

ORIGINAL REPORT

INPATIENT STROKE REHABILITATION: A COMPARATIVE STUDY OF
ADMISSION CRITERIA TO STROKE REHABILITATION UNITS IN FOUR
EUROPEAN CENTRES

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Objective: To explore the clinical and non-clinical factors involved in decision-making concerning admission to European stroke rehabilitation units.

Design: Observational study on case-mix at intake combined with questionnaires and semi-structured interviews with the medical consultants of each European stroke rehabilitation unit.

Patients and settings: Clinical data on 532 first-ever patients after stroke. Medical consultants from 6 European stroke rehabilitation units in 4 European countries (UK, Belgium, Germany and Switzerland).

Methods: Standardized clinical assessments within 2 days after admission. Questionnaires to each medical consultant followed by a qualitative round of semi-structured interviews.

Results: Case-mix of patients after stroke was significantly different between European stroke rehabilitation units. Clinical criteria for admission were seldom explicit and were evaluated differently between the European stroke rehabilitation units. In the UK units, diagnosis of stroke was the only criterion for admission. In the Belgian, German and Swiss units, pre-morbid conditions were taken into account in admission decisions. The likelihood of discharge home was considered highly important in the Swiss units.

Conclusion: Case-mix differences at intake could be linked to different appraisals of clinical and non-clinical factors of patients after stroke. The findings urge us to be more explicit about decision-making processes at admission in order to provide a more comprehensive insight into the interplay between context and process of care.

Key words: stroke rehabilitation unit, decision-making, admission.

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INTRODUCTION

Stroke is the third most common cause of death and the commonest cause of disability in Europe (1). Post-acute stroke rehabilitation is an essential part of the recovery process (2). Organized inpatient stroke rehabilitation has been proven to be more effective in terms of survival and promoting functional recovery compared with conventional medical wards (2, 3).

Caution is needed when comparing outcomes of stroke rehabilitation units (SRUs) (4). Davenport et al. (5) stressed the importance of case-mix differences when comparing rehabilitation outcomes between units. In most research, reasons for case-mix differences are narrowed down to solely clinical judgements identifying patients eligible for inpatient services. However, case-mix differences should also be considered in conjunction with contextual factors in which clinical practices are taking form. For example, the organization and financing of healthcare systems differ across Europe. This might have an impact on structural and financial organization of post acute stroke rehabilitation (4) and consequently also on admission policies and the selection of patients for further inpatient rehabilitation. Providers may be reluctant to admit patients with unclear rehabilitation potential because this may lead to an unwanted longer stay in the unit (6). Insurance systems also influence the admission to SRUs. In Germany, health insurance providers approve further rehabilitation, mainly based on predefined impairment and disability criteria (7).

This study focuses on the admission procedures in 6 SRUs across Europe. It explores the impact of clinical and non-clinical factors in the decision-making processes on admission. Being more explicit about decision-making criteria can help to improve comparison of stroke rehabilitation services. Context sensitive approaches will lead to a better and more detailed understanding of underlying reasons for differences in casemix (8).

METHODS

Procedures

This study is part of a European project, Collaborative Evaluation of Rehabilitation In Stroke across Europe (CERISE) comparing outcome after stroke between rehabilitation centres in 4 different European countries. Data collection took place in 6 SRUs: Queen's Medical Centre (SRU-GB1) and City Hospital, Nottingham, UK (SRU-GB2); 2 SRUs at the University Hospital, Pellenberg, Belgium (SRU-BE1 and SRU-BE2); the RehaClinic, Zurzach, Switzerland (SRU-CH) and the Fachklinik, Herzogenaurach, Germany (SRU-DE).

Clinical characteristics were documented based on a prospective study of CERISE focusing on the recovery of patients. The inclusion criteria for admission in this study were: (i) first-ever stroke as defined by WHO (9); (ii) aged 40 to 85 years; (iii) score on Gross Motor function of the Rivermead Motor Assessment (10) (RMA-GF) ≤ 11 and/or a score on Leg and Trunk function (RMA-LT) ≤ 8 and/or a score on Arm function (RMA-AR) ≤ 12 on admission to the rehabilitation centre. The exclusion criteria were: (i) other neurological impairments with permanent damage; (ii) stroke-like symptoms due to subdural haematoma, tumour, encephalitis or trauma; (iii) pre-stroke Barthel Index (BI) (11) < 50 ; (iv) admitted in the rehabilitation centre more than 6 weeks post-stroke; (v) no informed consent.

