

Description and evaluation of an acute stroke unit

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Acute Stroke Team

Abstract

CLINICAL TRIALS HAVE DEMONSTRATED THE SUPERIORITY OF COORDINATED interdisciplinary stroke unit care over conventional treatment of stroke patients on general medical wards. The evidence is so strong that several national bodies have recommended that stroke unit care be widely implemented. Translation of these research findings and care guidelines into clinical practice, however, represents a challenge for health care systems unaccustomed to managing stroke in a coordinated manner. This report describes the organization, operation and outcomes of the Acute Stroke Unit at the Queen Elizabeth II Health Sciences Centre in Halifax. By replicating and adapting the core characteristics identified in the randomized trials, we have been able to demonstrate the effectiveness of stroke unit care in a routine clinical setting. Our experience may help facilitate the development of organized stroke care in Canada.

Randomized trials have shown that organized care of stroke patients by a coordinated multidisciplinary team — operating within a discrete stroke unit and capable of providing a substantial rehabilitation period, if required — is effective in reducing mortality and morbidity.¹⁻⁵ A recent study⁶ showed that the significant factors in a stroke unit “treatment package” included earlier mobilization, earlier use of ASA, more frequent administration of parenteral fluid and more frequent use of antipyretic and antibiotic therapy. Organized stroke unit care appears to benefit a wide range of stroke patients in many ways, reducing death from secondary complications and decreasing the need for institutional care through reduced disability.⁷

Despite this evidence, organized stroke unit care is not widely available in Canada,⁸ probably because of logistical barriers. For example, in a 1998 survey of acute care hospitals in Ontario, only 4% had a dedicated stroke unit.⁹ The purpose of this paper is to describe how the Acute Stroke Unit at the Queen Elizabeth II Health Sciences Centre (QEII) in Halifax has been able to provide effective care through replication and adaptation of the core characteristics identified in randomized trials.

Program description

The objective of our Acute Stroke Program is to provide optimal care for stroke patients and their families using an interdisciplinary approach to assessment, treatment, education and research. The program model, goals and anticipated long-term effects are outlined in Fig. 1.

The QEII is a 1073-bed teaching hospital in Halifax that provides primary and secondary care for about 300 000 people and tertiary care for about an additional 500 000. The Division of Neurology offers a 24-hour consultation service to the QEII Emergency Department. In general, patients who present with uncomplicated transient ischemic attacks (TIAs) or non-disabling strokes are not admitted to hospital. The Neurosurgery Service usually manages patients with subarachnoid hemorrhage. All other patients with suspected or confirmed acute stroke (including patients with intracranial hemorrhage not requiring surgery) are admitted to the

Review

Synthèse

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β See related article page 649

Acute Stroke Unit. Patients receiving thrombolytic therapy^{11,12} are admitted to the intensive care unit and are transferred to the stroke unit after 24 hours. On any given day, the average number of patients in the Acute Stroke Unit is 17 (range 9–25). This includes patients in the acute phase of their illness, those receiving early rehabilitation,

those awaiting transfer to an alternative level of care and those receiving palliative care.

The Acute Stroke Unit is located on an acute neurology ward that also houses a general neurology service managing patients with acute nonvascular neurological disorders. Different neurologists supervise the 2 services.

