

# Effect of Acute Stroke Unit Care Integrated With Care Continuum Versus Conventional Treatment: A Randomized 1-Year Study of Elderly Patients

## The Göteborg 70+ Stroke Study

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**Background and Purpose**—The aim of the study was to compare the effect of conventional treatment with the effect of acute stroke unit care integrated with geriatric stroke unit care continuum.

**Methods**—A 1-year study was undertaken with 2:1 randomization to stroke unit care or conventional care, with assessment by an independent team. The study was composed of 249 elderly patients (aged  $\geq 70$  years) hospitalized for acute stroke, without previous cerebral lesion and without recognized need of care. Main outcome measures were patients at home after 1 year, ability in daily living activities, health-related quality of life score according to questionnaire, death or institutional care, and death or dependence.

**Results**—One hundred two patients (61%) in the stroke unit and 49 patients (59%) in the general ward group were alive and at home after 1 year (95% CI  $-10\%$  to  $16\%$ ). There were no significant differences in daily life activities or quality of life. In patients with concomitant cardiac disease, there was a reduction in death or institutional care after 3 months in the stroke unit group compared with the group receiving conventional care (28% versus 49%, respectively; 95% CI  $-40\%$  to  $-3\%$ ). This effect did not remain after 1 year. Patients seeking care after 24 hours often had mild stroke and lived alone.

**Conclusions**—There was no effect on the number of patients living at home after 1 year, but after 3 months of stroke unit care, a beneficial effect was found on mortality and the need for institutional care among those with concomitant heart disease. This study involved patients who were considerably older than those investigated in previous randomized studies of acute stroke unit care; thus, these findings will contribute to the specialized register of controlled trials in stroke. (*Stroke*. 2000;31:2578-2584.)

**Key Words:** elderly ■ stroke management ■ stroke outcome ■ stroke units

The concept of providing care for stroke patients in organized stroke units has been investigated and debated for about 2 decades.<sup>1</sup> A number of studies representing a variety in patient selection, stroke management, and experimental design have been published.<sup>1-22</sup> When the present study was planned, it was obvious that more data demonstrating the value of stroke units were needed. In most of the previous studies, the mean age of the patients was  $<75$  years, although half of all first strokes occur above that age<sup>23</sup>; treatment allocation was not carried out on a strictly random basis in several studies<sup>1</sup>; and/or assessment of outcome was often not made independently of the in-study treatment.<sup>1</sup> The previous studies examined in principal the long-term effects of care at a dedicated unit, whereas the stroke service in the community is carried out by a number of caregivers, ranging

from acute care at the hospital to rehabilitation clinics, primary care, and others.

Accordingly, the present study was planned to study elderly patients with acute stroke. The aim was to compare the effect of conventional treatment with the effect of care at an acute stroke unit integrated with continued geriatric stroke unit care after discharge from the hospital.

### Subjects and Methods

The overall design was a prospective 1-year study with a 2:1 randomization to stroke unit care or to conventional treatment at general wards.

### Patients

Sahlgrenska University Hospital is both a secondary care and a regional hospital. The Departments of Medicine and Neurology

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provide residents in the catchment area with acute hospital care for acute stroke. Patients admitted to the emergency room at the hospital between February 1, 1993, and May 17, 1994, were consecutively evaluated regarding their eligibility for participation in the present study, with the exception of a period of 127 days, during which there were no available beds in the acute stroke units or there was a summer intermission.

The inclusion criteria were patients aged  $\geq 70$  years living in the catchment area with acute focal neurological deficit of no apparent cause other than that of vascular origin and willingness to participate in the study. Exclusion criteria were onset of symptoms  $> 7$  days before admission to the stroke unit, known cerebral lesion with recognized need of care, extracerebral or subarachnoid hemorrhage or brain tumor, coma, and indication of specialized management at the Department of Neurology; patients living in nursing homes or those who encountered no available beds in the stroke units were also excluded. Informed consent was obtained after oral and written information was given to the patient and/or his/her relative.

The internist or neurologist on call completed the inclusion forms and randomized the patients to treatment in a stroke unit or the general ward by opening a serially numbered sealed envelope (randomization in blocks of 10).