Clinical characteristics of the patients were assessed with the RMA, the Barthel Index (BI) and the National Institute of Health Stroke Scale (NIHSS) (12). Pre-stroke disability was defined by a score ≥ 2 on the Modified Rankin Scale (MRS) (13). Each patient was assessed within 2 days after admission. Additionally, equivalent income was recorded via structured interview at discharge.

The medical consultants (MCs) were asked, by questionnaire, to document the impact of clinical and non-clinical factors on the admission of patients after stroke to the SRU. Based on the results of the questionnaire, a qualitative round of semi-structured interviews followed.

The questionnaire was developed on the basis of a literature search in PubMed and Current Contents (January 1995 to March 2004) on factors influencing discharge destination from an acute hospital and admission to a rehabilitation centre. Additionally, an internet search was performed for documents from healthcare policy-makers in the 4 countries involved. In total, 25 patient-related and 12 institutional context factors were identified (14–27).

They were grouped into 3 main categories: factors related to the patient, factors related to the network between facilities, factors related to the referring hospital. The MCs were asked to score the impact of each identified factor on the admission to their SRU on a 4-point scale, ranging from no effect to very high effect.

Additional information was collected by semi-structured interviews with each MC to identify the dimensions on their admission policies. Factors which were identified in the questionnaire as having a high or very high effect on admission were further explored, in order to gain a better understanding of the local context. The MC was asked if other significant factors that were affected the decision-making process, not listed in the questionnaire. All interviews were conducted and transcribed by the same researcher (KP). The study was approved by the ethics committee of each centre.

Analysis

The differences in clinical characteristics of patients between SRUs were compared using a χ^2 or Kruskal-Wallis test or an ANOVA.

The main differences between the SRUs' admission policies were identified on the basis of an analysis of the scores in the questionnaires. Only factors with a high (score 3) or very high (score 4) effect on admission, as identified by the MC, were considered in the interviews.

A content-analysis of the interviews was based on the methodology described by Miles & Huberman (28). We considered the SRU as the unit of analysis. First, a within-case analysis was conducted identifying and labelling the core elements in the admission procedure in each SRU. Subsequently, a between-case analysis identified differences and similarities in the core elements mentioned for each SRU. Finally, results from quantitative (clinical assessments and questionnaires) and qualitative (questionnaire and interviews) analyses were triangulated.

RESULTS

Differences in case-mix between the SRUs (Table I)

The patients' mean age was significantly different between the SRUs and ranged between 58.1 and 75.5 years. The patients in SRU-BE1 were the youngest, while in SRU-BE2 they were

Table I. Case-mix characteristics of the European stroke rehabilitation units (SRU) in United Kingdom, Belgium, Switzerland and Germany*

	SRU-GB1	SRU-GB2	SRU-BE1	SRU-BE2	SRU-CH	SRU-DE	
Patient (n)	70	65	64	63	135	135	
Age; years; mean (SD)	71.5 (9.8)	70.4 (8.8)	58.1 (8.5)	75.6 (4.4)	70.7 (9.5)	65.5 (9.7)	<0.001 ^a
Low income, %*	25	20	16	14	24	21	0.56 ^b
MRS ≤ 2 , %	7	11	8	37	8	3	<0.001 ^b
TSOA, median	5	13	22	17	19	16	<0.001 ^c
Q1–Q3	3–8.25	6–19	16.25–32	11–25	14–26	11–23	
NIHSS, median	6.5	7	10	6	5	4	<0.001 ^c
Q1–Q3	2.75–9	3.5–11.5	5–13	3–10	2–9	2–8	
RMA-GF, median	3	1	2	3	6	8	<0.001 ^c
Q1–Q3	1–6	0–5	1–6	1–7	1–9	4–10	
RMA-LT, median	4	4	3	5	6	7	<0.001 ^c
Q1–Q3	1–9	0–6.5	1–6.75	1–7	3–9	5–9	
RMA-AR, median	4	3	1	5	7	7	<0.001 ^c
Q1–Q3	0–12	0–9.5	0–5.75	1–9	1–11	1–11	
Barthel Index, median	50	40	40	35	70	75	<0.001 ^c
Q1–Q3	25–80	25–75	26.25–58.75	20–60	30–90	50–90	

*For different unit see explanation in M&M section.

