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MEDICO-SOCIAL CONSEQUENCES AND DIRECT COSTS OF STROKE IN A SWEDISH COMMUNITY

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ABSTRACT. Two hundred and eighty-one patients who had sustained a stroke for the first time were investigated in the municipality of Söderhamn, Sweden, and its rural surroundings. Of these patients 226 (80%) had lived in their own homes before the insult, while the majority of the remainder had lived in old people's homes. One hundred and eighty-nine patients survived for at least 3 months. The proportion of stroke survivors who were living at home was 53% after 3 months, 65% after 1 year and 68% after 2 and 3 years. The average number of days in hospital was 65 for men and 81 for women after 1 year and 111 and 181 respectively after 3 years. Only 11% were gainfully employed before the attack. This proportion varied between 1 and 10% in the 3-year post-stroke period. About 85% were retired, while the rest were receiving sickness benefit or a disability pension (4–16%). The direct costs of stroke per stroke patient in the municipality of Söderhamn, was estimated at 129 000 Swedish kr. (25 800 US dollars); index 1980. The major part of this sum consisted of charges for hospital care (43–46%), followed by charges for nursing care in old people's homes (16–24%) and home-helps (8–16%), during the 3-year follow-up. Disability pension or sickness benefit accounted for only 5–11%, auxiliary equipment for 1–6%, medication for 1–3% and out-patient care at the medical department for 1%. The cost of hospital care, which was dominated by charges for long-stay hospitals, increased by 32% (medical department) to 51% (long-stay department) during the period 1975–79.

Key words: Cerebrovascular stroke, costs, epidemiological survey, family, hospital care, out-patient care, placement, working capacity.

The social consequences of cerebrovascular stroke can at the outset be described in terms of high mortality and top ranking on the list of days spent in hospital (12, 15). However, the living conditions of stroke victims, including placement, is a product of many medical and social circumstances, for example residual symptoms, concurrent disease, family structure, and social and health services (4, 5, 7, 8). The working capacity is also dependent on several factors.

Of the total costs of stroke in the USA, it has been estimated that about 47% are direct costs, leaving 53% to be accounted for by indirect expenditures (1). In Sweden, there is a greater economic outlay for vascular diseases (15%) than for any other disease group. In 1975 this outlay was 11 217 million Swedish kr., of which 27% were direct costs (10). However, the costs for specified cerebrovascular stroke only constituted a part of this sum.

Detailed information concerning the above-mentioned factors is still sparse, especially from an epidemiological point of view. The present paper presents the placement, family structure and working capacity of stroke patients, as well as the direct costs of the disease, in a Swedish community.

METHODS

All patients who had sustained a stroke for the first time were registered in the municipality of Söderhamn during the period from 1 May 1975 to 30 April 1978. The population in this area, which consists of a small town with rural surroundings, was 32 000. The methods for tracing, registration and diagnosis have been described in detail elsewhere (15). Stroke was defined as "rapidly developed clinical sings of focal (and/or global) disturbance of cerebral function, lasting longer than 24 hours or leading to death with no apparent cause other than vascular". The term global mainly applies to cases of subarachnoid haemorrhage. All age classes, except children, were included. The number of new strokes was 281. The follow-up was ended in April 1979, which means that the time of observation varied between 1 and 4 years. Signs and symptoms and social data were recorded on special forms in the acute phase and at follow-ups after 3 months and 1, 2 and 3 years. The patients were treated according to the relevant principles for the Department of Internal Medicine at Söderhamn Hospital, including anticoagulant treatment in 49 patients (15). No intensive care was available for stroke patients. The rehabilitation was carried out at the above department in the vast majority (90%) of the patients; the other 10% were out-patients.

The costs of community services during 1975–79 were converted to the costs for 1980 according to the general price index, in order to eliminate the influence of inflation. The total costs of each type of social service were then

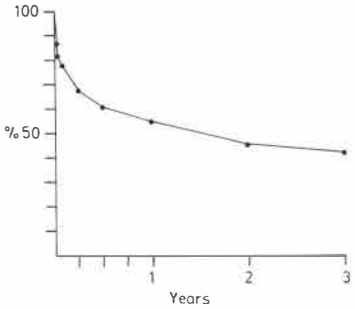

Fig. 1. The survival curve for 281 stroke patients in the community of Söderhamn, Sweden.

