STUDY COMPARING THE STROKE UNIT OUTCOME AND CONVENTIONAL WARD TREATMENT

A randomized study in Joinville, Brazil

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ABSTRACT - *Background and Purpose:* To assess the impact of a stroke unit (SU) on acute phase treatment when compared to a conventional general ward treatment (GW). *Method:* Seventy-four patients with acute stroke were randomized between a SU and conventional general ward (GW). We compared both groups regarding the length of hospital stay, lethality and functional and clinical status within 6 months, using the Scandinavian scale and Barthel index. *Results:* Thirty-five and thirty-nine patients were allocated at SU and GW, respectively. Lethality on the 10th day at SU and GW achieved 8.5% and 12.8% respectively (p= 0.41), whereas 30-days mortality rates achieved 14.2% and 28.2% (p= 0.24), 17.4% and 28.7% on the 3rd month (p= 0.39), and 25.7% and 30.7% on the 6th month (p= 0.41). Thirty-day survival curve achieved 1.8 log rank (p= 0.17), with a trend for lower lethality in the SU. In order to save one death in 6 months in SU, NNT (the number need to treat) was 20; to get one more home independent patient NNT was 15. No significant difference was found between the length of hospital stay and morbidity. *Conclusion:* No significant benefit was found in SU patients compared to GW group. However,an evident benefit in absolute numbers was observed in lethality, survival curve and NNT in thirty days period after stroke. Further collaborative studies or incresead number of patients are required to define the role of SU.

KEY WORDS: stroke unit, cerebrovascular disorders, stroke therapy, hospital units team, stroke care.

Estudo comparativo dos desfechos entre uma unidade de AVC e uma enfermaria geral: estudo randomizado em Joinville, Brasil

RESUMO - *Objetivo*: Avaliar se o tratamento da fase aguda em uma unidade de acidente vascular cerebral (U-AVC) reduz a morbi-mortalidade quando comparado a uma enfermaria geral. *Método:* Pacientes com AVC agudo foram randomizados entre a U-AVC e uma enfermaria geral (EG). Comparou-se tempo de internação, letalidade e dependência funcional e clínica no período de 6 meses. *Resultados:* Obtivemos 35 pacientes na U-AVC e 39 pacientes na EG. A letalidade encontrada na U-VAC e na EG foram respectivamente 8,5% e 12,8% no décimo dia (*p=,41),* 14,2% e 28,2% no trigésimo dia (*p=,24),* 17,4% e 28,7% no terceiro mês (*p=,39)* e 25,7% e 30,7% no sexto mês (*p=,41).* A curva de sobrevida em 30 dias evidenciou uma tendência de menor letalidade na U-AVC (log rank de 1,8; *p=,17).* O Numero Necessário para o Tratamento (NNT) para salvar um óbito em 6 meses na U-AVC foi 20 e o NNT para se conseguir um paciente a mais independente em casa foi 15. No 6º mês, 6.6% mais pacientes estavam independentes no grupo da U-AVC necessario para o tratamento (OR 0,77 IC 0,59-1,84). Não houve diferença significante entre o tempo de internação e a morbidade. *Conclusão:* Não houve benefício significativo de tratamento dos pacientes na U-AVC. Entretanto, observamos um evidente benefício em números absolutos da letalidade, curva de sobrevida e do NNT no período de 30 dias após o evento. Estudos com maior amostragem ou cooperativos são necessários para definir o papel das unidades de AVC.

PALAVRAS-CHAVE: unidade de acidente vascular cerebral, doença cerebrovascular, modelo assistêncial hospitalar, terapêutica.

Small series studies have suggested that better results in stroke treatment could be achieved by the interaction of medical and rehabilitation teams working in the same facilities and under strict accordance of routine procedures[1,2]. Subsequent studies have demonstrated that despite offering better functional results, Stroke Units (SU) was unable to improve survival or long-term prognosis[3].

This survival benefit was however reported by others in further controlled and randomized prospective studies[4,5]. Pan-European Consensus Meeting statement in 1995 stimulated the creation of SU in an attempt to enhance potential benefits on patient's outcome[6]. In 1997 a meta-analysis study including 19 series concluded that SU treatment provided better results than conventional wards (CW) regarding mortality, length of hospitalization and dependency status[2].