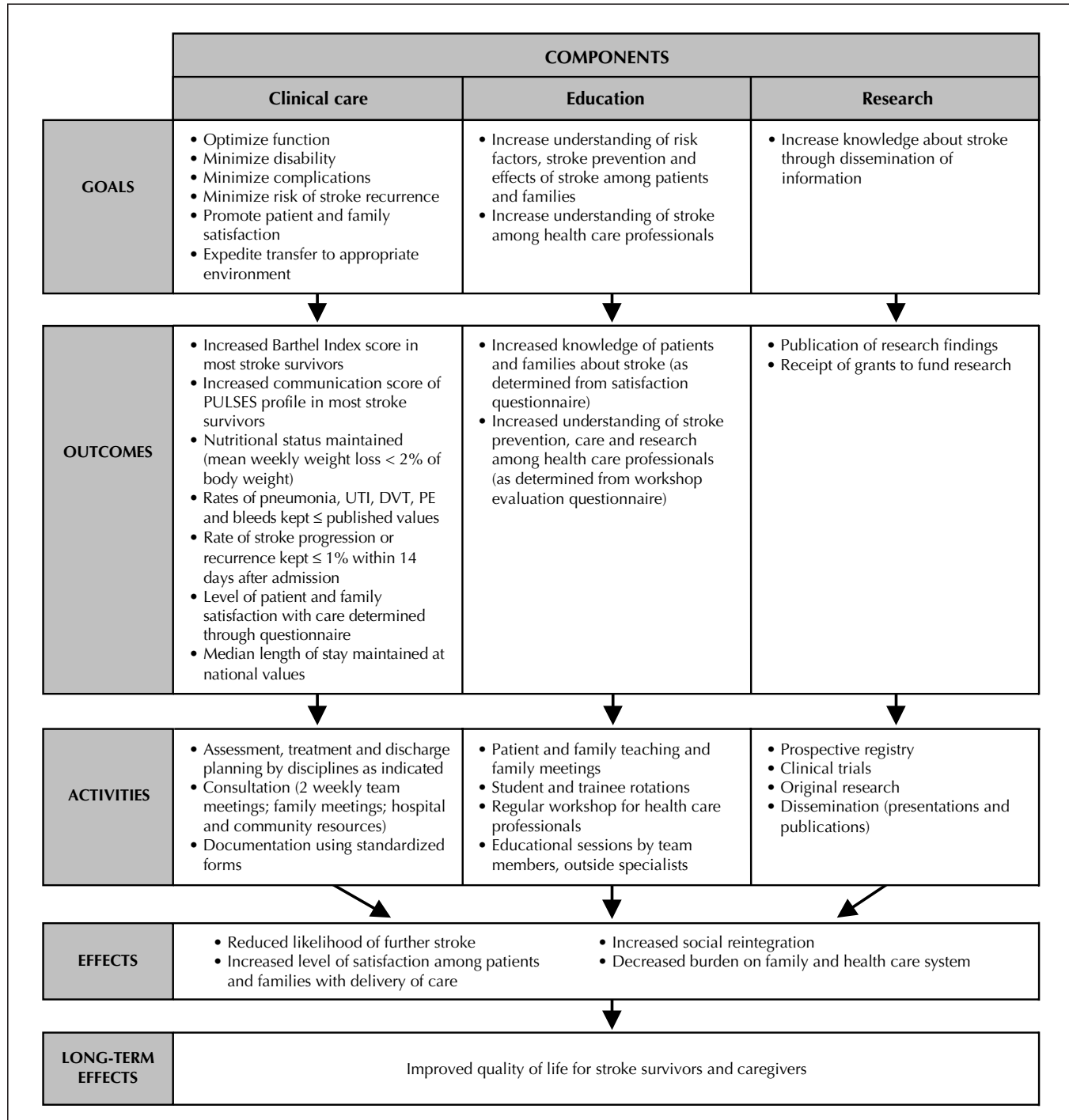


Fig. 1: Model of Acute Stroke Unit, illustrating connection between daily activities of interdisciplinary team and their long-term effects. PULSES = Physical condition, Upper limb functions, Lower limb functions, Sensory components (including communication), Excretory functions, Support factors;¹⁰ UTI = urinary tract infection; DVT = deep vein thrombosis; PE = pulmonary embolism.

