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## Lombardia Stroke Unit Network Project

**Abstract** Stroke unit care represents the major advancement in stroke management and it is applicable to all stroke patients. The Lombardia Health-Care Program for the period 2000–2004 planned to implement new semi-intensive stroke units in order to guarantee access to such units to all stroke patients. As has happened in other countries, there is a need to coordinate and streamline the process of care in order to optimise resources and outcome. The aim of the Stroke Unit Network (SUN) project is the improvement of the quality of stroke care in the acute and post-acute phase, developing an efficient network between hospitals involved in stroke care in order to quickly identify patients' needs and to improve cultural exchange on clinical and therapeutic information between people involved in the process of care. A web-based network has been created connecting the Lombardia Stroke Units and the departments in which stroke units will be implemented; a website to facilitate the exchange of scientific data, the discussion of clinical problems, the sharing of research projects and results, and a web-based quality register in order to verify quality, efficacy and efficiency of stroke units participating in the project providing important, consistently available data to monitor progress in reducing the incidence of stroke and associated disability and mortality. The

Lombardia Stroke Unit Network Project, promoting and facilitating the exchange of know-how and collecting data on the quality of the processes of care provided, can significantly improve stroke care in Lombardia.

**Key words** Acute stroke • Network • Registry • Medical quality care

### Introduction

Stroke is the leading cause of disability, the second cause of death and the third cause of dementia throughout the developed countries and it represents one of the most important health-care and social problems of the 20th century.

An updated systematic review of clinical trials of stroke unit care has confirmed that stroke unit care is effective in reducing rates of death (3% absolute risk reduction), institutional care (2% absolute risk reduction) and disability (5% absolute risk reduction) in these patients [1]. Further corroboration of the benefits of stroke unit care has been derived from the data of the National Stroke Register in Sweden (RIKS stroke project), which documented that patients admitted to an organised stroke unit were more likely to survive and return home [2]. Stroke unit care represents the major advancement in stroke management and it is applicable to all stroke patients. Despite this scientific evidence, many hospitals do not have the organisation, personnel and equipment to triage and treat stroke patients according to current guidelines. The PROSIT (research PROject on Stroke services in ITaly) study, performed in 1999 to evaluate the number and work organisation of acute in-hospital services (stroke units) and general wards in seven Italian regions, was able to detect only 9 stroke units in Lombardia. The global results of the study however confirmed the superiority of stroke units in the care of stroke patients [3].

Moreover, in the last decade aggressive treatments of patients with acute stroke, such as the use of thrombolytic

\*A list of the scientific committee and participants is given in Table 1

medication, have been demonstrated to be able to reduce disability if implemented in a timely fashion and used consistently. In particular the use of rTPA within three hours of stroke onset has been shown to reverse or limit the effects of acute stroke. However, only a fraction of patients arrive at hospital in time to receive the treatment and about 3% of patients are treated with the appropriate thrombolytic agent [4].

On the basis of this evidence, the Lombardia Health-Care Program for the period 2000–2004 planned to implement new semi-intensive stroke units, named “Unità di Cura Cerebrovascolari”, directed by a neurologist with proven experience in the management of cerebrovascular diseases in this region in order to guarantee access to such units to all stroke patients.

As has happened in other countries, in Lombardia too there is a need to coordinate and streamline the process of care of stroke patients in order to optimise resources and outcome.

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### **The Stroke Unit Network (SUN) project**

The aim of the Stroke Unit Network (SUN) project is the improvement of stroke care quality in the acute and post-acute phase, developing an efficient network between hospitals involved in stroke care in order to quickly identify patients' needs and to improve cultural exchange on clinical and therapeutic information between people involved in the process of care. To reach these objectives the SUN project plans to:

1. create a web-based network connecting the Lombardia Stroke Units and the departments in which stroke units will be implemented;
2. create a website to facilitate the exchange of scientific data, the discussion of clinical problems, and the sharing of research projects and results;
3. create a web-based quality register in order to verify quality, efficacy and efficiency of stroke units participating in the project, providing important, consistently available data to monitor progress in reducing the incidence of stroke and associated disability and mortality;
4. create a web-based data-bank on the typology and equipment of the Lombardia Stroke Units in order to assign stroke patients to the department that will better respond to the patient's needs;
5. define and validate pre-hospital stroke paths in order to reduce the door-to-needle time and to increase the number of patients;
6. define and validate diagnostic and therapeutic in-hospital paths for stroke patients in order to optimise the compliance to the national guidelines for stroke;
7. quantify the dimension and characteristics of post-stroke disability in order to better define the typology

of the intervention required in the post-acute and rehabilitative phases and when patients go back home;

8. develop training courses for physicians and nurses involved in the process of care of stroke patients;
9. stimulate stroke research.

