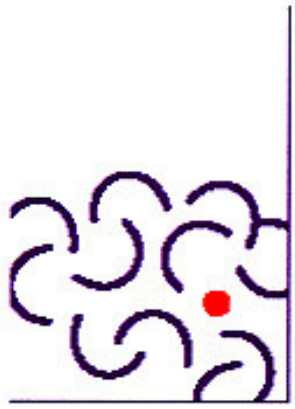

BELGIAN STROKE COUNCIL

PROPOSAL OF GUIDELINES FOR STROKE UNITS

On behalf of the Belgian Stroke Council

Philippe Desfontaines.; Geert Vanhooren.; Andre Peeters and Patrice Laloux

Address for correspondence

Ph Desfontaines, Geert Van Hooren, Andre Peeters, Patrice Laloux

Administrative address. Belgian Stroke Council

Serge Blecic

General Secretary of the Belgian Stroke Council

Department of Neurology. Free University of Brussels. Erasme Hospital

808 route de Lennik. B-1070 Brussels

Phone +3225553349

Fax +3225553942

Stroke is among the leading causes of death and disability in the European countries and in the United States of America. Improvement has been made in acute pharmacological interventions aimed chiefly at acute reperfusion (thrombolysis), neuroprotection of brain tissue in the ischemic penumbra and acute secondary prevention (antiplatelet therapy and anticoagulation). In addition, it is important to recognize the progress made in the more practical aspects of acute stroke organization and management. In particular, the development of stroke units also represents an acute approach that has been shown to significantly reduce mortality and morbidity after acute stroke (1). These guidelines discuss the setting for stroke units and the evidence that stroke units, incorporating expert multidisciplinary stroke teams, improve outcome after stroke and reduce hospital-associated costs.

A large amount of evidence is now available in the literature on the organization of stroke units. The following features of stroke unit will be discussed:

1. Emergency transport and arrival time of stroke patients
2. Emergency department triage
3. Hospital organization of acute stroke: Stroke Units
4. Geographic organization of Stroke Units
5. Organization and principles of the stroke team management:
    a) Acute care
    b) Early integrated neuro-rehabilitation

1. Emergency transport and arrival time of stroke patients (2, 3, 4, 5, 6, 7)

It is generally agreed that the great majority of acute stroke patients should be hospitalized in order to allow:

- Accurate diagnosis
- Acute interventional therapies
- Investigations that facilitate determination of stroke pathogenesis and treatment in a multidisciplinary setting including optimal acute medical care and coordinated neurorehabilitation

Short hospital arrival time is crucial or acute stroke therapy, due to a postulated short therapeutic window. Delayed arrival times remain a problem in most countries. Some studies showed that the medical delivery system for acute stroke could be substantially improved by a better collaboration between patients, relatives, primary care doctors, ambulance services and emergency departments of hospitals In the light of those studies, minimal hospital standards for acute stroke management should be availability of:

- 24-hour Emergency Department
- 24-hour CT scan
- 24-hour laboratory services
- Stroke Unit led by a neurologist or physician with stroke expertise, including a multidisciplinary stroke team with coordinated neuro-rehabilitation and discharge planning
- Doppler Ultrasound and angiography (Neuroradiology)
- Neurosurgical consultation
- MRI is strongly recommended

2. Emergency department triage (8, 9)

Some studies have shown that a quick triage of stroke patients in the emergency department reduces inefficiencies and delays and increases the proportion of patients eligible for acute stroke interventions. The presence of in-hospital treatment stroke teams could shorten the time from admission to examination and facilitate emergency management. The composition of the stroke team is discussed in the following section.

3. Hospital organization of acute stroke: Stroke Units (10 – 19)

The development of an acute Stroke Unit represents the single most important development in acute stroke management in recent years.

The benefits of stroke units measured by several randomized controlled trials are:

- Improvement of outcome, both mortality and morbidity, after acute stroke
- Improvement of diagnosis accuracy
- Facilitation of the introduction of new treatments
- Optimal setting for performing acute stroke trials
- Reduced length of hospitalization and earlier discharge to home or nursing home

Supported by a large number of studies, guidelines for the management of acute stroke have emphasized the importance of admission of patients to dedicated stroke units, based on level 1 evidence.

Although many models of stoke units have been described, it appears that the key components of the measured benefits are:

- A Stroke Unit located in a specific area
- A relative low technology care (non invasive monitoring facilities)
- A multidisciplinary stroke team

4. Most studies have involved geographically localized units with coordinated inpatient specialist care and a multidisciplinary team approach.

They showed that the benefits were due to an integrated approach linking acute therapy with early mobilization and rehabilitation including physical therapy, occupational therapy and speech therapy. The Stroke Unit Trialists' Collaboration identified 12 trials that compared specialist multidisciplinary stoke unit care with routine management in general medical wards. This analysis demonstrated a significant reduction of 23 % mortality at 1 year follow-up in the stroke unit patients. So, for every 100 patients treated in the stroke unit, five more returned home in an independent state, four fewer died, and one less was in institutional care after one year. Hence, there was no evidence that the improvement in case fatality rates was counterbalanced by an increase in severely disabled survivors. This overview supports the view that Stroke Unit care reduces length of hospital stay and might lead to some cost reduction.

