elderly and their families. It may have its greatest effects in this age group because of less physiological resiliency and the greater likelihood of associated debilitating morbidity and functional limitations. On this substrate, even mild deficits from a stroke can have enormous functional consequences. Understanding the social and functional consequences for patients and their families is crucial, particularly since pressures to reduce lengths of hospital stay may mean that patients are discharged from the hospital before much functional recovery has occurred. This may be further compounded by the reluctance of many rehabilitation facilities to accept elderly patients. While the health benefits of rehabilitation therapy following stroke are unquestionable,12,13 that does not allow for functional recovery to occur and for the education and mobilization of families.

Similar to findings in the rehabilitation literature,14,15 we observed that functional status was the most powerful predictor of discharge disposition following an acute hospital stay. Nevertheless, functional status was not a perfect predictor of disposition. Attitudes of families and desires of patients also undoubtedly influence decision making.

Another key finding of this study was the high prevalence of persisting functional dependence associated with stroke in this elderly population. A challenge to clinicians and researchers is to identify modifiable factors so that appropriate interventions can be developed to promote functional recovery of patients and to minimize the effects of persisting dysfunction on them and their families. Interventions must be targeted at both patient and family caregiver if optimal outcomes for both are to be achieved.

While providing important information about the consequences of stroke for the elderly, several limitations of this study should be considered. First, the data were collected retrospectively from secondary sources: medical records and family interviews. Second, the study was undertaken in the rural south prior to the advent of DRG’s (diagnosis-related groups). Nonetheless, since many other studies have been performed in other countries and have not focused on elderly patients, it provides useful information for health care providers and researchers in this country. Further prospective studies that focus on groups of stroke patients in different cultural and social settings are needed. Such investigations will provide the rationale for interventions that maximize functional recovery, both during and following hospitalization for acute stroke.

References

Key Words: stroke • disability • social history
The social and functional consequences of stroke for elderly patients.
R A Silliman, E H Wagner and R H Fletcher

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