Up until now, steps 1–3 have been realised. A scientific committee has been inaugurated and 27 departments of neurology involved in stroke care/stroke units have joined the SUN project, as reported in Table 1.

The website has been implemented at the address [www.sunlombardia.mondino.it](http://www.sunlombardia.mondino.it). The web-based quality register has been developed and implemented on the website and its validation is in progress. It is quite different from the traditional stroke registry, which is focused on the epidemiology and aetiology of stroke, because it aims to provide a monitoring system for measures of clinical performance that support quality improvements in the delivery of care.

The development of national and/or regional stroke registries has been identified by the leaders in stroke care as a critical step to document treatment pathways, procedures and use of resources in the delivery of stroke care to objectively guide improvements in the quality of care [5].

Quality registers in other countries address issues similar to the Lombardia Stroke Unit Registry. The Risk-Stroke Registry, established in Sweden in 1994, provides feedback on the quality of care and outcome of patients treated in different typology of care (stroke unit, neurological ward, general medical ward) [2]. The Registry of the Canadian Stroke Network is a national prospective database that provides information about care and treatment given to stroke patients in order to collect the information necessary to Canada for best practice in stroke management ([www.canadianstrokenetwork.ca](http://www.canadianstrokenetwork.ca)).

The data elements of the Lombardia Stroke Unit Registry include patient-level information organised in domains that reflect the entire timeframe of the acute stroke episode from onset through treatment to follow-up. These are subdivided into:

1. emergency evaluation and treatment;
2. in-hospital evaluation and treatment;
3. discharge information;
4. post-discharge follow-up.

The emergency evaluation and treatment data set concerns patient-care activities that occur during the first few hours after the arrival at the hospital. Tracking these elements may lead to identification of the process that can delay the initiation of thrombolytic treatment.

The in-hospital data set may allow the monitoring of the quality of care during hospitalisation. The discharge and post-discharge data set may give information on patients' medical and functional status. The follow-up visit will be done 90 days after discharge.

Patient-level data elements contained in the Lombardia Stroke Unit Registry are reported in Table 2.