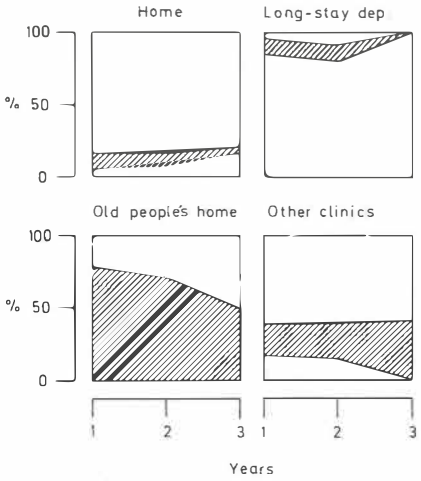

Fig. 2. The distribution of stroke survivors by time. Patients primarily released home (n=99); longstay department (n=22); old people's home (n=13) and other clinics (n=22) (rehabilitation, neurology, neurosurgery and psychiatry). Patients at home are represented by white areas (top), patients in old people's homes by striped areas and patients in hospital by grey areas (bottom).

divided by the number of patients observed in that period, giving a mean value per patient per year (5 Swedish kr. = 1 US dollar).

The statistical methods in the present study were Student's t-test for comparison of means and the chi-square test for comparing proportions. The results are compared with expected figures for hospital care in a standard population, with the same age and sex composition, in the municipality of Söderhamn. Information regarding the general population was provided by the National Board of Health and Welfare.

RESULTS

Social consequences

One hundred and eighty-nine patients (67%) survived for at least 3 months (Fig. 1). The majority of these (53%) had returned to their homes by this time. The proportion of patients living at home had increased to 65% after 1 year and to 68% after 2 and 3 years. Males lived in their own homes to a larger extent than females (Table I). This predominance was established already before the stroke. Thirty-seven percent of the patients were still in hospital after 3 months, while this frequency varied between 16 and 24% during the follow-up period. Ten per cent were living in old people's home at 3 months, whereafter this proportion varied between 7 and 17%.

A minority of the patients changed their address during the follow-up, which was complete for all of them (Fig. 2). Fewer than 20% of those who were sent home were found to be living in institutions subsequently. Also, fewer than 10% of those who had been placed in a long-stay department were living at home later on. None of the patients who were discharged to an old people's home were found in hospital during the follow-up; the tendency was rather the opposite, i.e. some had been sent to their own homes. The time-dependent distribution of patients discharged to other clinics (rehabilitation, neurology, neurosurgery or psychiatry) displayed a pattern similar to that of patients discharged home directly.

The duration of stay in hospital increased progressively during the period of observation and was significantly longer for women than for men (Table

Table I. *Proportion of stroke patients living at home at the time of registration and at follow-up*

	Registration	3 months	1 year	2 years	3 years
Men	136/154 (88%)	66/106 (62%)	66/86 (77%)	41/52 (79%)	14/21 (67%)
Women	90/127 (71%)	34/83 (41%)	34/68 (50%)	19/36 (53%)	14/20 (70%)
p-Value	<0.001	<0.001	<0.001	<0.05	>0.1

Table II. *Accumulated duration of stay in hospital (mean value) for stroke survivors during the period of observation*

	Observation time		
	1	2	3 years
Men	65	106	111 days
Women	81	147	181 days
p-Value	<0.05	<0.01	<0.01

II). After 1 year the average number of days in hospital was 65 for men and 81 for women. After 3 years it had increased to 111 days for men and 181 days for women. The accumulation was partly due to prolonged placement at the long-stay department and partly to readmissions to hospital. The average number of hospitalization periods was 1.6 in the first year and thereafter 0.5, compared to 0.3 for the standard population. The average duration of stay in hospital during the first year seemed to show a maximum in the age class 50–59 years (Table III). However, the shortening of the hospitalization period in the age class 70–99 years was due to a higher relative mortality. The time spent in hospital considerably exceeded the expected time for a standard population of up to 89 years of age.

