The Use of Medical Facilities for Cerebrovascular Disease Patients in a County of Western Pennsylvania

BY ROBERT R. CARPENTER, M.D., KENNETH D. ROGERS, M.D., AND DAVID E. REED, M.D.

Abstract:
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- A survey of hospital, nursing home, and death certificate records, and interviews with local physicians were undertaken in a county of 201,000 population. Data from these sources indicate that the incidence of cerebrovascular disease episodes requiring medical care is somewhat higher (particularly among the aged) than the incidence of cerebrovascular disease reported in the United States population. Each year, 385 patients per 100,000 population sought medical care for cerebrovascular disease; 37% of these patients died. One county resident in eight could expect to require care for cerebrovascular disease in the decade after his retirement. To care for the affected patients, one in 20 of the county's hospital beds and one in three of its nursing home beds were required. Including only the most easily identified direct costs, the care of patients with stroke in 1971 required $2,100 per patient and a yearly expenditure of $688,000 per 100,000 population.

Additional Key Words cerebrovascular disease incidence stroke incidence cost of medical care

Introduction

In establishing the Regional Medical Program, the Congress provided a national priority for investment in new kinds of care for patients with cerebrovascular disease. This priority was based on the importance of stroke as the Nation's third most common cause of death and on the assumption that certain new care programs, of value to the stroke patient, were not uniformly available to afflicted persons outside major medical teaching centers. The present study was undertaken to determine whether there were needs in a nonurban county of Western Pennsylvania for new or different kinds of medical care for cerebrovascular disease. The study assessed the magnitude of the cerebrovascular disease problem in the county and the efficacy of present medical management. The present report concerns the magnitude of the problem as indicated by numbers of persons affected, case fatality rates, care costs and medical facilities required for stroke patients.

Methods

The county studied has a population of approximately 201,000; 30% of the land area is rural and most of the population is supported by heavy industry. The county is in Appalachia; it is served by five general hospitals (three in the county and two at its borders), and by a large county facility for the elderly, including the elderly ill. Specialized metropolitan teaching hospitals and a rehabilitation institute are available by car within an hour.

Although "stroke" is not a specific diagnosis, the term is used here, as it was in the county studied, to indicate those conditions which are commonly considered as manifestations of the cerebrovascular disease. Six medical students surveyed hospital records, death certificates, and
nursing home records and interviewed local physicians in mid-1969. Certificates of deaths in 1968 of county residents specifying cerebrovascular disease (Eighth edition, International Classification of Diseases, Codes 430-434 and 436-438) as the primary causes of death were reviewed. A total of 235 such certificates were found. A search of 100 certificates of death from other causes revealed no other patients who died with cerebrovascular disease.

The five general hospitals serving the county register all discharged patients, by diagnosis, with the Hospital Utilization Project (HUP). In 1968, 1,040 patients were registered with the diagnosis of cerebrovascular disease; of these, 741 were residents of the county. Records of 12 county residents could not be located and 76 of those registered (10%) were not cases of cerebrovascular disease. (Most commonly, the record room coded physician's diagnosis “CVD” as cerebrovascular disease and review showed only cardiovascular disease.) Nineteen admissions were not identified by HUP, but were located by hospital record room librarians. Thirty-one strokes occurred in the county facility for the aged; records of these patients were added to the study.

Of 158 physicians from the county, 34 were asked to participate in a study interview. With the help of office records, they described their last five cerebrovascular disease patients. The following physicians were selected to be interviewed: (1) nine general practitioners and four internists responsible for the largest number of hospitalized stroke patients, (2) all 12 other internists in the county, and (3) nine other general practitioners chosen at random from the County Medical Society roster. Of the 34 physicians chosen for interview, three had moved from the county; one had retired; one refused the interview; and five were on vacation. The 24 physicians participating had cared for 40% of the hospitalized patients.

Death certificates indicated that county residents used nine nursing homes in the area in 1968. Records in eight of the homes, including 510 of the 558 nursing home beds serving county patients, were reviewed.