**Table 1** Lombardia Stroke Unit Network Project: scientific committee and participants

Name	Affiliation
<i>Scientific committee</i>	
Giuseppe Micieli (coordinator)	Direttore dell'UC Malattie Cerebrovascolari/Stroke Unit, IRCCS Fondazione Istituto Neurologico Casimiro Mondino, Pavia
Pietro Bassi	Direttore della Divisione di Neurologia, Azienda Ospedaliera San Carlo Borromeo, Milano
Giancarlo Comi	Direttore Neurologia, Neurofisiologia Clinica e Neuroriabilitazione, IRCCS Fondazione San Raffaele del Monte Tabor, Milano
Vittorio Crespi	Direttore dell'UO di Neurologia, Ospedale Civile di Vimercate
Roberto Sterzi	Direttore della Divisione di Neurologia, Azienda Ospedaliera Niguarda Ca' Granda, Milano
<i>Participants</i>	
Marco Poloni	Azienda Ospedaliera "Ospedali Riuniti" Divisione di Neurologia di Bergamo
Giampaolo Anzola	Ospedale Generale di Zona S. Orsola di Brescia
Mauro Magoni	Spedali Civili, Clinica Neurologica di Brescia
Luigi Bettoni	Azienda Istituti Ospedalieri di Cremona
Marco Arnaboldi	Azienda Ospedaliera "Ospedale S. Anna" di Como
Antonio Colombo	Azienda Ospedaliera "Ospedale Civile" di Vimercate, Presidio Ospedaliero Complesso di Desio
Davide Zarcone	Azienda Ospedaliera "S. Antonio Abate" di Gallarate
Dino Cittani	Azienda Ospedaliera "G. Salvini" di Garbagnate Milanese (MI)
Giuseppe Mariani	Azienda Ospedaliera "Ospedale Civile" di Legnano (Presidi Ospedalieri di Legnano – Cuggiano – Magenta – Abbiategrasso) Legnano (MI)
Giovanni Gariboldi	Azienda Ospedaliera della Provincia di Lodi, Presidio Ospedaliero di Lodi
Alessandro Romorini	Azienda Ospedaliera "Ospedale Civile" di Legnano (Presidi Ospedalieri di Legnano – Cuggiano–Magenta – Abbiategrasso) Magenta (MI)
Paolo Previdi	Azienda Ospedaliera "Carlo Poma" di Mantova
Elio Agostoni	Azienda Ospedaliera di Lecco, Presidio Ospedaliero Leopoldo Mandic di Merate
Marco Stramba Badiale	Istituto Auxologico Italiano IRCCS di Milano
Giancarlo Comi	IRCCS Fondazione San Raffaele del Tabor di Milano
Claudio Mariani	Azienda Ospedaliera "Luigi Sacco" di Milano
Pietro Bassi	Azienda Ospedaliera S. Carlo di Milano
Roberto Sterzi	Azienda Ospedaliera Niguarda Ca' Granda, Milano
Carlo Ferrarese	Azienda Ospedaliera S. Gerardo di Monza
Anna Cavallini	IRCCS Fondazione Istituto Neurologico Casimiro Mondino, Pavia
Fabio Frediani	Casa di Cura Policlinico S. Pietro di Ponte S. Pietro (BG)
Giampiero Grampa	Azienda Ospedaliera "Ospedale di Circolo di Busto Arsizio", Presidio Ospedaliero di Saronno
Iginio Votta	Azienda Sanitaria Locale di Sondrio, Presidio Ospedaliero di Sondrio
Giorgio Bono	Azienda Ospedaliera Ospedale di Circolo e Fondazione Macchi di Varese
Vittorio Crespi	Azienda Ospedaliera "Ospedale Civile" di Vimercate, Presidio Ospedaliero Complesso di Vimercate
Emilio Magrotti	Azienda Ospedaliera della Provincia di Pavia, Stabilimento di Voghera
Massimo Camerlingo	Policlinico S. Marco, Unità Operativa di Neurologia di Zingonia

**Table 2** Patient-level data elements contained in the Lombardia Stroke Unit Registry

Data elements	Items
Patient demographics	Date of birth Gender Race Fiscal code Phone number
ED evaluation and treatment	Date and time of arrival in ED Date and time of symptoms onset Date and time of neurological consult
• Triage	Type of image Date and time of image Image findings
• Initial brain image	
• Rankin scale mod. pre-stroke	
• NIHSS	
• Acute treatment	
In-hospital evaluation and treatment	Date of admission Hypertension, diabetes, hypercholesterolaemia, peripheral artery disease, smoking, dementia, previous stroke/TIA, previous myocardial infarction, atrial fibrillation, congestive heart failure, coronaropathy, valve prosthesis
• Current risk factors	ECG, coagulation screening, carotid, vertebral, peripheral duplex scan, transcranial Doppler, echocardiography, brain image, cerebral angiography
• Diagnostic procedures	Monitoring of vital signs, screening for dysphagia, TVP prophylaxis, mobilisation, naso-gastric tube placement, bladder catheter placement
• Procedures	Neurological, cardiac and medical Antiplatelet, anticoagulant
• Adverse events	
• Medical treatment	
• Invasive procedures/treatments	
• Rehabilitation treatment	
Discharge	Date of discharge
• NIHSS	
• Barthel Index	
• Rankin scale mod.	
• Discharge plan	
• Diagnosis	
• TOAST classification for ischaemic stroke	
• ICD-9 CM code	
• Medical treatments	
90-day follow-up	Date of follow-up
• Status	
• Cause of death (if indicated)	
• NIHSS	
• Barthel Index	
• Rankin scale mod.	
• Adverse events	

## Conclusion

The optimal improvements in stroke care will require improvements in community educational programmes, emergency and in-hospital evaluation and management of stroke patients and a systematic national programme for monitoring the quality of medical stroke care. The Lombardia Stroke Unit Network project, promoting and

facilitating the exchange of know-how and collecting data on the quality of the processes care provides, represents a valid tool able to significantly improve stroke care in Lombardia. It can also be considered a pilot study for the future development of a national stroke registry. In fact the realisation of a national registry, as suggesting by Wattingney et al. [5], could provide important, consistently available data to monitor progress in reducing the incidence of stroke and associated mortality and disability.

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