The composition and roles of our interdisciplinary stroke team are shown in Table 1. Other stroke units have reported similar staffing levels.¹³ Some team members also provide care for patients in the general neurology service. The nursing staff comprises 75% registered nurses (25% with national neuroscience certification or a post-RN course in neuroscience nursing) and 25% licensed practical nurses. Nurses function as active members of the interdisciplinary team, facilitating a patient-focused model of care delivery. The patient-to-nurse ratio is usually 4:1 during the day and 7:1 at night. Individual team members are responsible to their department heads for meeting standards of care delivery. The team coordinator reports to the manager of the Neurology Nursing Unit. The attending stroke neurologist reports to the head of the Division of Neurology.

The physician who assesses the patient upon admission records the clinical findings on a standardized history and physical form adapted from the Royal College of Physicians stroke audit package.¹⁴ This form minimizes the amount of writing required and prompts the physician to consider the salient features of the clinical assessment. The use of such a form improves the recording of information¹⁵ and, in our experience, makes information more accessible to the stroke team.

A standardized admission orders form prompts the physician to consider all aspects of care and to select an appropriate course of action from a menu of options. For patients assessed within the first 3 hours after ischemic stroke, an eligibility checklist and standing orders form facilitate thrombolysis treatment.

By completing a single requisition, the physician can initiate interdisciplinary assessment and treatment by the team's dietitian, neuropsychologist, occupational therapist, physiotherapist, social worker and speech-language pathologist (Table 1). Pharmacy support is provided routinely. Pastoral care services are also available. Other disciplines such as physical medicine and rehabilitation, neurosurgery, psychiatry and clinical psychology are consulted as needed. The team meets twice weekly to discuss the status of each patient and to update the plan of care.

We maintain a prospective computerized registry of all cases of stroke and TIA admitted to the Acute Stroke Unit. Data summarizing demographic details, stroke type, lesion localization, stroke severity, functional status, complications, investigations and other information are recorded during the hospital stay by the team coordinator. At discharge the data collection form is removed from the patient's chart by a research assistant who checks the accuracy of the information and enters it into the database. The reg-

Table 1: Composition and roles of the Queen Elizabeth II Health Sciences Centre (QEII) Acute Stroke Team

Discipline	Role	Full-time equivalents*
Food and nutrition services	Assessment of nutritional status and requirements; collaborative assessment and management of swallowing disorders; implementation of appropriate diet plan; risk factor modification; patient and family education	1.3
Neurology	Diagnostic evaluation; medical treatment; prevention of stroke recurrence; patient and family education; staff and trainee education; research; program evaluation	0.5
Neuropsychology	Assessment of changes in cognition, behaviour and emotional status; evaluation of competency; development of intervention programs, including patient and family education; program evaluation; research	0.2
Nursing	Assessment and provision of care needs; support and education for patients and families; discharge planning	28.3
Occupational therapy	Assessment of personal and domestic care activities; evaluation and treatment of functional impairments related to change in sensorimotor, cognitive and perceptual abilities; prescription of wheelchairs and bathroom appliances; home visits; patient and family education	1.7
Pharmacy	Consultation for matters related to drug therapy; patient and family education	0.8
Physiotherapy	Assessment and treatment of motor functioning, including motor control, strength and physical conditioning; balance, gait and mobility retraining; home and community visits; patient and family education regarding mobility and safety issues	1.2
Rehabilitation medicine	Assessment of impairment, disability and handicap; recommendations for rehabilitation treatment; patient and family education	0.1
Research assistants	Case-finding, data recording and protocol execution; patient, family and staff education; research accounting and administration	4.0
Social work	Emotional and adjustment counselling for patients and families; assessment of patient, family and community resources required to facilitate discharge planning; referral to appropriate community agencies; patient and family education	0.8
Speech-language pathology	Diagnosis and treatment of acquired communication disturbances; collaborative assessment and management of swallowing disorders; patient and family education	1.1
Spiritual care	Supportive counselling; referral to appropriate denominational resource	0.8
Team coordinator	Organization of patient care rounds, administration meetings and educational sessions; data recording in registry	0.5

*Full-time-equivalents reflect resources at the QEII and do not necessarily represent recommended staffing levels.

istry is a useful clinical tool for program planning, research and quality assurance and audit purposes.