Present concerns about costs in stroke patients must include hospitalized patients treatment as well as medical expenses and social impact of chronic neurological sequels. This aspect is particularly relevant in developing countries where a suggested eight per cent reduction of length of hospitalization obtained by SU could contribute to an important benefit in public health services budget[2,6].

The aim of this study is to assess the role of a specialized Stroke Unit in patient's outcome regarding mortality, morbidity and length of hospitalization.

METHOD

All patients admitted to Emergency Room at São José Hospital in Joinville, Brazil, between March and December, 2000, at first or recurrent stroke within seven days period were considered for this study. Exclusion criteria included requirement of intensive care unit, mechanical pulmonary ventilation, transient ischemic events, subarachnoid hemorrhage or death in first 24-hours after hospitalization. Stroke has been defined according National Institute of Neurological Disorders and Stroke[7]. For ischemic stroke we used sub-type classification the TOAST study criteria[8]. No patient was excluded due to severity of the event, co-morbidities or cognitive deficiencies.

After the admittance procedures patients were allocated at the Stroke Unit or at a conventional general ward according a list of randomized numbers available at the emergency room. Clinical and related information were obtained following a standard questionnaire by the same neurologist (NLC) in the first 48-hours after hospitalization. Treatment costs were fully covered by National Health System and a regular six-month follow-up was undertaken after hospital discharge. No patients were excluded after randomization.

Scandinavian scale (SSS) was used for clinical assessment in the first 48-hours period with maximal score of 58 points[9]. Functional assessment was obtained by Barthel index (BI) with maximal score of 100 points[10]. Both scores were reviewed on the seventh day by the same observer in cooperation by nurses and relatives.

A good reproducibility has been reported to both scales[10,11]. Patients were classified after this evaluation as follows[2]: *Mild stroke:* patient able to stand (with or without assistance). BI at least 10/20 during the first week after stroke; *Moderate stroke:* patient is conscious and has sitting balance but is unable to stand or walk during the first week of stroke. Intermediate BI between mild and severe. *Severe stroke:* patient has reduced consciousness or no sitting balance, or both, during the first week of stroke; BI lower than 3/20.

Outcomes were evaluated regarding the following aspects: Mortality: tenth day, first, third or sixth month; Morbidity: scale scores at admission, seventh day, third and sixth post-discharge month; Length of hospitalization.

Clinical investigation and treatment protocol

Repeated neurological examination, blood tests, EKG, plain chest radiological examination and brain CT scan were undertaken in the first 24-hours after hospitalization. Carotid, vertebral and trans-cranial doppler was performed in all mild and moderate ischemic stroke patients. Suspected heart disease symptoms, EKG abnormalities or radiologic heart area increase were assessed by trans-thoracic echocardiogram.

Patients with negative investigation[8] or inconclusive trans-thoracic echocardiogram were submitted to trans-esophagic echocardiogram. Cerebral angiograms, brain magnetic resonance, cerebral spinal fluid studies, metabolic, hematologic or inflammatory serology was undertaken in inconclusive cases[8]. The same neuroradiologist assessed all cranial CT scan studies.

Medical treatment routine of stroke patients was defined according Brazilian Consensus for Stroke Treatment as well as current literature recommendations[12,13]. A standard follow-up schedule at home, outpatient clinics or anticoagulation unit was undertaken.

The present study was approved by the hospital ethical committee.

Stroke unit

São José Hospital SU has nine beds devoted to acute and rehabilitation treatment of stroke patients. The multi-professional team is composed by a neurologist as well as stroke trained nurses, physiotherapists, occupational therapist, psychologist and speech therapist[14]. Patients with disturbances of consciousness or swallowing, hiccups, nasal voice or reflux were feed by enteral nutrition (nasoenteric tube) until pulmonary aspiration risks were excluded. Nursing teams attended to an annual one-month stroke actualization course. Physiotherapists have used the Bobath method[15].

Stroke information booklets were received by patients at hospital discharge.

General wards

No specific general ward was used for this study and patients were allocated according bed availability. Routine medical investigation or treatment by neurologist as well as physiotherapy and occupational therapy were identical to that undertaken at SU. Speech therapist assessment was provided when required.

