



## Organisation of in-hospital acute stroke care and minimum criteria for stroke care units. Recommendations of the Belgian Stroke Council

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### Abstract

*There is ample evidence from randomized trials that for patients with stroke, stroke unit care is superior to care in general medical or neurological wards. This evidence, which has been adopted by international guidelines has to be implemented into daily stroke care. This consensus document prepared by the Belgian Stroke Council provides a set of minimum criteria to meet international standards for stroke care. It is intended to provide help in the creation of stroke units in centers who do not currently have one and to provide a benchmark for centres already having organised stroke care.*

**Key words:** Stroke; stroke units; organized stroke care; thrombolysis; endarterectomy; imaging of stroke complications of stroke.

### Introduction

The patient with suspected stroke or TIA is best cared for within a continuous stroke care pathway: this entails recognition of stroke symptoms by the patient and his environment, prehospital management, in hospital treatment and post-acute rehabilitation services (Langhorne and Dennis, 2004; Norrving and Adams, 2006). There is international agreement on the fact that there is still room for improvement in realising this goal (Heuschmann *et al.*, 2006; Leys *et al.*, 2007; Lindsay *et al.*, 2005; Rudd *et al.*, 2005; Scholte op Reimer *et al.*, 2006).

The focus of this document is on the in-hospital management (Alberts *et al.*, 2000). There is ample evidence from randomized trials that for patients with stroke, stroke unit care is superior to care in general medical or neurological wards (Stroke Units

Collaboration, 2000). The benefit extends to all groups of stroke patients (Terent *et al.*, 2009). Stroke unit care is cost-effective compared to other treatment strategies (Kalra *et al.*, 2005).

Research into stroke unit care originally defined a “stroke unit” as a *geographic location within the hospital designated for stroke and stroke-like patients staffed by a multidisciplinary team (medical, nursing, physiotherapy plus occupational and speech or language therapists, case manager or discharge planner or social worker) with a special interest and expertise in stroke care.* In these trials, stroke units provided both medical and neurological treatment and early rehabilitation services.

There is ample evidence that early stroke recurrence is common, that multiple medical tests are required to determine the etiology of the TIA or stroke in order to start adequate treatment, and that consequently early stroke prevention is highly effective. This evidence from randomized controlled trials, translated into guidelines has to be implemented into daily stroke care. Stroke units guarantee this adherence to processes of care and consequently improve patient outcome (Cadilhac *et al.*, 2004).

In Belgium there is large variability in the implementation of the existing international guidelines for the organisation of “state-of-the-art” stroke units. This leads to a striking heterogeneity in the quality of care for the stroke patient, while stroke unit care has been recognized by international organizations as a prerequisite for contemporary stroke care.

This document provides a set of minimum criteria to meet international standards (European Stroke Organisation, 2008; Adams *et al.*, 2007). It is

intended to provide help in the creation of stroke units in centers who do not currently have one and to provide a benchmark for centres already having organised stroke care. In addition to the minimum criteria, continuous quality monitoring is an essential characteristic to maintain high quality patient care and to prove value for money to healthcare providers. In 2002 the Belgian Stroke Council published a proposal of guidelines for stroke units (Desfontaines *et al.*, 2002). That document, which was not intended as a practical guide, has been revised and updated. The current document provides more practical guidelines. This document was created as a consensus statement among the members of the Belgian Stroke Council.

## ACUTE STROKE CARE UNIT Program

### 1. TARGET POPULATION

The target population of stroke and TIA includes patients with suspected or confirmed recent ischemic stroke, recent transient ischemic attack, cerebral venous thrombosis and certain patients with intracerebral haemorrhage and subarachnoid haemorrhage. Some patients with stroke should be transferred to the intensive care unit and bypass the stroke unit if ventilatory and circulatory support is required.

### 2. TYPE AND CONTENT OF CARE

The essential types of care provided in the acute stroke care unit program are early diagnostic investigations, therapeutic interventions, and multidisciplinary rehabilitation.

The types of care provided in this program are dynamic and can be modified according to evolutions in national and international therapeutic and diagnostic guidelines.

This document provides a minimum set of criteria that should be fulfilled by all hospitals willing to provide care for patients belonging to the target population.

The acute stroke care unit program provides at least the following interventions.