Eighty-seven patients with a mean  $\pm$  SD age of  $80.4 \pm 6.5$  years were excluded, and the most frequently occurring exclusion criteria were known cerebral lesion with need of care (53%), coma (20%), and likelihood of diagnoses other than stroke (20%).

### Stroke Unit Care

Stroke unit care was organized in a care continuum with 2 acute stroke units and 2 stroke units at geriatric wards working according to identical principles that had been agreed on. The acute and geriatric stroke units collaborated in terms of treatment principles, training, and work procedures. There were daily contacts between the acute and geriatric stroke units regarding individual patients in whom prolonged care was considered. The acute stroke units were located in a medical ward and in a neurological ward. The 2 acute units were similarly staffed and run. The management program was based on experience from previously published studies.<sup>10,11</sup> Thus, in principle, all patients were examined by CT (160 patients [96%]), ECG, and routine blood tests on admission. All patients underwent a standardized examination and a systematic observation of neurological deficits, blood pressure, and cardiac and pulmonary disorders. Body temperature, glucose levels, and fluid and electrolyte balance were monitored. Hypertension was not treated during the initial days except in the case of patients with very high blood pressure levels.<sup>24</sup> Antihypertensive therapy was given at discharge according to established guidelines (73 patients [44%] in the acute stroke unit group compared with 26 patients [31%] in the general ward group,  $P=0.056$ ). Glucose infusion was avoided in patients with hyperglycemia during the acute stage.<sup>25</sup> Antiedema agents were not used, but oxygen therapy was given in patients with decreased oxygen levels. Anticoagulants were used after careful individual evaluation in patients with embolic infarction or ischemic stroke in progress. Subcutaneous low-dose heparin was used to prevent venous thrombosis in patients with extensive paresis but with no sign of cerebral hemorrhage.<sup>26</sup> Follow-up data showed that 25 patients (15%) had received subcutaneous low-dose heparin in the acute stroke unit group compared with 3 patients (4%) in the general ward group ( $P=0.006$ ).

The members of each stroke unit team were a physician, a stroke nurse (who followed a modified primary nursing approach, including contacts with family members and social institutions), a physiotherapist, and an occupational therapist. A speech therapist was consulted when needed. There was a continuous program of education for all the staff at the ward directed to improve knowledge in the care of stroke patients. Active participation of family members was requested for all patients, and great emphasis was put on information. Each stroke unit was organized with a team approach to patient care and regular team conferences. Diagnostic and functional evaluations were made as soon as possible, and a treatment plan incorporating medical issues and rehabilitation was started immediately.

Careful discharge planning was practiced, and there was no limit to the length of time the patients could stay in the stroke units. However, patients who needed more than a few weeks of rehabilitation were referred to 1 of 2 geriatric stroke units working according to principles similar to those used at the acute stroke units. For patients who were discharged to their homes, the need of assistive devices and home assistance were evaluated and arranged. Contact was also established with primary care representatives.

### General Ward Care

The other patients were treated in 6 general medical wards. There was no standardized program for this treatment, and there were no extra resources for the management of stroke patients. CT of the brain was performed in 75 patients (90%). Physiotherapy and occupational therapy were given if prescribed by the physicians in charge. Follow-up data showed that physiotherapy and occupational therapy had been administered in 26 patients (15%) and 47 patients (57%) in the general ward group compared with 145 patients (88%) ( $P<0.001$ ) and 148 patients (90%) ( $P<0.001$ ), respectively, in the acute stroke unit care group.