Follow-up

A written guideline with follow-up instructions was provided at hospital discharge. Third and sixth month follow up were blindly undertaken by an occupational therapist trained for scale assessment. Each appointment was previously reminded by phone call. At sixth month evaluation, patients with 0–2 scores were considered to be independent while 3-5 scores were regarded as dependent in Rankin scale[16]. Follow-up lasted until June 2001 and death information was obtained by phone calls.

Active follow-up by home visits were performed when necessary. Four patients were lost due to changed address.

Seventy-four patients were randomized for SU group (n=35) or GW group (n=39). Demographic, clinical and severity stratification data are shown in Table 1. Age, gender, stratified average income in MW (minimum wage), educational status, previous risk factors for atheriosclerosis and incidence of intracerebral haematoma were matched among both groups. Six patients in coma were randomized to GW group (15.3%) and three to SU group (14.2%).

Table 1. Demographic characteristics, clinical state and stroke type of eligible patients admitted to SU and to GW.

Characteristics	SU (n=35)	GW (n=39)	p
Average age, years (SD)	64.8 (12.9)	70.7 (8.8)	0.22
Men average age, years (SD)	63.5 (13.1)	70.9 (8.3)	0.30
Women average age, years (SD)	66.6 (12.8)	70.6 (9.7)	0.34
Female	15 (42.8%)	16 (41.0%)	0.87
Average income (in MW)	—	—	—
< 1 MW	8 (22.8%)	12 (30.7%)	0.86
1-3 MW	21 (60%)	22 (56.4%)	
3-10 MW	5 (14.2%)	4 (10.2%)	
> 10 MW	1 (2.8%)	1 (2.5%)	
Illiterate	6 (17.4%)	9 (23.0%)	0.62
Primary level	27 (77.1%)	28 (71.7%)	
Secondary level	1 (2.85%)	2 (5.1%)	
Tertiary level	1 (2.85%)	(0%)	
Prior Medical History			
Previous Stroke/TIA	11 (31.4%)	7 (17.9%)	0.28
Myocardial infarction	3 (8.5%)	5 (12.8%)	0.71
Diabetes	9 (25.7%)	12 (30.7%)	0.82
Atrial fibrillation	5 (14.2%)	5 (12.8%)	1.00
Arterial hypertension	29 (82.8%)	32 (82.0%)	1.00
Tabagism	14 (40.0%)	16 (41.0%)	1.00
Cancer	1 (2.8%)	—-	0.47
Alcoholism	8 (22.8%)	5 (12.8%)	0.40
Coma	3 (8.5%)	6 (15.3%)	0.48
Intracerebral haematoma	5 (14.2%)	10 (23.7%)	0.35
First week Clinic State			
Mild stroke	13 (37.2%)	16 (41.0%)	0.91
Moderate stroke	13 (37.2%)	9 (23.0%)	0.28
Severe stroke	8 (22.8%)	14 (35.8%)	0.33
SSS	35 (15-35)	29 (12-45)	0.39
BI	30 (10-55)	29 (12-45)	0.67
Hospital stay period, days (SD)	11.0 (8.51)	12.6 (10.8)	0.50

Continuous data are expressed through the average ± SD. Category data are expressed in number of patients with and without a certain characteristic, and also in percentage. SSS and IB are expressed in median with the percentage variations of 25- 75.

Table 2. Comparison of BI and SSS values variation, by treatment group and time interval.

Time interval	SU	GW	p
SSS day 1	35	25	
SSS day 5	43	37	
SSS month 3	44	46	
SSS month 6	39	51	0.969
BI day 1	30	20	
BI day 5	50	25	
BI month 3	65	75	
BI month 6	75	80	0.815

SSS and BI scales values are in median; GW indicates conventional general ward treatment. Probability value among groups from day 1 until the 6th month for surviving and eligible patients (Mann-Whitney test)

Table 3. Lethality (mortality percentage) by treatment groups in different times after initial event.