The stroke team has developed educational materials for patients and families to complement those published by organizations such as the Heart and Stroke Foundation. In-service training sessions concerning various aspects of the care of stroke patients are held regularly. For the past several years we have organized annual workshops attended by health care professionals from the Maritime provinces.

Table 2: Description of patients admitted to the QEII Acute Stroke Unit, 1997–2000 (n = 1284)

Variable	% of patients*
Mean age (and SD), yr	72.3 (13)
Female	48.4
Lived independently before stroke†	85.2
Admitted to Acute Stroke Unit in the year before current admission	3.7
Time from symptom recognition to first medical assessment at QEII	
< 3 h	35.7
< 6 h	50.0
< 12 h	59.7
Type of event	
Subarachnoid hemorrhage	0.2
Intracerebral hemorrhage	10.2
Transient ischemic attack	13.2
Ischemic stroke	76.4
Type of ischemic stroke‡§	
Total anterior circulation stroke syndrome	19.0
Partial anterior circulation stroke syndrome	32.8
Lacunar stroke syndrome	27.5
Posterior circulation stroke syndrome	18.3
Uncertain	2.3
Ischemic stroke treated with intravenous alteplase therapy§	7.6

Note: SD = standard deviation.

*Unless stated otherwise.

†Pre-admission Oxford Handicap Score 0,1 or 2.²⁸

‡Oxfordshire Community Stroke Project classification.²⁹

§Percentage based on the total number of patients with ischemic stroke (n = 981).

Revenues from the workshops are used to support the professional education of team members. Trainees from the various team disciplines rotate through the program.

We have participated in several clinical trials^{16–21} and have used our registry for original projects^{22–26} as well as for quality control and audit purposes. Our research is clinically oriented, focusing on treatment and outcomes. Our philosophy is to integrate patient care and research as much as possible. Research personnel contribute to the clinical, educational and administrative activities of the team, and team members participate in research projects.

Administration meetings are held every 2 to 4 weeks and provide team members with an equal opportunity to participate in the decision-making related to the functioning of the program. An annual 1-day retreat provides a forum for in-depth review of the program (including the registry data) and allows for strategic planning.

The administration and funding of the component parts of the are organized on a departmental basis. Research contracts and grants support our research personnel and registry. An economic analysis using data from the Stroke Unit Trialists' Collaboration indicated that stroke units are unlikely to consume extra resources and may even release some for use elsewhere.²⁷

Preliminary evaluation

Table 2 provides a summary description of the patients admitted to the Acute Stroke Unit between Jan. 1, 1997, and Dec. 31, 2000. During this time the in-hospital case-fatality rate was 13% (95% confidence interval [CI] 11%–15%). Table 3 summarizes stroke survivors' recovery of function and minimization of disability (as measured by change in Barthel Index scores^{10,32} between admission and discharge), length of stay in the Acute Stroke Unit and the proportion of patients discharged home.

We evaluated patient satisfaction by questionnaire during the autumn of 1999. The questions were constructed to obtain feedback related to program goals. The questionnaire was given to 34 consecutive patients just before discharge

Table 3: Recovery of function, length of stay and proportion discharged home among survivors of ischemic stroke and intracerebral hemorrhage, by stroke severity, 1997–2000

Stroke severity*	No. of patients	Function (Barthel Index)†				% of patients with improved function‡	Length of stay, d			% of patients discharged home
		In first week		At discharge			Mean	Median	Range	
		Mean	Median	Mean	Median					
Mild	185	87	100	92	100	28	8	6	0–55	84
Moderate	567	58	57	71	80	60	17	12	1–165	50
Severe	191	21	7	39	32	69	36	25	2–414	19
Total	943	56	57	69	79	56	19	12	0–414	50

*Determined at time of admission on the scale used in the Extracranial/Intracranial Bypass Study and the North American Symptomatic Carotid Endarterectomy Trial^{10,31} (mild = < 4; moderate = 5–7; severe = 8–10).