#### 2.1. Diagnostic investigations

- Urgent access to neurologic evaluation and to expertise of a neurologist, available within 30 minutes after hospital admission 24/7. Evaluation of the severity of the stroke by a standardized neurologic impairment scale (like the NIHSS) is required. The severity of stroke at

admission and age are the most important determinants of stroke outcome and allow correction for case mix in outcome evaluations in the setting of quality control measurement (Goldstein *et al.*, 2003; Jongbloed, 1986)

- Urgent diagnosis of ischemic stroke, cerebral haemorrhage, or subarachnoid haemorrhage obtained with brain imaging (at least CT scanner). (European Stroke Organisation, 2008; Adams *et al.*, 2007)
- In patients who are candidates for thrombolysis, the door to brain imaging time should be less than 30 minutes around the clock (Adams *et al.*, 2007)
- Early state of the art evaluation of extracranial carotid artery stenosis can be performed at least within 24 hours of symptom onset onsite. Rapid access to confirmatory tests (e.g. CT angiography, magnetic resonance angiography or intraarterial digital subtraction angiography) either onsite or in a hospital providing such services is available. An agreement with the Radiology Department for providing timely access to these services onsite or in an outside hospital is available and documented in a written protocol (European Stroke Organisation, 2008; Adams *et al.*, 2007)
- Access to magnetic resonance imaging (MRI) of the brain within 24 hours is required. If MRI is not available onsite an agreement with a hospital providing such services is arranged. A written agreement with the Radiology Department for providing access to MRI onsite or in an outside hospital is available. MRI can confirm the diagnosis of stroke and special conditions like arteriovenous malformation, cerebral venous thrombosis, dissection of the cervical arteries, etc... (European Stroke Organisation, 2008; Adams *et al.*, 2007)
- Access to a cardiologic expertise to identify cardiac sources of embolism using state of the art techniques is available 7 days a week during work hours. An agreement with the Department of Cardiology for providing timely access to these services onsite is available
- Early continuous monitoring of oxygen saturation, blood pressure, heart rhythm is available (European Stroke Organisation, 2008; Adams *et al.*, 2007)
- In patients who are candidates for acute stroke intervention 24/7 laboratory test results are available within 30 minutes after blood draw (blood platelets number, prothrombin time and INR) (European Stroke Organisation, 2008; Adams *et al.*, 2007)

## 2.2. Therapeutic interventions

- Standard stroke care and general care in dedicated stroke units, including the daily follow-up of neurological status and the rapid detection of medical or neurologic complications related to stroke, according to current guidelines (European Stroke Organisation, 2008; Langhorne and Dennis, 2004)
- Intravenous thrombolysis and other acute stroke interventions according to current treatment guidelines (European Stroke Organisation, 2008; Adams *et al.*, 2007)
- Early secondary stroke prevention according to state of the art guidelines (European Stroke Organisation, 2008; Adams *et al.*, 2007)

## 2.3. Multidisciplinary rehabilitation

A multidisciplinary team provides early rehabilitation services. This includes

- nursing care (fluid balance assessment, neurological monitoring, pressure-area risk evaluation, careful positioning and handling of the patient, avoidance of urinary catheters)
- systematic screening for and management of swallowing problems
- multidisciplinary team rehabilitation with formal multidisciplinary meetings (at least once a week), goal setting, discharge planning, involvement of carers in the care of the patient and close linking with nursing care and provision of information on stroke, stroke recovery and services

## 3. LOGISTICS AND ENVIRONMENTAL ELEMENTS

### 3.1. Environmental elements

In this section we detail the necessary hospital environment characteristics without which a stroke unit cannot be operational. The environmental elements required for the acute stroke care unit program are:

- Laboratory available around the clock
- Department of radiology with at least CT scan technology
- Department of cardiology
- Cervical artery ultrasonography laboratory
- Certified Emergency department
- Intensive care unit (ICU)

### 3.2. Logistics

In this section we detail the essential elements defining a stroke unit and its interaction with the environmental elements described above.

The stroke unit is a dedicated, geographically defined ward within the hospital where the target population is admitted. The stroke unit consists of two parts: one acute stroke monitoring unit and one post-acute stroke unit. In the acute stroke monitoring unit at least four beds provide 24-hour state of the art continuous monitoring of ECG, blood pressure, oxygen saturation and temperature monitoring. Most patients are initially admitted to the monitoring unit until stabilisation (minimum 24 hours), after which patients are transferred to the post-acute stroke unit beds where continuous monitoring of vital parameters is not required. A setup where the acute stroke monitoring unit is geographically embedded within the stroke unit is preferred. Due to the continuous inflow of new patients, a swift transfer from patients within the stroke unit from the monitored to the other beds is organized.