Post-ictus time	SU	GW	RR	CI	p
10 days	8.5	12.8	0.66	0.17-2.59	0.41
1 month	14.2	28.2	0.50	0.19-1.31	0.24
3 months	17.4	28.2	0.60	0.25-1.47	0.39
6 months	25.7	30.7	0.83	0.40-1.74	0.41

RR, indicates relative risk; CI, confidence interval; GW, conventional general ward treatment.

Clinical severity subgroups, SSS and BI scales in the first week of hospital stay were compared. Hospital stay average time was of nearly 2 weeks in both groups. The same result was found in another study about causes of unjustified hospital stay following cerebral infarction[17]. No statistical difference between both groups was found regarding all variables above described.

Statistical analysis

Outcome differences are shown with odds ratio and relative risk with CI (confidence interval) of 95%. BI's and SSS's scores differences have been analyzed through the Mann-Whitney test. Qui-square test was used for categorical variables and t-test for continuous variables. Kaplan-Meyer's actuarial curve has been used to assess the survival curve. Statistical analysis was performed in the Statistical Package for Social Sciences (SPSS 8.0 computer program)[18].

RESULTS

Despite the improvement of clinical status observed in both groups at days 1 and 5 and months 3 and 6 after admission no significant difference was demonstrated by both SSS (p=0.96) and IB (p=0.81) scores (Table 2).

As demonstrated on Table 3, respective mortality rates for SU and GW were 8,5% and 12.8 for the tenth day (p=0.41; RR=0.66), 14.2% and 28.2% at the first month (p=0.24; RR=0.50), 17.4% and 28.7% at the third month (p=0.39; RR=0.60) and 25.7% and 30.7% at six months (p=0.41; RR=0.83). Kaplan–Meyer's survival curve showed a trend for lower mortality in SU group at the first month as demonstrated on Figure 1 (log rank= 1.8; p =. 17).
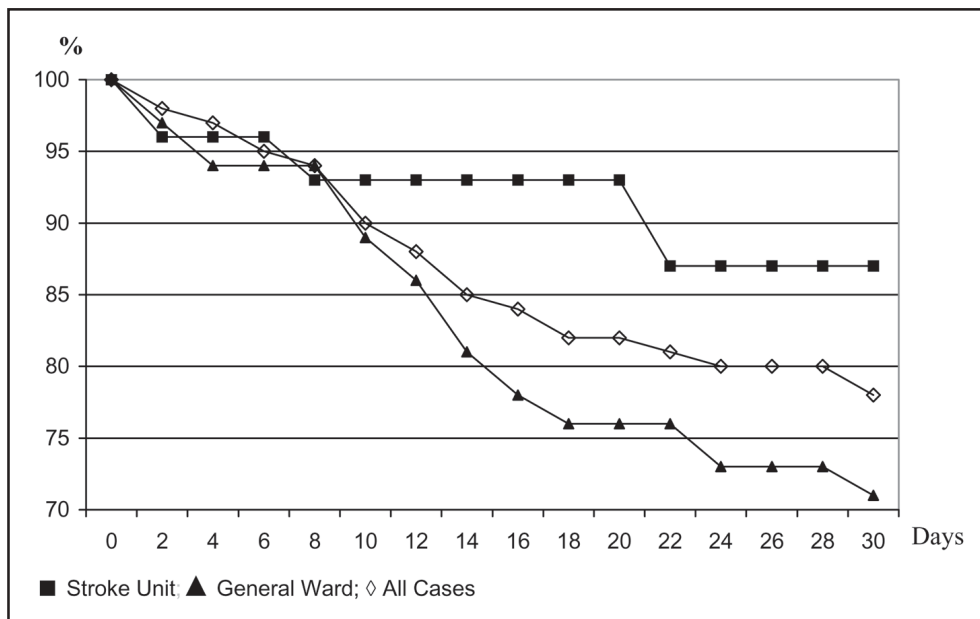

Figure 1. Survival actuarial curve within the first 30 days post-event (log rank=1.8 p=.17).

Table 4. Final evolution of groups divided by severity after a 6-month follow-up.