### Measurements

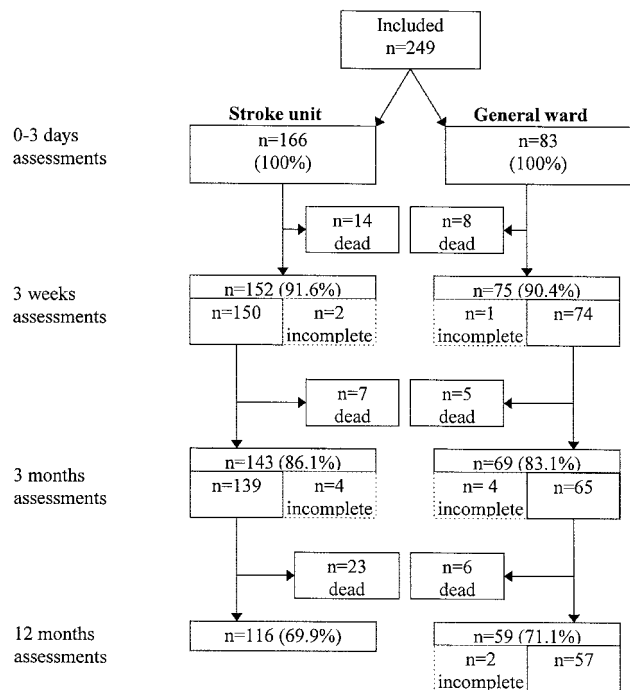
The Barthel Index<sup>27</sup> and the Sunnaas index of ADL<sup>28</sup> were used to assess the patient's ability to perform the activities of daily living. A neurological score developed by the Scandinavian Stroke Study Group was used to obtain a prognostic score and measure changes in neurological deficit.<sup>29</sup> These assessments, as well as examinations of vitality status and place of stay, were performed for all patients within 3 days of admission, after 3 weeks, after 3 months, and after 1 year. Health-related quality of life was evaluated with the Nottingham Health Profile questionnaire after 3 months and 1 year.<sup>30,31</sup> These measurements were made by 2 independent occupational therapists (L.C. and G.G.-H.), who were not employed by the departments in charge and who had not participated in the original design of the study or the treatment of the patients. The agreement between the occupational therapists in evaluation of ADL assessments was 0.94 by Spearman correlation coefficient for Barthel Index and Sunnaas ADL index and 0.97 for neurological score. The present study was approved by the ethics committee of the Sahlgrenska University Hospital.

### Statistical Analyses

The calculation of sample size was based on the results of a previous studies.<sup>11</sup> It was expected that 45% of the patients in the conventional care group would be at home after 1 year. Because it was assumed that 20% more patients would be at home in the stroke unit group, each group had to consist of 120 patients ( $\alpha=0.05$ ,  $\beta=0.20$ ). A 2:1 randomization to the stroke unit groups was applied to establish a continuous input of patients to these units. Such a procedure has only a marginal effect on the power of the study.<sup>32</sup> In the stroke unit group, 75% of the patients were allocated to the medical stroke unit, and 25% were allocated to the neurological stroke unit.

The primary outcome measure was the proportion of patients alive and at home after 1 year. The end points defined by the Stroke Units Trialists' Collaboration were also used<sup>1</sup>: (1) death or institutional care and (2) death or dependence, with the latter defined as Barthel Index  $< 95$ . ADL ability and quality of life measures were also compared. Subgroup analyses were performed for patients with mild, moderate, and severe stroke (Barthel Index of 50 to 100, 15 to 45, and 0 to 10, respectively, during the first 3 days) and for patients with cardiac disease.<sup>1,33</sup>

All results were analyzed according to the intention-to-treat principle. Differences between groups in the proportion of patients at home, deceased, or dependent were compared with the use of the Fisher exact test. The Spearman correlation coefficient was calculated when examining the agreement in measurements performed by the occupational therapists. A survival curve was calculated, and the difference was analyzed with the log-rank test. The Mann-Whitney test was used for comparing continuous variables, and the  $\chi^2$  test was



**Figure 1.** Data access after randomization. Incomplete data refer to missing information on ADL and health-related quality of life.

used for comparing proportions. When appropriate, 95% CIs were calculated. A value of  $P < 0.05$  (2-sided) was considered significant.

### Results

Access to data during follow-up is shown in Figure 1. Table 1 shows that the groups were comparable at entry except that a history of angina pectoris was more common in the stroke unit group. Two patients in each group did not fulfill criteria for acute cerebrovascular disease. Figure 2 shows that 80% of the patients in the stroke units at the acute and geriatric hospitals were discharged to their homes compared with 72% in the general ward group (95% CI -4% to 18%).