- A swift transfer from the emergency department to the acute monitoring beds is guaranteed
- Access to CT scan can be performed within 30 minutes after hospital admission in cases of acute stroke intervention
- Access to *Doppler and duplex* ultrasonography
- Access to state of the art cardiac examinations necessary to diagnose cardiac sources of embolisation
- Permanent access to ECG is available
- Access to state of the art imaging confirmatory tests for stenosis of vessels leading to the brain and brain imaging with MRI as detailed previously
- Access to intensive care unit accessible around the clock with state of the art equipment, including continuous monitoring of ECG, oxygen saturation, invasive or non invasive measurement of blood pressure, ventilatory assistance and intubation to provide care for any serious medical condition related to stroke when deemed necessary

For centers without MRI or advanced CT: In addition to the above requirements, the certified hospital for the acute stroke care program must have access within 24 hours to advanced imaging techniques like MRI in a collaboration with a nearby facility.

## 4. REQUIRED EXPERTISE AND MEDICAL AND NON MEDICAL STAFF

The multidisciplinary stroke team consists of medical and paramedical staff. The team is headed by a stroke program director who is responsible for

organising the stroke care pathway of which the above described stroke unit is a core element.

#### 4.1. Medical staff and expertise

The stroke program physicians fulfill the following criteria: (1) at least one year neurological training during residency, (2) participation (as an attendee or faculty) in at least 2 regional, national, or international stroke courses or conferences each year, (3) 5 CP continuing medical education (CME) credits each year in the area of cerebrovascular disease, and (4) updated NIHSS certification and Rankin scale certification. Every stroke center should have a designated medical director who has training and expertise in cerebrovascular disease. The director does not have to be a neurologist but should have sufficient knowledge of cerebrovascular disease to provide leadership and guidance to the program.

In order to provide the necessary continuity of acute stroke care, the medical team requires at least 2 stroke physicians, at least one of them being present in the hospital during the work hours. One of them is on call around the clock and able to be on the spot *within 30 minutes*.

A neurosurgeon can provide rapid (within 2 hours) consultation. If neurosurgical services are not available onsite, a written arrangement with a neurosurgical team from a nearby hospital is required to provide neurosurgical services. A written protocol is available for handling patients requiring neurosurgical expertise.

A vascular surgeon can be consulted within 24 hours. If vascular surgical services are not available onsite, a written arrangement with a vascular surgical team from a nearby hospital is required to provide vascular surgical services. A written protocol is available for handling patients requiring vascular surgical expertise.

A cardiologist can be consulted around the clock.

A physician expert in stroke rehabilitation is available.

#### 4.2. Paramedical staff and expertise

- A multidisciplinary paramedical team is present. This team consists at least of a physiotherapist, an occupational therapist, a speech therapist and a social worker. Some patients require the intervention of a neuropsychologist or a clinical psychologist. This team should meet at least once a week to discuss goal setting and progress of the patients with stroke
- Therapy should be tailored around the needs of the individual patient

- A general guideline on the amount of therapy each individual patient requires cannot be established but descriptive examples of the intensity and content of physical therapy have been published (Bernhardt *et al.*, 2004; De Wit *et al.*, 2005; De Wit *et al.*, 2006). Studies indicate a relationship between the intensity of therapy and outcome (Duncan *et al.*, 2005; Kwakkel *et al.*, 2004; Langhorne *et al.*, 1996)
- Nurses: No extra nursing is required for the non-monitored beds on the stroke unit. In order to provide permanent (24/7) stroke nursing, the monitoring unit based on a 4-bed unit requires 5.75 full time equivalent nurses trained on a regular basis in stroke management
- All medical and paramedical staff should be trained at least once a year in stroke management

## 5. QUALITY CRITERIA AND FOLLOW-UP

### 5.1. Requirements for quality of stroke care

Quality of stroke care requires:

- Interdisciplinary meeting group once a week documented in a log book
- Organisation of an annual teaching course for nurses and paramedics
- Availability of a written care protocol for acute stroke intervention and standard stroke management
- Availability of a written care protocol for early secondary stroke prevention
- Follow-up of outpatients admitted to acute stroke unit ward in order to assess the outcome of stroke unit care should be performed at least once 3 to 6 months after discharge
- Registration into the SITS international registry ([www.acutestroke.org](http://www.acutestroke.org)) or equivalent registries of all patients who received an intravenous thrombolytic treatment

### 5.2. Cooperation with other stroke care programs

The hospital certified for the stroke unit care program must have a written agreement with at least one department of rehabilitation to transfer stroke patients that are beyond the acute stroke unit care phase.

### 5.3. Level of minimal activity

To ensure a high level of quality, the certified hospital must have managed on average at least 150 TIA or stroke patients per year on the acute stroke unit ward. On average, at least 5 patients per year are treated by intravenous thrombolysis.

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