SD: standard deviation; Q1–Q3: quartile 1–quartile 3; MRS: Modified Rankin Scale; TSOA: time between stroke onset and admission to the stroke rehabilitation unit in days; NIHSS: National Institute of Health Stroke Scale; RMA-GF: Gross Function on the Rivermead Motor Assessment; RMA-LT: Leg and trunk function on the Rivermead Motor Assessment; RMA-AR: Arm function on the Rivermead Motor Assessment.

^aANOVA; ^b χ^2 test; ^cKruskal-Wallis test.

*Categorization was defined by the at-risk-of-poverty threshold (31) and equalled 60% of the median national equivalent income. Patients below this threshold were considered as patients with low equivalent income.

the oldest. The proportion of patients with a low equivalent income was not significantly different between SRUs. Pre-stroke functional disability was significantly different with SRU-BE2 and -GB2 having the highest proportion of patients with a score higher than 2 on the MRS. Time between stroke onset and admission (TSOA) to the SRU was significantly different between units. The median time span ranged between 5 and 22 days. The lowest median TSOA was found for SRU-GB1, the highest for SRU-BE1.

The median scores for the clinical characteristics (NIHSS, RMA and BI) were significantly different. At SRU-CH and SRU-DE the median scores on the NIHSS were lower than in the other SRUs, indicating that patients were less disabled on admission. This was confirmed by the scores on RMA and BI.

Decision-making about admission (Table II)

Factors related to the patient: Physical condition. The patient's age was highly important for admission in SRU-BE1. The age limit was set on 70 years. Patients older than 70 years were systematically referred to SRU-BE2. SRU-BE2 operates as an intensive geriatric stroke rehabilitation unit. This distinction was not made for the other SRUs.

Pre-morbid functional disability was judged as an important determinant of not admitting patients after stroke to SRU-BE1, -CH and -DE. In SRU-DE, patients with a pre-morbid disability requiring support, were automatically transferred to geriatric rehabilitation or nursing care, who do not offer the same degree of rehabilitation services. Admission to SRU-CH was delayed if the patient showed "rehabilitation potential" but did not yet have the stamina required for intensive rehabilitation. In this case, patients were transferred to a nursing facility, with the option to be admitted to SRU-CH at a later stage.

Exclusion criteria were not quantified or formalized, except for SRU-DE, where the external stakeholder (the insurance/cost bearer) set the admission threshold at a minimal score of 35 on the BI.

Factors related to the patient: Cognitive abilities, psychological condition and behavioural aspects. Except for SRU-GB1 and -GB2, the presence of pre-morbid cognitive disability or depression reduced the likelihood of being admitted in the SRUs. In SRU-BE2 also disorientation in time and space was an important criterion. In SRU-BE2, a standard practice of screening for advanced dementia was applied by the MC. Severe behavioural problems after stroke play an important role in SRU-GB1, -GB2, -BE1 and -BE2, but policies differ. At SRU-GB1 and -GB2, patients stay longer at the acute ward before being transferred to the SRU. For the Belgian situation, patients from the acute ward were not admitted to SRU-BE1 or -BE2, but discharged to other settings such as geriatric wards, nursing home.

In Germany, admission decisions sometime were influenced by the negotiation skills of patients or their peers. Highly motivated patients or their relatives sometimes exert pressure on their health insurance institute, sometimes supported by selfhelp groups, to be admitted in SRU-DE.

Factors related to the patient: Socio-economic situation and patient's network. The medical consultants declared that the patient's socioeconomic situation did not influence their decision to admit a patient to the SRU. On the other hand 3 factors concerning the patient's network, (i) readiness of the home front to support the patient, (ii) abilities and supporting power of the home front, and (iii) presence of a social network of the patient were evaluated by the MC at SRU-CH. Another major concern was the likelihood of the patient to be discharged home, after rehabilitation at the SRU-CH. The patient's chances of returning home after rehabilitation were estimated on the basis of the home situation and the available support through their social network. If this was minimal, the patient was less likely to be admitted to SRU-CH.