Subgroup Stroke	Evolution	SU	GW	OR	CI
Mild	Independent	11(85%)	13(87%)	0.84	0.10-7.03
	Dependent	2(15%)	2(13%)	1.18	0.14-9.83
	Death	—-	—-		
Moderate	Independent	6(42.8%)	3(25%)	2.25	0.41-2.10
	Dependent	5(35.8%)	7(58.3%)	0.39	0.08-1.93
	Death	3(21.4%)	2(16.7%)	1.36	0.18-9.91
Severe	Independent	——	——		
	Dependent	2(25%)	2(16.7%)	1.75	0.30-10.15
	Death	6(75%)	10(83.3%)	0.90	0.56- 1.44

Data are expressed as the number of patients with or without a characteristic and a (%). OR, odds ratio; CI, confidence interval.

Table 5. Outcome 6 months after stroke, comparing death or functional dependence with independence among groups.

Outcome	SU (n=35)	GW (n=39)	OR (CI 95%)
Death/ dependence	18 (51.4%)	23 (58%)	0.73 (0.59-1.84)
Independence	17 (48.6%)	16 (42%)	1.35 (0.54-33.41)

Data are expressed as patient's number with or without a characteristic and also in %. OR indicates the odds ratio with a CI of 95%.

Six-month follow-up functional status and mortality are shown on Table 4. Results were assessed according severity subgroups, based on stratification performed by the first week of hospital stay. Independency rates at six months (0 to 2 Rankin scale) for SU and GW groups were respectively 85% and 87% for mild sub-group, 42,8% and 25% at moderate sub-group. No patient was rendered independent in severe sub-group. Odds ratio calculation confidence intervals showed no statistical difference among these groups.

Overall independency findings six months after stroke for SU and GW groups were respectively 48.6% and 42%. Odds ratio calculation showed no statistical difference among these groups (Table 5).

DISCUSSION

Controversy has been raised regarding the life quality of increased survival SU patients[19]. In 1988 a British Parliament Committee questioned also the SU cost-effectiveness[20]. Recent review from Cochrane Library added five new randomized series to the collaborative study and showed that besides a lower mortality, SU experimental group was also able to offer a 25 to 29% improvement of functional independence rates[2,21]. A Danish study has compared SU (n=936) or GW (n=305) patients regarding age, gender or initial severity[22]. Severity subgroups showed similar prognosis including length of hospitalization, mortality or functional outcome at one and five-year follow-up. In the present study we have also included all patients. Coma cases were randomized to both SU (8.5%) and GW (15.8 %) groups.

Despite the lack of significant difference in clinical outcomes between both groups, better results were achieved in moderate severity subgroup in SU patients, where an advantage of dependency rates was demonstrated when compared to GW group (Table 4). These results may support previous studies, which have focused their attention on moderate severity patients, excluding mild or severe sub-groups[3]. Further studies have however stressed the existence of benefits in all sub-group[21].

The lack of nursing homes (generally used for late rehabilitation support) and low-income patient profile have led us include at least a one-week hospital stay for rehabilitation purposes. This approach may explain the nearly two weeks of mean hospitalization length found in this study. It has been previously demonstrated by the cooperative study that units with later discharge policy (over one week) showed better long-term prognosis regarding death or dependence rates[20].

The lack of significant benefit in outcomes found in this study may be possible explained by the size of the sample[20,23]. Langhorne and Dennis have suggested that "...a stroke unit designed to reliably detect a modest reduction in the number of patients

who die would need to recruit thousands of patients..." This conclusion may be better demonstrated by the fact that only two studies were able to find significant difference in death or functional outcomes in eighteen and seventeen, respectively[20]. Nevertheless statistical benefit could be demonstrated when all series were put together by the Cooperative Study[2].

A possible benefit of SU may be however suggested by a comparison between present data and previous study undertaken in 1997 in Joinville[24]. According that study thirty days lethality of stroke patients were 26%. These results are comparable to the lethality found in general ward in the present study but are much higher than the 14.2% of deaths observed in the stroke unit.

Cooperative study have demonstrated that SU required 25 or 20 patients treated to avoid one death or dependent patient, respectively[2,20]. In our study the number needed to treat (NNT) was 20 and 15 for avoiding death or dependence, respectively, in a six-month period.

In conclusion, the results obtained in the present study demonstrate that potential benefits of stroke units are still to be determined and further national cooperative studies are required to detect its real role in the modern treatment of stroke patients.

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