

Ischemic stroke management in Northern Lombardy: the impact of organizational factors on thrombolysis rate

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Introduction

Thrombolysis is the most effective treatment in patients with acute ischemic stroke (1,2). This project aimed to assess the effectiveness of our organizational model on increasing the number of thrombolysis and clinical outcome in stroke patients, focusing on management factors such as Emergency Medical Service (EMS) use and assignment of Stroke Code (SC). This work is part of a bigger research project funded by Lombardy Region (3).

Materials and Methods

This study enrolled consecutive patients admitted to 15 hospitals of 5 provinces (Como, Lecco, Milano, Sondrio, Varese) of Northern Lombardy with suspected diagnosis of stroke, over a 8 months period (from November 2013 to March 2014 and September 2014 to January 2015). For each patient, data regarding pre-hospital and in-hospital times were collected through two structured questionnaires, as well as demographic and clinical characteristics (NIHSS at admission, pre-morbid mRS, TOAST, OCSP). rTPA therapy or endovascular approach, mode of transportation (private or by EMS), transport and triage patients' codes (green, yellow, red), use of SC for transport and Triage were considered.

Results

We enrolled 2373 patients (median age: 74.06±12.96 years; 52.4% male); 1688 of them were affected by ischemic stroke, 346 by hemorrhagic stroke and 330 were discharged from Emergency Department (ED) with other diagnosis. Our analysis was performed on 1036 patients whose symptoms onset time was known; demographic, clinical and management characteristics are shown on Tab 1.

Univariate analysis pointed out that transportation with EMS was related to an increased rate of thrombolytic treatments compared with self-presentation (25.7% and 10.3% respectively; $p < 0.001$). The assignment of SC by EMS operators was related to a major percentage of thrombolysis (39.7% vs 22.8%; $p < 0.001$); thrombolytic rate was also increased in patients with SC assigned by Triage (29.0% vs 17.7%; $p < 0.001$). A multivariate analysis (Tab. 2) confirmed higher rates of thrombolytic treatment if patients are younger and with a higher NIHSS score ($p < 0.001$); focusing on management factors, we found that thrombolysis is performed more frequently in patients transported by EMS (odds ratio -OR- 2.73, CI 95% 1.66-4.49) and with assignment of higher emergency code at Triage (SC/Red code versus Yellow code OR 1.45, CI 95% 1.02-2.06; SC/Red code versus Green code OR 10.65, CI 95% 3.21-35.31).

Finally, a multivariate analysis was performed in order to individuate the factors related to patients' disability at discharge: thrombolytic treatment and a lower NIHSS score at admission were significantly correlated to an improvement of at least 4 points on NIHSS score ($p < 0.001$).

Study Population	
<i>Demographic variables</i>	
Gender (male)	541 (52,2%)
Age, years (median)	77 (68-84)
<i>Clinical characteristics</i>	
NIHSS at admission (median)	6 (3-14)
<i>Management factors</i>	
EMS use	711 (71,0%)
Transport code	
Green	92 (16,8%)
Yellow	407 (74,4%)
Red	48 (8,8%)
EMS Stroke Code	116 (21,3%)
Triage Code	
Green	142 (15,1%)
Yellow	624 (66,2%)
Red	177 (18,7%)
Triage Stroke Code	317 (32,6%)
<i>Outcome</i>	
Thrombolysis	220 (21,2%)

Table 1: Population characteristics

Multivariate Analysis				
	p-value	OR	C.I. (95%)	
			Lower lim.	Upper lim.
Age	<,001	0.945	0.932	0.959
Gender (M vs F)	0,581	0.906	0.637	1.288
NIHSS at admission	<,001	1.087	1.059	1.115
EMS use (yes vs no)	<,001	2.731	1.660	4.493
Triage Code (R/SC vs G)	<,001	10.653	3.214	35.315
Triage Code (R/SC vs Y)	<,001	1.455	1.026	2.063

Table 2: Multivariate Analysis

Conclusions

EMS use and SC assignment by ED team and Triage represent two essential organizational factors in the improvement of management pathway of acute stroke. Our results confirmed the strong association of the assignment of SC and the transportation via EMS against with the increased number of thrombolytic procedures.

References

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