The accumulated number of visits at the medical out-patient department increased during the study period. The individual range after 3 years was 0–27 visits with an average of 5.7 in patients receiving anticoagulant treatment and 3.4 in those given

Table III. *Average duration of stay in hospital (days) of stroke patients during the first year, as compared to the expected hospitalization for a standard population in the municipality of Söderhamn*

Age class (years)	All stroke patients (n=281)	Stroke survivors (n=154)	Standard population
30–39	16.3	24.0	0.9
40–49	25.4	30.7	1.5
50–59	113.8	102.9	1.9
60–69	81.5	92.1	5.1
70–79	69.5	81.9	11.5
80–89	71.0	134.2	34.7
90–99	19.8	–	74.3
30–99	72.2	92.7	16.4

Table IV. *Accumulated number of visits of stroke survivors to the medical out-patient department of Söderhamn Hospital*

Mean values and ranges (within brackets) are given for patients receiving anticoagulant treatment (n=49) and for those who were given standard therapy (n=232)

	Observation time			
	3 months	1 year	2 years	3 years
Anticoagulants	0.8 (0–4)	3.1 (0–10)	4.7 (0–11)	5.7 (0–27)
Standard therapy	0.6 (0–3)	1.9 (0–7)	2.7 (0–10)	3.4 (0–12)

standard treatment (Table IV). No comparable figures are available for the standard population. Additionally, patients having anticoagulant treatment were called for monthly checks of the Thrombotest® value.

The majority of stroke patients who survived for at least 3 months had relatives in the municipality of Söderhamn. The highest figure, 95%, was registered in women living at home and the lowest, 72%, in men placed in old people's homes. Forty-eight per cent of the women discharged home were living alone before the insult, while the corresponding proportion of men was 21% (p<0.05).

Thirty-two out of 43 patients (74%) below 65 years of age were gainfully employed at the time of registration, constituting only 11% of the total number of stroke patients (Table V). Three patients were working 3 months after the insult and 10 (all men) returned at their previous work within 1 year. Five of these had physically strenuous labour (2 farmers, 2 fitters and 1 carpenter), while the rest were either blue (n=3) or white (n=2) collar workers. Three patients had experienced a major stroke, while 5 had had reversible ischemic neurological deficits and 1 was found to have had subarachnoid haemorrhage. The majority (85%) were retired, while the others had a disability pension, except for one person who was unemployed.

The time taken by helpers for assisting the stroke patients discharged home can be seen in Table VI. The individual range was 0 to 98 hours per week. Community help was utilized about 6 hours per week, while the district nurse spent less than 1 hour per week in the homes. Almost all patients received medication during the period of follow-up

Table V. *Income conditions before and after the stroke*
The figures represent percentage numbers of patients

	Before (n=281)	3 months (n=189)	1 year (n=154)	2 years (n=88)	3 years (n=41)
Gainfully employed	11	1	7	10	7
Sickness benefit	1	13	7	9	0
Disability pension	3	3	5	4	10
Old-age pension	85	84	82	78	83
Unemployed	(0.3)	0	0	0	0

(Table VII). A walking stick, walking frame or wheelchair was used by about 40%. Equipment for use in the household and for toileting had been delivered to 95% after 3 years.

Direct costs

The costs for medical care in the municipality of Söderhamn rose during the four years from 1975–79. The cost of in-patient care for one day in the medical department increased from 480 to 703 Swedish kr. (32%). The corresponding figure for care in the long-stay department was 51%. The general rise of prices in Sweden reached 45% during these years.