†Missing data for 7 patients.

‡Change in Barthel Index significant for all groups (p < 0.001, Wilcoxon signed rank test).

from the stroke unit. If required, a member of the family or the QEII volunteer service assisted in completing the questionnaire. Thirty-two patients (94%) returned the questionnaire. On a scale of 1 (very dissatisfied) to 5 (very satisfied), the mean rating for items related to care delivery was 4.6.

Length of stay, complications, and death or need for long-term institutional care for patients admitted to the Acute Stroke Unit were compared with these outcomes for TIA and stroke patients admitted during 1993–1996, before the stroke unit was established (Table 4). Despite the methodological limitations of a before–after comparison, the data show that patients managed in the stroke unit had a shorter median length of stay than those managed beforehand. With a cost of \$1066 per day at the QEII, a 2-day reduction in median length of stay per stroke unit patient translates into a saving of more than \$2.1 million per 1000 patients treated.

In the Acute Stroke Unit the odds of symptomatic deep vein thrombosis occurring were reduced by 68% (95% CI 16%–89%) (Table 4). The odds of death or needing long-term institutional care after a median follow-up of 10 days was reduced by 3% ($n = 943$; 95% CI 19% reduction to 16% increase, $p = 0.12$). This trend is in keeping with the results of the meta-analysis of randomized trials ($n = 3812$), which showed an odds reduction of 23% (95% CI 12%–32%, $p < 0.001$) after a median follow-up of 1 year.¹

Comments

The Acute Stroke Program at the QEII integrates clinical care, education and research to maintain a high standard of care and education for patients and families, while

developing the knowledge and various interests of the disciplines contributing to the program. Patients report a high level of satisfaction with the care they receive. The before–after analysis indicated that stroke unit care at our hospital has been associated with a statistically and economically significant reduction in length of stay and a reduction in the incidence of deep vein thrombosis. The program provides an ideal training environment for health care professionals from a broad range of disciplines. An organized approach also facilitates clinical research, including participation in treatment trials.

Areas needing growth and development include our neurovascular ambulatory care program and training in stroke medicine for postgraduate medical trainees. Also, in our aspirations for smooth and continuous patient care, we would like to improve the transition between acute stroke care and long-term rehabilitation, and between hospital care and community living.

Recommendations for stroke-unit care have been published in Europe,³³ the United States³⁴ and Canada.³⁵ We hope that this description of our experience helps facilitate the development of a more organized approach to stroke care in Canada.

The clinical care forms described in the text are available from the corresponding author upon request.

Competing interests: None declared.

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Table 4: Outcomes of TIA and stroke patients admitted during 1993–1996 and those admitted to the QEII Acute Stroke Unit during 1997–2000

Variable	1993–1996* $n = 1324$	1997–2000 $n = 1284$	p value
Patient characteristic			
Mean age (and SD), yr	71 (14)	72 (13)	> 0.05
% female	47	48	> 0.05
Length of stay, d			
Mean	19	17	
Median	12	10	< 0.001
Range	1–626	0–414	
Complication, % of patients			
Deep vein thrombosis	1.4	0.5	0.01
Pulmonary embolus	0.5	0.5	> 0.05
Pneumonia	3.9	3.8	> 0.05
Discharge disposition, % of patients			
Dead	14	13	> 0.05
Hospital or nursing home	12	12	> 0.05

Note: TIA = transient ischemic attack.

*Patients discharged from a medical service with most responsible ICD-9 diagnostic code 431 (intracerebral hemorrhage), 435 (TIA), 434 (cerebral thrombosis) or 436 (acute but ill-defined cerebrovascular disease).

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