Determinants of Using EMS or Attending Emergency Department after Minor Stroke and High-risk Transient Ischemic Attack in Henan, China

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Abstract: Objective: On the basis of current evidence, treatment delay is minimal if patients contact the emergency medical services（EMS） or attend an emergency department (ED) immediately after minor stroke or high-risk transient ischemic attack (TIA). Little is known about the factors that can influence these actions in China.. Methods: Data were collected from university affiliated hospital records from March 2010 to March 2012, and a questionnaire was administered that included questions about socio-demographics, self-reported risk factors and hospital arrival. Potential impact factors of utilizing EMS or attending ED were analyzed by both univariate and multivariate logistical regression. Results: Of 4247 patients who sought medical attention within 24 hours, 61.05%(2593) used EMS or attended ED after minor stroke or high-risk TIA. Multivariate analysis demonstrated that consciousness dysfunction(OR 3.129, 95% CI 2.397 to 4.084) at symptom onset, a higher income (≥2001 Yuan/month) (OR 2.590, 95% CI 2.244 to 2.990), speech impairment (OR 1.343, 95% CI 1.208 to 1.493), Headache or vertigo (OR 1.223, 95% CI 1.090 to 1.372), atrial fibrillation(OR 1.539, 95% CI 1.180 to 2.007), and have family history of stroke(OR 1.290, 95% CI 1.107 to 1.504) were significantly associated with utilizing the EMS or attending an ED. Older patients (65-74years) were less likely to use EMS or attend ED than younger patients (OR 0.765, 95% CI 0.612 to 0.956), similarly to those who reported having previously TIA (OR 0.757, 95% CI 0.616 to 0.929). Conclusion: Utilizing EMS or attending ED after minor stroke or high-risk TIA in Chinese patients is not enough. Being elderly, previous TIA and lower income may contribute to this current status..

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Introduction

There is now clear evidence that the risk of recurrence after TIA or minor stroke is relatively high. This risk has been estimated as ranging from 8% to 12% within the first week[1-3]. Prompt assessment and investigation of TIA and minor stroke followed by early initiation of secondary prevention is effective in reducing recurrent stroke[4, 5].Most guidelines now recommend that patients with minor stroke or high-risk TIA should be assessed within 24 hours.[5, 6]Consequently, timely medical attention is increasingly critical.

Some registry studies in emergency department (ED) found that use of emergency medical service (EMS) transport after acute stroke has been associated with decreased prehospital and in-hospital delay[7], including time to physician evaluation[8, 9],which was similarly important to patients after TIA and minor stroke. A recent systematic review of delays to seeking medical attention after TIA[10] reported that on the basis of current evidence, treatment delay was minimal if patients contacted the EMS or attended an ED immediately. However, little is known which factors can influence utilizing the EMS or attending an ED after minor stroke or high-risk TIA in China. Information on these impact factors resulting delaying can be very useful to health care decision makers.

Subjects and Methods

The First Affiliated Hospital of Zheng Zhou University is a university-affiliated hospital placed in the Henan region in China. Influence area of the hospital involves 5 municipalities and includes rural and urban area, which covers population of about 270 0000 people. Maximum distance from influence area to the hospital is 50 km. All minor stroke or high-risk TIA patients admitted to our hospital within 14 days after the onset of symptoms from March 2010 to March 2012 were prospectively studied. We excluded patients referred from other hospitals. All questions were answered by the patients themselves if possible or by a stroke onset witness or a close relative for sociodemographic data. TIA was defined based on World Health Organization criteria[11]. High-risk TIA was defined as $ABCD^2$ scores ≥ 4[5]. Minor stroke was defined as acute occurrence of neurological deficit with focal or generalized involvement of the nervous system lasting for more than 24 hours, with National

Institutes of Health Stroke Scale score ≤3.[12, 13] All cases of minor stroke were confirmed by brain CT or MRI scan. Prehospital delay was defined as the time from symptom onset until the earliest documented time in the ED or outpatient clinics of our hospital. Patients were excluded if they had any unknown or missing time of symptom onset. Detailed baseline data such as age, sex, marital status, education, health insurance, place of residence, risk factors and symptoms were abstracted prospectively using paper-based registry forms. All cases were subsequently reviewed by the study's senior neurologist and the study protocol was approved by the ethics committee of our hospital. Written informed consent was obtained from the patients or their legally authorized representatives.

Statistical Analysis

For each factor analyzed, the number and percentage of patients who did and did not use EMS or attend ED were recorded for the TIA and minor stroke groups. The $\chi 2$ test was used to compare proportions of categorical variables, and the student's t-test test was used to compare continuous variables.

Multivariate odds ratios with 95% confidence intervals were calculated using a multiple logistic regression model. We introduced all variables that showed a significant association (P<0.05) in the univariate analysis. We considered P<0.05 to be statistically significant in multivariate analysis. All analyses were conducted using SAS (9.1) software.

Results

7467 consecutive eligible patients included in the analysis, only 8.37%(625) arrived at the hospital by EMS, the majority of this action (arrival) occurred within 72 hours; 38.88%(2903) by taxi, which continued as a high percent within 14 days(**Figure 1**). Of 4247(56.87%) patients sought medical attention within 24 hours, 61.05%(2593) used or attended ED after minor stroke or high-risk TIA (**Figure2**).