Factors related to the network between facilities (Table II). Affiliations between the SRU and other healthcare settings were evaluated as highly important for the admission to SRU-BE1, -CH and -DE. SRU-B1 and -CH had formal links with an acute hospital. The majority of the patients in SRU-BE1 were directly transferred from the acute stroke unit in the academic hospital. Being part of a large academic hospital, SRU-BE1 was considered as the reference centre for treating severely affected patients after stroke. Less severely disabled patients after stroke were referred to SRUs closer to their home.

The MC of the SRU-CH, was also consultant physician at the acute stroke unit, where he was responsible for the referral policy of all eligible patients after stroke to SRU-CH. Referrals from the other hospitals took place on the initiative of the MC of the acute hospitals and were discussed beforehand with the MC of SRU-CH. Priority was given to patients transferred from 4 acute neighbouring hospitals, motivated through an existing informal network between SRU-CH and these hospitals.

In SRU-DE, the association of insurance type with the rehabilitation centre was appraised as having a very high effect on the admission policy. Patients after stroke were transferred from 5 acute hospitals in the region, if they fitted the health insurance rules and procedures. The MC of SRU-DE was not involved in the selection of stroke patients. External stakeholders decide, based on the referral letters from the MCs in the acute services, whether the patient was "suitable" for further rehabilitation in SRU-DE. Older patients after stroke were often admitted to geriatric rehabilitation units. Within a competitive insurance market, packages of rehabilitation services in SRUs were negotiated and bought. Cost bearers who issue cheaper assurance policies made contracts with SRUs in the region that offer a reduced service package. Therefore their patients were not admitted to SRU-DE.

Factors related to the referring hospital (Table II). The presence of an emergency unit and an acute stroke unit was reported as highly important in the decision-making on admission in SRU-BE2. Since the acute stroke unit was introduced, patients were treated more intensively with the aim to discharge them earlier for further rehabilitation. As a consequence, more patients after severe stroke were referred to SRU-BE2. In SRU-CH, the MC was involved in the decision-making process at discharge from the

Table II. Impact of clinical and non-clinical factors on the decision-making process on admission to 6 European stroke rehabilitation units (SRU)

	SRU-GB1	SRU-GB2	SRU-BE1	SRU-BE2	SRU-CH	SRU-DE
1. Factors related to the patient						
<i>1.1 Physical condition</i>						
Patient's age > 70 years	1	1	4	1	2	2
Patient had a former stroke	1	1	1	1	2	2
Presence of pre-morbid functional disabilities	1	1	3	2	3	3
Patient had a loss in consciousness (< 48 hours post-stroke)	2	1	1	1	2	2
Severe functional disabilities post-stroke	1	1	1	1	3	1
Patient has poor sitting balances	1	1	1	1	2	2
Strong impairments in position and movement sense	1	1	1	1	2	1
<i>1.2 Cognitive abilities/psychological condition</i>						
Presence of pre-morbid cognitive disabilities	1	1	3	3	3	3
Presence of pre-morbid depression and/or fear	1	1	3	2	2	1
Severe communicative disabilities	1	1	1	2	1	2
Disorientation in time and place	2	1	2	3	2	2
Presence of a neglect	1	1	1	1	1	2
Presence of apraxia	1	1	1	1	1	2
Presence of post-stroke depression and/or fear	1	1	1	2	1	1
<i>1.3 Behavioural aspects</i>						
Severe behavioural problems	3	3	3	3	2	2
The patient's high expectation	1	1	2	1	1	3
<i>1.4 Socio-economic situation</i>						
Patients' personal low financial means	1	1	1	1	1	1
High insurance reimbursement of patients' rehabilitation	1	1	1	1	2	1
The low quality of the patient's residence with regard to the adaptation to the needs and abilities of the patient	1	1	2	1	2	2
<i>1.5 Patient's network</i>						
Presence of a home front	1	1	2	1	2	2
No readiness of the home front to support the patient	1	1	2	1	3	2
Low frequency of contacts with close relatives and friends	1	1	1	1	2	1
The ability from the home front to provide support	1	1	2	1	2	1
Good abilities/supporting power of the home front	1	1	2	1	3	1
Presence of a large social network of the patient	1	1	2	1	3	2
2. Factors related to the network between facilities						
Affiliations between your centre and other healthcare settings	1	1	3	2	3	3
The association of insurance type with the rehabilitation centre	1	1	1	2	2	4
Affiliations between doctors and hospitals	1	1	2	2	3	2
There are many other centres in the close neighbourhood where also stroke patients are treated	1	2	3	1	2	4
3. Factors related to the referring hospital						
The presence of an emergency unit in the referring hospital	1	2	1	3	2	3
Stroke patients are admitted from only one acute hospital	1	1	1	2	2	1
The presence of an acute stroke unit in the referring hospital	1	2	1	3	3	3
Early involvement in the decision-making process at the referring hospital to refer patients	1	1	2	2	3	1
An inefficient discharge process in the referring hospital (e.g. incomplete medical notes, incomplete application, . . .)	1	1	2	1	2	2
Long distance between the rehabilitation centre and the acute hospital(s)	1	1	2	1	2	1
Small number of beds in the referring hospital	1	1	1	2	2	1
The absence of bed managers in the referring hospital	1	1	1	1	3	2