The average costs for care, according to the 1980 index, are given in Tables VIII and IX. The costs for care in "other clinics", are based on the costs for care in departments of rehabilitation, neurology, neurosurgery and psychiatry. The costs per patient for a single day in hospital in the medical department was 799 kr., in the long-stay department 475 kr. and in other clinics 905 kr. The accumulated number of days in hospital and the corresponding costs are presented in Table VIII and Fig. 3. Each patient was treated in hospital for an average of 72 days in the first year of observation. The corresponding figures for 2 and 3 years were 125 and 142 days respectively. The major part of these periods referred to nursing care in the long-stay department, except for the first year (Fig. 3). The cost for this latter treatment was proportionately less, or about half (43 225 kr.) of the total expenditure (85 996 kr.) for hospital care during the three years in question. Between 1 and 3 years there was a very small increase in the number of the days spent in the medical clinic. On the contrary, the costs for care in this department between 2 and 3 years seemed to be reduced. This finding was probably an artifact due to shorter treatment times during the first two years in the group of patients that were observed for 3 years.

The average, specified direct costs per patient are listed in Table IX. The total sum was 73 011 kr. in the first year, decreasing to 52 441 kr. in the second year and to 24 836 kr. in the third year. The account is dominated by the cost of hospital care, followed by the costs for care in old people's home, home-helps, auxiliary equipment, disability pension or sickness benefit, out-patient care at the medical department and medication.

The average direct cost for each of the 281 patients in this stroke population was estimated on

Table VI. *Time (hours per week) taken by helpers to assist patients discharged home*
Mean values and ranges (within brackets)

	3 months	1 year	2 years	3 years
Relative	15.6 (0–98)	15.4 (0–98)	12.0 (0–98)	9.8 (0–60)
Home help	7.2 (0–42)	6.0 (0–14)	6.0 (0–14)	5.1 (0–14)
District nurse	<1	<1	<1	<1

Table VII. *Proportions of stroke patients, in per cent, receiving medication and using auxiliary equipment for locomotion and for household tasks*

	3 months	1 year	2 years	3 years
Medication	93	92	87	97
Walking stick, frame and wheelchair	32	43	47	41
Equipment for use in household etc.	32	53	79	95

Table VIII. *Accumulated stay in hospital expressed as an average for each patient*
The costs are given in Swedish kr. according to the index of 1980

		1 year		2 years		3 years	
	Single cost	Days	Cost	Days	Cost	Days	Cost
Medical clinic	799/day	29.0	23 171	35.6	28 444	32.2[a]	25 727
Long-stay dept.	475/day	37.5	17 813	80.0	38 000	91.0	43 225
Other clinics	905/day	5.7	5 159	9.0	8 145	18.8	17 014
Total		72.2	46 143	124.6	74 589	142.0	85 996

[a] For explanation see text.

the basis of a mean survival time of 2 years and 7 months (=31 months) (15) and a price of 150288 Swedish kr. for 3 years (=36 months). Thus, the estimated figure was about 129000 Swedish kr. (25800 US dollars). The yearly cost for stroke patients in the municipality of Söderhamn was then calculated to be 12 million kr. (380 kr. per inhabitant), as the registration of patients extended to 3 years.

DISCUSSION

The long duration of hospital care after a stroke, which is especially prolonged for women, is the dominating social consequence of this condition in the municipality of Söderhamn. The family structure is characterized by a fairly large number of people living alone before the stroke, while on the other hand, the vast majority have some relative in this municipality. It is also impressive that a large majority of the stroke patients were retired already before the attack, which reduces the quantitative loss of productive work. The direct costs for each stroke patient are considerable. The incidence of stroke has been calculated to be 2.50 per thousand inhabitants in Sweden, after adjustment for differences in age and sex composition between the population of Söderhamn and that of the whole country (15). The crude sum of direct costs for stroke in the whole of Sweden will then be about 520 million dollars. This may be compared with the total direct costs for all vascular diseases, which have been estimated at 605 million dollars for 1975 (10). However, the costs in Söderhamn were converted to the costs of 1980, which were 49% higher than those of 1975. Moreover, different

Table IX. *Direct costs of cerebrovascular stroke for 281 patients in Söderhamn 1975–79*
The cost is expressed as an average for a single patient. The mean survival time was 2 7/12 years. Index = 1980

