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# The Mureş–Uzhgorod–Debrecen study: a comparison of hospital stroke services in Central-Eastern Europe

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Stroke mortality is extremely high in Central-Eastern European countries. The high rate of risk factors and differences in health care services might be among the factors resulting in high stroke morbidity and mortality in this region. As only few prospectively collected information are available from this region, we decided to evaluate some characteristics of stroke services in neurological departments of a Romanian, a Ukrainian and a Hungarian city in the framework of the Mureş–Uzhgorod–Debrecen comparative epidemiological study. We registered demographic data, the absence or presence of the most important risk factors, and clinical signs on admission and at discharge. We recorded the application of various diagnostic methods, stroke treatment and recommendations for secondary prevention. Follow-up is planned after 30 days and after 1 year. The paper summarizes the methodology of this prospective epidemiological study of stroke patients hospitalized in neurological departments in Târgu Mureş, Uzhgorod and Debrecen, three Central-Eastern European cities in Romania, Ukraine and Hungary, respectively.

## Introduction

Comparing trends in 27 countries, Bonita *et al*. (1990) found that in the period of 1970–85 countries of the former Eastern block had the highest increase in stroke mortality. Although in some of these countries, like in Hungary, stroke mortality rates started to decrease in the last decade, in others, like Romania and Ukraine, the trend is either high and stable or still increasing (WHO, 2000). Decreasing trends in stroke mortality in Western countries were assumed to be associated with a better control of risk factors, especially hypertension and it has also been reported that although stroke mortality has decreased, the total number of strokes (i.e. incidence) was stable or even increased (Harmsen *et al*., 1992; Brown *et al*., 1996). We might assume that the decrease in stroke mortality is at least because of the decrease in stroke severity: a better control of risk factors could have resulted in a tendency of increase in milder strokes in countries with effective primary prevention.

In the present study, we set forth to establish a database of acute hospital stroke treatment in a region where such studies have been scarce if done at all. The database is designed in such a way that the most important demographic features and risk factors, the neurological signs at admission and at discharge, the applied diagnostic methods, and the acute treatment and recommendations for secondary prevention could be recorded. We also registered whether the patient was discharged home or to another setting. Follow-up is planned after 30 days and after 1 year. According to the recommendations for such studies (Brainin, 1994) this first paper in this project summarizes the methodological issues of this database.

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## Method of data collection

A standard case report form (CRF) was developed and used in the languages of the participating countries. To find a balance between the amount of information to register and the time available, a four-page form was designed. The first page has the most important demographic data, the risk factors and the category of the cerebrovascular disease. In the second and third pages admission and discharge conditions are recorded: neurological signs, blood pressure and heart rate. The last page contains information on the application and results of diagnostic methods, on the specific treatment for stroke, on recommendation for secondary prevention, on discharge conditions and follow-up information.

Data collection started after an initial training for the participating physicians on 1 October 1999 and patient inclusion lasted for 1 year, until 30 September 2000. We

planned to include data of all consecutive patients hospitalized for acute cerebrovascular disease in neurological departments in three cities: Târgu Mureş (Romania, 165 000 inhabitants), Uzhgorod (Ukraine, 126 000 inhabitants) and Debrecen (Hungary, 210 000 inhabitants). All the neurological departments included provided stroke services for the inhabitants of the three cities. These were the neurological departments of the university hospitals in all three cities, plus neurological departments of two other hospitals in Uzhgorod. Physicians (residents or young neurologists, supervised by the local project leaders) in each participating department were asked to fill in the admission part of the form immediately after admitting the patient with acute cerebrovascular disease. Neurologists in charge of the wards treating stroke patients were asked to fill in the discharge part of the form. The forms were collected by the study co-ordinators of the centres. The hospital registries were regularly checked to find if CRFs for each patient had been filled in. If missing forms were identified the form was subsequently filled in based on the patient documentation by a specially trained neurologist. In a previous study we tested and found that stroke scale scores could be estimated with acceptable reliability from medical records (Bereczki *et al.*, 2000). The patients did not have any diagnostic or therapeutic intervention specifically for this study, the aim of our survey was the evaluation of routine stroke care in the region.