There was no difference between the groups in survival rates (Table 2 and Figure 3). The proportion of patients at home and the proportion of patients staying in institutions did not differ between the groups after 3 or 12 months (Table 2).

There were no significant differences between the groups in the neurological score or in the ADL scores during the study (Table 3). There were no significant differences in mean total Nottingham Health Profile scores between the stroke unit and general ward groups after 3 months (22.5 versus 23.9) or 1 year (23.2 versus 26.0). The combined end points of death or institutional care and death or dependence are shown in Table 4. Death or institutional care was more common after 3 months in the general ward group among patients with concomitant cardiac disease. A similar trend was found among patients with severe stroke, with a better outcome in the stroke unit group.

All included patients were living in their own homes, and no patient was transferred from other hospitals or clinics. One hundred ninety-seven patients (80%) arrived at the emergency room  $\leq 24$  hours after onset of the index stroke. Among the remaining patients arriving after 24 hours, the

**TABLE 1. Baseline Characteristics and Diagnostic Workup**

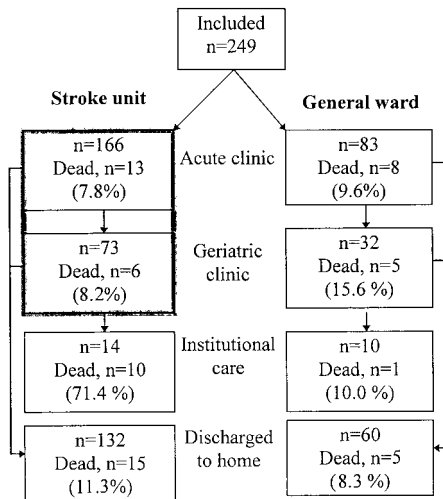
	Stroke Unit (n=166)	General Ward (n=83)
Female sex, n (%)	110 (66)	45 (54)
Mean age (all), y	80.1 $\pm$ 5.60	79.7 $\pm$ 5.50
Medical history, n (%)		
Myocardial infarction	34 (21)	13 (16)
Chronic heart failure	22 (13)	9 (11)
Atrial fibrillation	61 (37)	24 (29)
Angina pectoris	44 (27)	12 (15)*
Previous stroke	21 (13)	12 (15)
Transient ischemic attack	18 (11)	11 (13)
Intermittent claudication	6 (4)	6 (7)
Diabetes mellitus	37 (22)	14 (17)
Hypertension	62 (37)	26 (31)
Living alone (n=163/81), † n (%)	96 (59)	39 (48)
Physical examination at entry		
Lowered consciousness, n (%)	22 (13)	8 (10)
Neurological score before randomization, mean (median)	41 (45)	42 (46)
Side of predominant neurological deficit, n (%)		
Right	74 (45)	35 (42)
Left	85 (51)	37 (45)
Paresis (n=145/65), † n (%)		
Slight	74 (51)	31 (48)
Moderate	30 (21)	14 (22)
Severe	41 (28)	20 (31)
Speech disorder, n (%)	79 (48)	41 (49)
Systolic blood pressure, mm Hg	170 $\pm$ 30	170 $\pm$ 34
Diastolic blood pressure (n=163/83), † mm Hg	88 $\pm$ 16	87 $\pm$ 16
Final diagnosis		
Cerebral infarction, n (%)	155 (93)	74 (89)
Intracerebral hemorrhage CT, n (%)	7 (4)	4 (5)
Transient ischemic attack, n (%)	2 (1)	3 (4)
Other diagnosis, n (%)	2 (1)	2 (2)

Values are mean  $\pm$  SD or as indicated.

\* $P=0.036$ .

†Data are incomplete, and the numbers report assessed patients.

median delay between stroke onset and arrival at the hospital was 2 days, and there were 34 (21%) patients in the stroke unit group and 15 (19%) patients in the general ward group. All patients in the present study were randomized in the emergency room to stroke unit or general ward care and were immediately transferred to the assigned unit. The patients who arrived late, ie, 24 hours after stroke onset, had less severe stroke than those who arrived early, ie, within 24 hours (mild stroke, 31 [62%] versus 80 [41%] patients in the late and early groups, respectively; moderate stroke, 7 [14%] versus 51 [26%] patients, respectively; and severe stroke, 12 [24%] versus 63 [34%] patients, respectively;  $P=0.035$ ). Patients living alone were more often admitted late (n=34 [26%]) compared with those who were not living alone



**Figure 2.** Mortality rates after 1 year by discharge status after the index hospitalization. Bold frame indicates stroke care continuum.