Results

**Identification of Stroke Patients**

From all sources it was estimated that, in one year, physicians diagnosed and treated stroke in 774 county residents (table 1). Records of 696 hospitalizations, which were accepted in the study, reported the care of 642 patients; 45 patients were admitted more than once. Although more than 90% of hospitalizations were precipitated by new symptoms attributed to cerebrovascular disease, objective paralysis or sensory change was reported in only 402 cases (63%). Of the 642 hospitalized patients included in the study, 427 (66%) survived (table 1).

Of the 215 patients found by hospital record review to have died in county hospitals, one-third (72) were not identified by death certificates. On the other hand, no hospital record was found for 24 (14%) of 167 patients identified by death certificates as having died of stroke in one of the county's hospitals. Fourteen of these patients were dead on arrival at county hospitals and so no hospital record was prepared. No explanation was available for the failure to locate the records of the other 10 (6%), and they were omitted from the study. The death certificates identified 12 patients referred directly to hospitals other than those primarily serving the county, 16 patients (not previously admitted to the county's hospitals) who died in nursing homes, and 28 who died outside of institutions (presumably at home or work).

Of the 103 county residents treated for cerebrovascular disease in nursing homes in 1969, 88 were admitted from county hospitals. Fifteen other patients, admitted from their own homes, and two admitted from other nursing homes all survived. Physicians interviewed indicated that 4.5% of their last five stroke patients had survived at home without institutionalization (table 1).

**The Impact of Cerebrovascular Disease on the County's Medical Care System**

Of the 774 patients with cerebrovascular disease seeking medical care in 1968, 574 were cared for in the hospital; 88 patients required

<table>
<thead>
<tr>
<th>TABLE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>County Residents Requiring Treatment for Cerebrovascular Disease in 1968</td>
</tr>
<tr>
<td>---------------------------------------------</td>
</tr>
<tr>
<td><strong>Primary treatment</strong></td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Hospitals of county</td>
</tr>
<tr>
<td>Other hospitals</td>
</tr>
<tr>
<td>Nursing homes</td>
</tr>
<tr>
<td>Home</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

†Estimate from numbers dying in these hospitals.
§1968 death certificates.
**Includes 14 dead on arrival at county hospitals.

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both hospital and nursing home care; four required both hospital care and care in a rehabilitation facility. Thirty-one patients were cared for primarily in nursing homes, and 77 in their own homes.

The average length of 696 hospital admissions was 18 days, and so 12,528 hospital days were required for these patients. At 90% occupancy, 38 hospital beds were required. In one typical hospital with 244 beds, there were 191 admissions requiring 3,400 hospital days; an average of 10 hospital beds was needed year-round for these patients.

The average length of stay of 103 nursing home admissions was 134 days, and 13,800 nursing home days of care were required. At 90% occupancy, 42 nursing home beds were needed. Of patients admitted to nursing homes in the year preceding the nursing home survey, 33% died in the home; 41% were discharged alive; and 26% remained in the nursing home at the time of the survey. Of those dying in the homes, 79% did so within two months of their admissions; the median length of stay for these patients was 32 days, and only three survived more than 600 days. Similarly, 83% of patients discharged alive stayed less than two months in the home; their median stay was 48 days, and the longest stay was nine months. Half of the patients still in the home at the time of the survey had been there less than two months and the median stay by this group was 30 days. Of all nursing home admissions, only one in ten remained for more than a year.

Hospital records and physician interviews suggest that approximately one of ten patients hospitalized with a classic stroke, and discharged alive with residual motor weakness, is referred for posthospital rehabilitation procedures. Two of the county’s hospitals provide home care and outpatient physical therapy. These hospitals supplied 540 home visits to 35 stroke patients in 1969. Six other patients are known to have returned to the hospital after their discharge for outpatient physical therapy. The amount of physician time involved in the care of patients with cerebrovascular disease in the county is more difficult to estimate. The 24 physicians interviewed estimated that they saw an average of 17 (two to 50) new stroke patients yearly.

Discussion

Since some county residents with stroke may not seek care every year, this study must underestimate the prevalence of disability from “stroke.” Nor does the study reflect the incidence of newly symptomatic cerebrovascular disease, since the duration of symptoms of the identified patients is often not clear. Nevertheless, from the point of view of those planning for and providing medical care in the county, the number of patients identified was of interest since it indicated the number with “stroke” requiring the attention of the medical care system: 385 patients per 100,000 population per year.