Low technology care or intensive care model ? (20, 21, 22)

There is less evidence of benefit of a mobile stroke team operating throughout the hospital when compares to a localized stroke Unit. Most studies have involved localized stroke units equipped with relative low technology care including non-invasive computer assisted monitoring facilities. In contrast to those units, an intensive care unit management of stroke focuses on respiratory care with intubation and ventilation facilities, cardiac care and intracranial pressure management, as well as general nursing and neuro-rehabilitation. Admission in an intensive care unit may be appropriate for life strokes (in about 10 % of stroke patients). Stroke subtypes often requiring neurocritical care include acute proximal middle cerebral artery occlusion, basilar artery thrombosis, space-occupying cerebellar infarction or hematomas, large cerebral hematoma with intracranial hypertension, and subarachnoid hemorrhage. Stroke patients with concurrent medical conditions, including severe hemodynamic failure, myocardial infarction, severe aspiration pneumonia or renal failure, may also

benefit from admission in intensive care units. One study showed that 8% of ischemic stroke patients required elective intubation and only 20 % of them had a satisfactory outcome. Therefore, admission in an intensive care stroke unit is an expensive option for a small proportion of stroke patients, while relative low cost, non-invasive Stroke Unit care seems the most useful option in the vast majority of patients.

5. Organization: Stroke Unit and Stroke Team

According to the data reported by the Stroke Unit Trialists' Collaboration, a Standard Stroke Unit should have the following organization:

Stroke Unit of 4 beds:

- Admission of at least 100 stroke patients per year
- Equipment: 1 non-invasive computer assisted monitoring per bed, (arterial blood pressure, cardiac arrhythmia detection, and oxygen saturation measurement).
- Medical:staff
    - 1 full-time neurologist specially involved in stroke management, and 1 consultant physician expert in stroke rehabilitation
- Nursing:
    - Staff trained physical nurses used in the management of stroke in the acute phase
- Physiotherapy :
    - 1 physical therapist for motor rehabilitation sessions of 30 to 60 min. per day and per patient, 5 days a week
- Occupational therapy:
    - 1 therapist (ergotherapist) for cognitive and perceptual therapy sessions of 40 min per day, and 5 days a week.

- Speech therapy:
    - 1 therapist (Peech therapist and/or neuropsychologist)
- Social assistant: early discharge planning
- Education, training and quality control yearly workshops for nurses and therapists, weekly Stroke Unit seminars, patient and staff questionnaires, information to patients and relatives with leaflets and educational board.

Treatment of the acute stroke patient should include a protocol that starts in the emergency department. These clinical management plans should involve checklists including:

- Laboratory investigations
- Medical and nurses procedures
- Monitoring and therapy
- Multidisciplinary neurorehabilitation
- Family involvement
- Support and education
- Discharge planning.

Nursing care plan:

- Assistance with day-life activities
- Hygiene: according to the autonomy of the patient
- Mobilization: - as soon as possible
    - Special care for the paralyzed limb: the hand of the paralyzed upper limb must be placed above the elbow; ergonomic boots for the paralyzed lower limb to avoid "equine foot"

- Liquid balance: survey of the outcomes and incomes to avoid dehydratation or hyperhydratation
- Avoid glucose i.v. solution
- Feeding:
    - deglutition must be tested by a blue test before feeding the patients
    - Food must be adapted to the ability of deglutition
    - Survey of the gastric tube if necessary (checking of food injection, checking of the gastric residue, prevention of nose friction, rinsing of the gastric tube)
    - Close survey of patients with deglutition difficulties and correct positioning of these patients when eating
- Mouth care: twice a day to avoid infection
- Cutaneous necrosis prevention:
    - Supervision of the skin aspect
    - Prophylactic materials
    - At least changing of patient's position 3 times a day

Monitoring of vital parameters:

- Monitoring of oxygen arterial saturation, breathing, and use of aerosols, aspiration, if necessary
- Checking of glycemia 4 times a day during the first 48 hours in diabetic patients
- Changes in neurological status (Clinical score such as NIH score or European Score two times per day; consciousness, ...)
- Temperature measured every day and treat any infection as soon as possible
- Pain control

- Supervision of the catheter site
- Patient's education to autonomy, to emotional self-control

A number of studies have shown that the stroke team, using clinical management plans, can reduce post-stroke complications and acute hospital costs, chiefly due to reduced duration of admission , without increasing the number of investigations.

Conclusions

There is now clear evidence that treating acute stroke patients in a Stroke Unit, involving an expert multidisciplinary team can reduce stroke mortality and morbidity. All patients with acute stroke should be managed in such facilities, under the direction of a neurologist with a special interest and expertise in stroke management. Most patients can be managed in relatively low technology stroke units, but up to 10 % of acute stroke patients may require management in intensive care unit. In addition to the treatment of stroke using evidence-based medicine, the introduction of new therapies and clinical trials can be facilitated. Also, Stroke Units should involve close collaboration among expert doctors, nurses, and allied health disciplines in a coordinated team approach.

GUIDELINES FOR A STROKE UNIT

Minimal hospital standards for acute stroke management in a Stroke Unit should be:

1. A 24-hours Emergency Department recognized as a "100 service", including:

- 24-hour access to CT scanner
- 24-hour access to laboratory services
- Access to angiography and Doppler Ultrasound in emergency
- Access to MRI in emergency
- Access to neurosurgical consultation in emergency
- Access to neurological consultation in emergency
- Admission of at least 100 strokes patients per year

2. A localized Stroke Unit of at least 4 beds with individualized non-invasive computer assisted monitoring equipment patient including, arterial blood pressure monitoring, cardiac arrhythmia detection and oxygen saturation measurement.

3. A multidisciplinary stroke team including:

- A neurologist with stroke expertise for the acute treatment
- A coordinated neurorehabilitation team including a consultant physician interested in stroke rehabilitation, a physical therapist, an ergotherapist, a speech therapist and/or neuropsychologist
- A social department allowing planning of early discharge
- Facilities for continuous education, training and quality control.
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