1: no effect; 2: low effect; 3: high effect; 4: very high effect.

acute stroke unit. The SRU-CH provided services for the rehabilitation of patients with neurological conditions who are admitted in the acute hospital formally linked with the SRU. Therefore the opinion of the consultant was a decisive factor in the referral. The absence of bed managers in most referring hospitals was indicated by the MC of SRU-CH as a reason for the fact that referrals were delayed. It was put forward that this could result in an inadequate system of indication setting for further rehabilitation.

DISCUSSION

Six European SRUs showed significant differences in case-mix at intake. Clinical characteristics of the patients after stroke were appraised differently between the various SRUs. For the SRU-GB1 and -GB2 the only criterion to be admitted was the diagnosis of stroke. For SRU-CH, -BE1 and -BE2, pre-morbid functional and cognitive disabilities were concomitant factors. Age was also considered in SRU-BE1 and -BE2. The availability of home support was a decisive factor in the decision to admit a patient in SRU-CH. For SRU-DE, health insurances impose admission criteria without involvement of the MC in the decision-making process.

Differences in clinical characteristics of the patients admitted in the various units can to a large extent be explained by non-clinical factors. Several external factors seemed to determine whether patients are referred to inpatient stroke rehabilitation services.

Strengths and weaknesses of the study

This study used a multi-method approach, which enabled a better understanding of case-mix differences between SRUs incorporating the conditions and processes of decision-making at admission. The comparison of SRUs generated important additional knowledge, stressing the importance of the need for context-sensitive analysis when appraising rehabilitation practices. Clinical practice is set up within specific constraints and under specific circumstances. This will affect admission and referral decisions. In scientific literature very little attention is paid to how these external conditions are managed in order to optimize the rehabilitation process.

It will be clear that this research has its particular limitations. The locus of analysis was the SRU. Descriptive data on the patient flow from acute services was not available. This would have given additional information on the alternative trajectories after acute stroke care. The sample of SRUs is small. Further research and validation of the results is needed, by means of broadening the sample of SRUs and respondents. Further comparative research should study a larger sample of SRUs within each country, in order to increase generalizability and to obtain a clearer distinction between "country-determinants" and "organization-determinants" in the clinical decision-making process.

Clinical relevance

Implicit criteria used for admission to SRUs varied, resulting in different case-mix with less disabled patients in SRU-DE

and SRU-CH. Although, less severely disabled patients after stroke may equally benefit from generic settings (29). If they could equally well be treated in different settings, this would increase availability of rehabilitation beds for more severely disabled patients after stroke without jeopardizing the other patient group in their recovery.

Decision-making processes about patients are complex issues, in which criteria are used beyond the medical characteristics of the patient. But precisely these decision-making processes, and the context in which they are taken, cause variations in case-mix between units.

More attention needs to be given to the initial evaluation of patients after stroke (30). This research was not aimed to study best practice of rehabilitation organization but to describe the criteria used in the decision-making process on admission. As benchmarking becomes more widespread, inclusion criteria must be made more explicit in order to improve comparison between SRUs. Moreover, our research offers indications that the context of the stroke rehabilitation services and characteristics of healthcare systems in general are to be integrated in these quality studies and as a consequence in the formulation of clinical guidelines.

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