## Demographic characteristics and risk factors

The patients' age, gender, identification number, the contact information of the patient and his/her nearest relative and his/her family doctor are recorded. Also registered was information on whether, at the time of stroke, the patient lived alone, with family, or in hospital/institution. The date and time of stroke onset and that of admission is also recorded. Information was collected on risk factors and medical history: diabetes, hypertension, previous stroke or transient ischemic attack (TIA), heart disease/arrhythmias, peripheral artery disease, psychiatric illness, alcohol consumption, smoking and history of stroke in the family.

Based on the physical examination and on the results of imaging studies the current acute cerebrovascular disease was categorized by the affected region and by the main stroke subtype as follows: affected region – right hemisphere, left hemisphere, brainstem/cerebellum, multiple areas; stroke subtype – ischemic stroke, parenchymal haemorrhage, TIA, subarachnoid haemorrhage (SAH), and other. Based on the recorded data a more detailed characterization of stroke subtypes will also be possible.

## Recording neurological status on admission and at discharge

Although stroke scales are not recommended to measure stroke outcome (van Gijn and Warlow, 1992), they are appropriate to use in clinical trials to evaluate stroke severity and to detect changes in clinical signs (Hantson and De Keyser, 1994). Physical examination for the study was performed on admission to the acute stroke unit and the clinical signs were scored on 19 items containing the items of the Mathew Scale (Mathew *et al.*, 1972), the NIH Stroke Scale (Brott *et al.*, 1989), the Orgogozo Scale (Orgogozo, 1989), the Scandinavian Neurological Stroke Scale (Scandinavian Stroke Study Group, 1985) and the Unified MCA Stroke Scale (Orgogozo *et al.*, 1992). In our previous study we found that all of these scales are sensitive enough to detect changes in neurological signs in the first week of stroke (Bessenyei *et al.*, 2001).

## Interrater comparison of scoring neurological signs by the scales

Unbiased intraclass correlation coefficients (U-ICC) via the analysis of variance method (Bartko and Carpenter, 1976) were calculated to evaluate interrater reliability for all stroke scales. The project leaders of the three centres of the study examined 23 patients and scored the 19 items of neurological signs independently. Thirteen patients were evaluated by all three, and a further 10 patients were scored by two examiners. Examination of the same patient by the two or three examiners was performed within 60 min. Interrater reliability for the four scales are summarized in Table 1. There was a good agreement among the scores given by the three examiners: U-ICC ranged from 0.85 for the NIH Scale to 0.96 for the Scandinavian Stroke Scale. Therefore, we concluded that severity of stroke signs can be compared among the centres by any of the scales.

**Table 1** Interrater reliability of the application of various stroke scales

| Scale | U-ICC* |
|---|---|
| MATHEW | 0.957 |
| SNSS | 0.963 |
| U-MCA | 0.947 |
| ORGOGOZO | 0.938 |
| NIH | 0.847 |

*$P < 0.005$.

MATHEW: Mathew stroke scale; SNSS: Scandinavian Neurological Stroke Scale; U-MCA: Unified Middle Cerebral Artery Stroke Scale; ORGOGOZO: Orgogozo Stroke Scale; NIH: National Institutes of Health Stroke Scale; U-ICC: unbiased intraclass correlation coefficient.

## Diagnostic interventions

To evaluate stroke subtypes and aetiology, cranial CT, carotid Doppler and cardiac evaluation (electrocardiography and echocardiography) are recommended tools (Hacke *et al*., 2000). Therefore, we found it important to record if such interventions were performed in routine practice. Before the CT era cerebrospinal fluid (CSF) examination was used to differentiate ischaemic and haemorrhagic strokes. Although CSF examination is not considered to be a recommended diagnostic tool in most stroke cases any more, we assumed that access to CT might be limited in some of the departments. For this reason we decided to record if CSF examination was performed. In addition to these, the results of other investigations were also recorded if performed (haematocrit, haemoglobin, white blood cell count, platelet count, serum triglycerides, cholesterol, HDL-C, LDL-C and plasma fibrinogen). No diagnostic or treatment intervention was done specifically for this study, for each routine intervention the verbal or written consent of the patient was obtained according to local regulations.