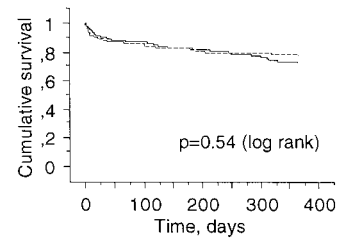
(n=15 [14%],  $P=0.02$ ) (Figure 4). Eight patients (5%) in the stroke unit group and 4 patients (6%) in the general ward group showed the combination of severe stroke and arrival >24 hours after onset. The patients who arrived 24 hours after the onset of stroke had no worse prognosis than those arriving within 24 hours in terms of mortality or the number of patients living in their own homes after 1 year (data not shown).

The mean length of stay after the index hospitalization was 28.3 (median 15) days in the acute stroke units integrated with a care continuum and 35.8 (median 10) days in the general ward group ( $P=NS$ ).

In the entire study group, venous leg thrombosis was found in 1 patient, pulmonary embolism occurred in 1 patient, and pneumonia was diagnosed in 14 patients (6%) during the acute index hospitalization. There was no difference in these incidence rates between the acute stroke units and general wards.

### Discussion

We continuously screened patients aged  $\geq 70$  years who were admitted to the emergency unit at our hospital with the clinical presentation of acute stroke and randomized 249 patients. The 2 different treatment arms were structured



**Figure 3.** Survival curves for patients in the stroke unit (continuous line) and general ward (broken line) groups.

stroke management with a care continuum versus conventional care. An independent team of 2 occupational therapists assessed the study outcome.

The results of the 1-year follow-up show that the structured stroke care program was not associated with a better outcome in terms of a greater number of surviving patients living at home, better ability to perform activities of daily living, or higher quality of life. Transient favorable effects on mortality and need of institutional care were observed after 3 months in patients with cardiac disease. A similar trend was also found in patients with severe stroke.

The stroke unit care in the present study was organized in accordance with established principles.<sup>1,10,11</sup> This program is associated with more careful examinations and better adherence to current treatment recommendations than is conventional care. Thus, compared with patients receiving conventional care, more patients in the acute stroke unit care received physical and occupational therapy, subcutaneously heparin was more often administered to prevent venous thrombosis, and antihypertensive therapy tended to be more frequently prescribed at discharge.

Three previous studies in the Nordic countries have used designs and treatment principles similar to those used in the present study.<sup>10,11,17</sup> A Norwegian trial demonstrated that stroke unit care up to 42 days after admission, with a follow-up period of 5 years, improved survival, functional state, and quality of life.<sup>12</sup> The other 2 studies demonstrated favorable effects on functional state and the need of institutional care but no effects on survival and only transient effects on health-related quality of life.<sup>10,17</sup> Compared with the patients in these 3 studies, the patients in the present study were an average of 7 years older and were more often women. Concomitant cardiac disease was very common in all the studies. There were considerable differences in the 1-year

**TABLE 2.** Number of Patients by Group at Home, in Institutions and Deceased After 3 wk and 3 and 12 mo

	3 wk			3 mo			12 mo		
	Stroke Unit Group (n=166)	General Ward Group (n=83)	95% CI	Stroke Unit Group (n=166)	General Ward Group (n=83)	95% CI	Stroke Unit Group (n=166)	General Ward Group (n=83)	95% CI
At home, n (%)	77 (46)	37 (44)	-11% to 16%	112 (68)	51 (61)	-7% to 19%	102 (61)	49 (59)	-11% to 15%
In acute hospital, n (%)	23 (14)	3 (4)	...	1 (1)	0	...	0	0	...
In geriatric ward, n (%)	45 (27)	29 (35)	-20% to 5%	17 (10)	12 (15)	-13% to 4%	3 (2)	2 (2)	...
In other wards, n (%)	5 (3)	5 (6)	...	0	0	...	0	0	...
In institution, n (%)	1 (1)	1 (1)	...	14 (8)	7 (8)	...	16 (10)	13 (16)	-15% to 3%
Dead, n (%)	15 (9)	8 (10)	-8% to 7%	22 (13)	13 (16)	-12% to 7%	45 (27)	19 (23)	-7% to 16%