The mortality rate for the county population calculated from death certificates (only the primary diagnosis is coded in Pennsylvania) and corrected for age is 115/100,000, slightly higher than rates reported for the U. S. population (table 2). In contrast, mortality in the county, estimated from all available records, for white males age 35 to 74, is 141/100,000. This is less than the mortality (193/100,000) in a careful study of cerebrovascular disease mortality in Denver, Colorado, and Denver is a low incidence area in the United States.6,7

The incidence of episodes of cerebrovascular disease requiring medical care has been reported before.8–13 The rate reported here was 3.8/1,000 with all cases included and 2.7/1,000 if only patients with acute paralysis are included. Both rates are higher than those reported from Middlesex County, Connecticut.10 In table 3 is shown a comparison by age of the incidence of total episodes of cerebrovascular disease in this study and in the Mid-Missouri Survey.11 Like mortality, the incidence of disease requiring care in the study

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Males County</th>
<th>U.S.A.* County</th>
<th>Females County</th>
</tr>
</thead>
<tbody>
<tr>
<td>35–44</td>
<td>11</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>45–54</td>
<td>41</td>
<td>26</td>
<td>34</td>
</tr>
<tr>
<td>55–64</td>
<td>139</td>
<td>180</td>
<td>103</td>
</tr>
<tr>
<td>65–74</td>
<td>301</td>
<td>402</td>
<td>383</td>
</tr>
<tr>
<td>75–84</td>
<td>1,565</td>
<td>2,480</td>
<td>1,445</td>
</tr>
<tr>
<td>85+</td>
<td>3,735</td>
<td>5,150</td>
<td>3,796</td>
</tr>
<tr>
<td>All</td>
<td>103</td>
<td>105</td>
<td>110</td>
</tr>
</tbody>
</table>

*Reference 8.
TABLE 3
Episodes of Cerebrovascular Disease per 1,000 Population per Year, Mid-Missouri and Study County of Western Pennsylvania

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Mid-Missouri, major stroke</th>
<th>Study county, major stroke</th>
<th>Study county, all syndromes</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-34</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>35-44</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>45-54</td>
<td>0.9</td>
<td>1.8</td>
<td>1.6</td>
</tr>
<tr>
<td>55-64</td>
<td>3.2</td>
<td>7.8</td>
<td>6.6</td>
</tr>
<tr>
<td>65-74</td>
<td>9.6</td>
<td>18.0</td>
<td>13.9</td>
</tr>
<tr>
<td>75-84</td>
<td>23.7</td>
<td>64.0</td>
<td>39.5</td>
</tr>
<tr>
<td>85+</td>
<td>55.9</td>
<td>105.0</td>
<td>65.5</td>
</tr>
</tbody>
</table>

*Acute paralysis attributed to cerebrovascular disease, reference 11.

The county is high, even when hospitalized patients without paralysis are excluded. The incidence among the study county patients age 30 to 62 (1.9/1,000 population, including vague syndromes) is similar to the incidence in this age group (2.0/1,000) reported from Framingham, Massachusetts.12 The magnitude of the problem of cerebrovascular disease in the study county is indicated by the high risk of stroke in the decade after an individual's retirement at age 65. There is no previous history of stroke in 68% of hospitalized patients.1 It follows (table 3) that 68% of 18, or 12.2, patients/1,000/year will require treatment sometime in the ten-year period. Even in the ten years before retirement, the incidence is high; one in 19 persons will require treatment.

The costs involved in caring for patients with cerebrovascular disease are significant. Per 100,000 population, 348 hospital admissions were required and 6,233 days of hospital care were provided. The cost of this care can be estimated from the 1971 average daily cost for care in county hospitals, $72/day. In addition, only one in 19 patients without paralysis was expected to be at the rate of $28 per day, the cost of this care, ignoring additional professional fees, can be calculated. After hospitalization, 270 home visits were used by 18 patients and the cost of this (at $9.00 per visit) can be calculated.

Outpatient physician services can be estimated to be required at least once a year for each of the 244 surviving patients ($8.00 per visit). From these estimates, the yearly cost of care for stroke patients per 100,000 population must amount to more than $688,000 or $2,100 per patient; the real cost is estimated to be considerably higher; it would also include the expense of medication, special laboratory tests, referral, consultation, lost productivity, etc.

References

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