## Therapeutic interventions

Treatment given specifically for stroke as well as recommended secondary preventive measures were recorded. The CRF specifically included items on the application of heparin (or its derivatives), aspirin, ticlopidine or clopidogrel, mannitol, glycerol or other specified treatment, including surgery. The 'other' category was used to record thrombolytic, neuroprotective or any other treatment used for treating stroke in a given centre. For secondary prevention the recommendation for antiplatelet or anticoagulant treatment and carotid endarterectomy were recorded.

## Follow-up items

The status of the patient at discharge was recorded by the Glasgow Outcome Scale (Jennett and Bond, 1975). The living arrangement planned at discharge was recorded as at home alone, at home with family, discharge to other hospital or discharge to nursing home.

Follow-up was planned after 30 days and after 1 year. The Glasgow Outcome Scale and the living arrangement was recorded at both times. If the patient died the date of death was also noted on the CRF.

## Method of follow-up

The primary method for follow-up was a telephone call to the family or the family practitioner. Further information was obtained by checking the hospital electronic database. If information could not be obtained, a questionnaire was sent out to the patients by mail or through a personal visit to the patient's home.

## Method of data analysis

All data including risk factors, neurological signs, diagnostic tests, treatment and follow-up items were coded numerically in the CRFs. The data are entered in an electronic database as an Excel worksheet. The format of the database is the same in the three centres. Detailed data analysis will be performed by Statistica for Windows (version 6.0, StatSoft, Tulsa, USA).

## Discussion

As stroke is a major public health problem in former Eastern block countries, it is essential to have reliable information on current health care needs and practices. The optimal method to get accurate data is a population-based study. Of the three centres it was possible to perform such a study only in Ukraine (Mihálka *et al*., 2001). From that survey it is known that not all acute stroke patients are hospitalized and the hospitalized stroke patients differ in age and in stroke outcome from those who are treated at home. Therefore, a drawback of the current study is the lack of population-based data. The proportion of non-hospitalized stroke patients might differ from country to country, and might depend on local traditions and conditions. For example, by comparing stroke deaths in national statistical registries and hospital records in Hungary we estimated that in 1995 $<20\%$ of stroke deaths could have occurred outside hospital settings (Mihálka *et al*., 1999), whereas in West Ukraine about one-third of stroke patients are treated at home (Mihálka *et al*., 2001). In Romania, although the exact rate of hospitalization is not known, a considerable number of patients with mild stroke are never hospitalized but treated by neurological outpatient services. As a hospital-based survey, the current study is not appropriate to directly compare stroke incidence and mortality in the three centres and conclusions only on hospitalized patients can be drawn.

In spite of the disadvantages of hospital-based stroke studies, the present project will give accurate information on the current practice of stroke inpatient care in these three cities of Central-Eastern Europe. It will be possible to compare these data with other hospital-based stroke registries, e.g. with registries of countries with more favourable stroke mortality. The application of five frequently used stroke scales makes it possible to compare initial stroke severity with several other databases and the hypothesis might be tested if hospit-

alized strokes are indeed more severe in those countries where stroke mortality is higher. Characteristics of special patient groups (e.g. those with altered consciousness or those with aphasia) can be compared among the three centres as well as with other databases. Comparison of the distribution of various risk factors will also become possible.

In addition to research purposes the study will have direct practical use: the data arising from this study might help health care authorities in this region to define the most important measures for primary prevention, to accurately define hospital care needs for stroke patients, and to identify the most important issues in quality assurance in stroke care. Treatment in stroke units resulted in a more favourable outcome compared with treatment on general wards (Langhorne *et al*., 1993). The information of this study will provide information needed to organize stroke units and a more efficient health care system for stroke patients with the aim of decreasing stroke mortality in this region.

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