**TABLE 3. Neurological Score and Ability in Daily Life Activities by Group 0–3 d After Randomization and After 3 wk and 3 and 12 mo**

	0–3 d		3 wk		3 mo		12 mo	
	Stroke Unit Group (n=161)	General Ward Group (n=80)	Stroke Unit Group (n=150)	General Ward Group (n=74)	Stroke Unit Group (n=139)	General Ward Group (n=65)	Stroke Unit Group (n=116)	General Ward Group (n=57)
Neurological score (range 0–48), mean (median)	32 (37)	31 (37)	39 (44)	37 (44)	42 (46)	41 (45)	43 (45)	41 (46)
Barthel Index score (range 0–100), mean (median)	44 (45)	42 (40)	71 (88)	67 (85)	80 (95)	79 (95)	82 (95)	76 (90)
Sunnaas ADL index score (range 0–36), mean (median)	13 (11)	12 (12)	22 (25)	20 (23)	25 (29)	24 (28)	26 (29)	24 (28)

mortality rates in the conventional care groups among these studies, decreasing from 41% in the oldest Swedish study, to 33% in the Norwegian study, down to 21% in the Finnish study, and to 23% among the much older patients in the present study.<sup>10,11,17</sup> These varying mortality rates may of course reflect differences in selection principles and regional variations. However, a plausible explanation is that overall management of cardiovascular diseases has improved over time and conferred prognostic benefit, because a considerable proportion of patients with acute stroke suffer from cardiovascular diseases or have risk factors for such diseases. Typical complications of acute stroke, such as pulmonary embolism or pneumonia, rarely occurred among the patients in the present study; they were treated either in the stroke units or in the general wards.

There are also a few studies that have included elderly patient groups with a mean age more similar to that in the

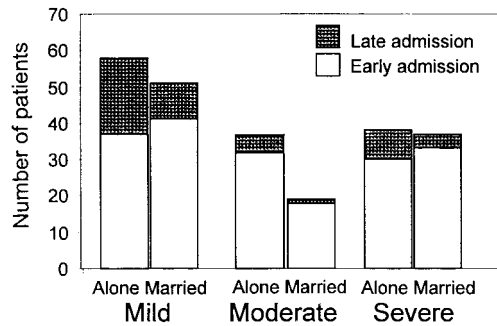
present study.<sup>15,18,22</sup> These studies have shown a beneficial effect of acute stroke unit care, although alternative designs with nonacute stroke units<sup>15,18</sup> or quasi randomization<sup>22</sup> were used.

Different degrees of severity of stroke among the studied patients may also influence the results. In the present study, 45% of the patients suffered from mild stroke according to a recommended definition.<sup>1</sup> Our results indicate that the beneficial effects of acute stroke unit care on mortality and dependence are mainly to be found in patients with severe stroke. Such patients constituted a minority in the present study, and the favorable effect in this group may have been overshadowed by the patients with less severe stroke, in whom no obvious effect was discerned. This explanation is supported by data from the meta-analyses showing that acute stroke unit care had no significance on death or institutional care in patients with mild stroke (95% CI, odds ratio 0.57 to

**TABLE 4. Combined End Points Given for All Patients Fulfilling Criteria for Acute Cerebrovascular Disease, Those With Mild, Moderate, or Severe Stroke, and Those With Cardiac Disease at Entry**