	Single cost	0–1		1–2		2–3 years	
	(Swedish kr.)	Kr.	(%)	Kr.	(%)	Kr.	(%)
Hospital care							
Medical clinic	799/day						
Long-stay department	475/day	46 194	(63)	28 411	(54)	11 377	(46)
Other clinics	905/day						
Out-patient care							
Anticoagulant treatment	517/visit						
Standard treatment	377/visit	890	(1)	414	(1)	309	(1)
Old people's home	214/day	11 730	(16)	12 490	(24)	5 576	(22)
Home help	46/hour	5 869	(8)	5 513	(11)	3 934	(16)
Disability pension/ sickness benefit	72/day	3 165	(5)	3 429	(6)	2 638	(11)
Auxiliary equipment		4 184	(6)	1 264	(2)	105	(1)
Medication		952	(1)	920	(2)	897	(3)
Total		73 011	(100)	52 441	(100)	24 836	(100)

Sum for 2 7/12 years: 129000 kr.

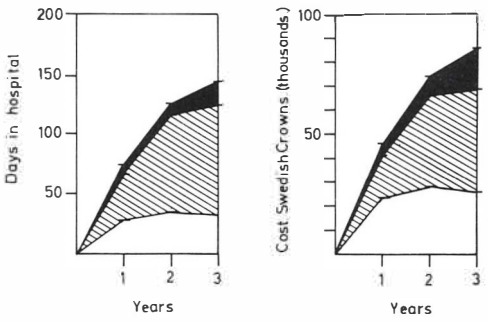

Fig. 3. The accumulated duration of stay in hospital and the corresponding costs expressed as an average for each stroke patient. Grey areas (bottom) represent the medical clinic, striped areas the long-stay department and black areas the other clinics (rehabilitation, neurology, neurosurgery and psychiatry).

methods have been used for the calculations. Taking these limitations into consideration, it would seem that the bill for cerebrovascular stroke exceeds that for most other diseases in Sweden. The direct costs for stroke in Massachusetts, USA, were estimated to be about 23 000 dollars per stroke survivor in 1975 (11). This figure, however, is not directly comparable to the present one of 25 800 dollars. First, inflation was 49% during the years 1975–80. Secondly, patients who died in the early course of the disease were not included in the American study.

The major part of the direct costs consists of charges for hospital care. Patients with cerebrovascular diseases of all types account for about 10% of the bed-days in the Uppsala medical care region (12), in which the municipality of Söderhamn is included. The use of hospital care facilities after a stroke most probably varies in different countries, depending, for example, on the family structure and on the system of health insurance (13). In one part of the USA, only 60% of the stroke patients were treated in hospital in the seventies (3), compared to 90% in the present population. On the other hand, when the fee for nursing care in old people's home is added to the fee for hospital care, a proportion of 68–79% of the total expenditures is reached. This proportion is almost the same (74%), as that calculated by the National Survey of Stroke in the USA (1). In a South-British area, 60% of the stroke patients were treated in hospital (17), while in Melbourne, Australia, 80% were treated in some kind of institution (6).

Home-helps accounted for 8–16% of the direct costs, in spite of the fact that the great majority of these patients had relatives in the municipality of Söderhamn. The use of social services most probably varies with their availability. Moreover, the demands are not always related to the actual needs (9). The same may be true for the use of auxiliary equipment, which accounted for 1–6% of the direct costs. In the American survey the expenditure for aids and appliances was 0.9% of the direct costs (1).

About 30% of those in productive ages were able to return to work after 1 year. Similar figures have been reported from Finland and the USA. In the Finnish study, 30% had returned to an occupational status after 3 months (2). In Massachusetts, USA, the earning capacity after a stroke was estimated to be 49% (11). In Söderhamn the outlay for disability pension and sickness benefit was however limited to 5–11% of the direct cost yearly, as most patients were retired at the time of the stroke. The indirect costs, which are mainly constituted by expected future earnings, have not been calculated in detail. However, the total figure must be much lower than 50%, as only 10 persons were younger than 50 years at the time of the stroke. Also, almost all were wage earners with a fairly low income. Medication only accounted for about 150 dollars a year (1–3%), which moderately exceeds the average figure of 126 dollars for the ages in question in the whole population (14).

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