	3 mo			12 mo		
	Stroke Unit Group n (%)	General Ward Group n (%)	95% CI	Stroke Unit Group n (%)	General Ward Group n (%)	95% CI
<b>All patients (n=164/81)</b>						
Dead or institutional care	51 (31)	31 (38)	–20% to 6%	61 (37)	33 (41)	–17% to 10%
Dead or dependent	107 (65)	52 (64)	–12% to 14%	108 (66)	54 (67)	–14% to 12%
<b>Mild stroke (n=77/34)</b>						
Dead or institutional care	6 (8)	2 (6)		15 (20)	5 (15)	
Dead or dependent	32 (42)	10 (29)	–8% to 32%	34 (44)	13 (38)	–14% to 26%
<b>Moderate stroke (n=38/21)</b>						
Dead or institutional care	11 (29)	8 (28)	–35% to 17%	16 (42)	9 (43)	–28% to 27%
Dead or dependent	30 (79)	16 (76)	–20% to 26%	31 (82)	17 (81)	–21% to 22%
<b>Severe stroke (n=49/26)</b>						
Dead or institutional care	34 (69)	21 (81)	–32% to 9%	30 (61)	19 (73)	–35% to 11%
Dead or dependent	45 (92)	26 (100)	–16% to 2%	43 (88)	24 (92)	–20% to 11%
<b>Cardiac disease (n=98/39)</b>						
Dead or institutional care	27 (28)	19 (49)	–40% to –3%	33 (34)	18 (46)	–31% to 6%
Dead or dependent	62 (63)	28 (72)	–26% to 9%	63 (64)	27 (69)	–23% to 13%

Numbers are given for each randomization group. Institutional care was defined as any care except in an acute hospital. Dependence was defined as Barthel Index <95.<sup>1</sup> Mild, moderate, and severe stroke were defined as Barthel Index 50–100, 15–45, and 0–10, respectively, during first 3 d after randomization.<sup>1</sup> Cardiac disease was defined as angina pectoris, myocardial infarction, congestive heart failure, and atrial fibrillation isolated or in combination.<sup>34</sup>



**Figure 4.** Number of patients who were admitted within 24 hours (early) or after 24 hours (late) of stroke onset divided into those who were living alone or were not alone (married). Data are presented separately for patients with mild ( $n=109$ ), moderate ( $n=56$ ), and severe ( $n=75$ ) stroke. Information was lacking for 9 patients.

1.24) compared with patients with severe stroke, in whom there was a clearly significant effect of stroke unit care (95% CI, odds ratio 0.38 to 0.88).<sup>1</sup>

The interval between stroke onset and hospital admission may also affect outcome. We found that 80% of the patients arrived within 24 hours after stroke onset. Those who arrived >24 hours after stroke onset suffered mainly from mild stroke, a category of acute stroke for which stroke units have little impact on outcome.<sup>1</sup> There was also a small group of patients living alone and who suffered from severe stroke. These patients do not seem to have confounded the outcome of the present study because they were few and evenly distributed between the 2 study groups.

The sample size was calculated to give the study an 80% power to show that stroke unit care resulted in 20% more patients being at home after 1 year. However, this is a crude measure, because living at home may depend to a great extent on the access to supportive care. Therefore, we also analyzed the results according to the approach used by the Stroke Unit Trialists' Collaboration in their meta-analyses, ie, to analyze the effect on combined end points, such as death or institutional care and death or dependence, with the latter defined as Barthel Index <95.<sup>1</sup> These analyses indicated that in patients with severe stroke or concomitant cardiac disease, stroke unit care was more effective than general wards in preventing death or institutional care at the 3-month follow-up examination. Our data support the findings in the meta-analyses showing that stroke unit care reduced mortality or need of institutional care or dependence, especially among those with severe stroke<sup>1</sup> or in patients with cardiac disease.<sup>33</sup>

Our conclusion is that stroke unit care did not result in more surviving patients being at home after 1 year or improved ADL scores. However, the 95% CIs were wide, and an effect on mortality or institutional care after 3 months was indicated, in particular among stroke patients with concomitant cardiac disease or severe stroke. An additional finding was that there is a tendency among elderly patients with stroke to wait to seek hospital care after stroke onset, especially among those with mild stroke. The present study, involving patients who were considerably older than patients in most previous studies, will contribute to the specialized register of controlled trials of acute stroke unit care.

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