Factors associated with utilizing the EMS or attending an ED in the univariate analyses are shown in **Table 1**. After minor stroke or high-risk TIA, older patients (65-74years) were less likely to use EMS or attend ED(p<0.0001), but patients with a higher income (≥2001 Yuan/month) were more likely to use EMS or attend ED(p<0.0001). Analysis of symptoms showed that sensory symptoms (p=0.0498), Speech symptoms (p<0.0001), Headache or vertigo (p=0.0007), and Consciousness dysfunction (p<0.0001) were associated with utilizing the EMS or attending an ED.

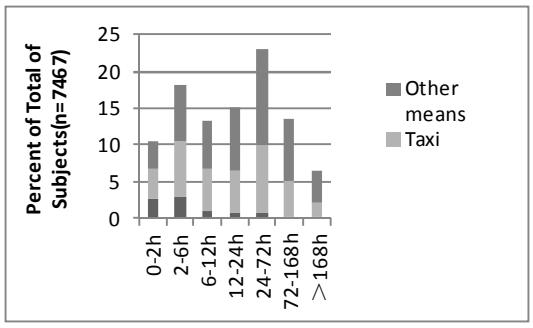

Figure1 Percentage distribution of arrival mode by delay time among patients after high-risk TIA or minor stroke within 14 days

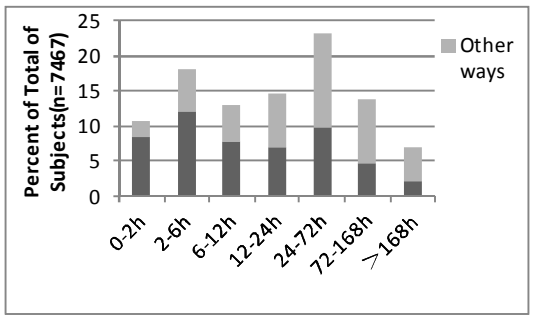

Figure2 Percentage distribution of presenting ways by delay time among patients after high-risk TIA or minor stroke within 14 days

Analysis of vascular risk factors showed that Previous TIA was significantly associated with not utilizing the EMS or attending an ED (p=0.0186), and Hypertension (p=0.0007) diabetes(p=0.0102) , coronary heart disease (p=0.0009), atrial fibrillation(p<0.0001), valvular heart disease (p=0.0022) and Family History of Stroke (p=0.0026) were associated with utilizing the EMS or attending an ED. There was no association between utilizing the EMS or attending an ED and sex, residence status, educational level, health insurance, with motor symptoms, or view symptoms at onset.

Multivariate analysis (**Table 2**)showed that older patients (65-74years) were less likely to use EMS or attend ED than younger patients (OR 0.765, 95% CI 0.612 to 0.956). Patients with a higher income (≥2001 Yuan/month) as opposed to those lower income (OR 2.590, 95% CI 2.244 to 2.990) more likely to use EMS or attend ED. One main symptom factor associated with utilizing the EMS or attending an ED was with consciousness dysfunction (OR 3.129, 95% CI 2.397 to 4.084) at symptom onset, the other independent factors were speech impairment (OR 1.343, 95% CI 1.208 to 1.493), headache or vertigo (OR 1.223, 95% CI 1.090 to 1.372), atrial fibrillation(OR 1.539, 95% CI 1.180.

to 2.007), and family history of stroke(OR 1.290, 95% CI 1.107 to 1.504). Surprisingly, those who reported having previously TIA (OR 0.757, 95% CI 0.616 to 0.929) were less likely to use the EMS or attend an ED

Table 1: Factors Related to the presenting to EMS or an ED after TIA or minor stroke: Univariate Analysis

	Used EMS or Attended ED		
	YES %(n)	**NO** %(n)	p
	50.69(3785)	49.31(3682)	
Stroke type			0.5841
High-risk TIA	18.94(717)	18.33(675)	
Minor stroke	81.06(3068)	81.67(3007)	
Sex			0.0833
Male	62.99(2384)	64.91(2390)	
Female	37.01(1401)	35.09(1292)	
Age(year)			<0.0001
18–44	6.05(299)	5.87 (216)	
45-64	41.53(1572)	42.80(1576)	
65-74	27.85(1054)	31.80(1171)	
75-84	21.22(803)	17.06(628)	
>85	3.36(127)	2.47(91)	
Educatin			0.1366
<high school	67.37(2529)	68.98(2502)	
≥high school	32.63(1225)	31.02(1125)	
Residence status			0.1327
Living alone	3.78(142)	3.14 (114)	
Living with others	96.22(3613)	96.86(3515)	
Health Insurance			0.5230
Medical insurance	82.22(3112)	82.78(3048)	
Own expense	17.78(673)	17.22(634)	
Average monthly			<0.0001
≤1000 Yuan	18.18(688)	29.85(1099)	
1001-2000 Yuan	11.70(443)	19.99(736)	
≥2001 Yuan	70.12(2654)	50.16(1847)	
symptoms			
Motor	63.92(2354)	62.29(2141)	0.1562
Sensory	23.75(879)	25.75(891)	0.0498
view	6.39(242)	6.33(233)	0.9076
Speech	38.49(1457)	30.96(1140)	<0.0001
Headache or	26.92(1019)	23.52(866)	0.0007
Consciousness	7.03(266)	2.36(87)	<0.0001
Cognitive	3.41(127)	3.45(120)	0.9243
Clinical			
Hypertentsion	65.50(2479)	61.71(2272)	0.0007
Diabetes	21.77(824)	19.36(713)	0.0102
Hyperlipidemia	12.10(458)	10.76(396)	0.0678
Previous CHD	14.16(536)	11.60(427)	0.0009
Atrial fibrillation	5.71(216)	3.04(112)	<0.0001
Current Smoker	28.67(1055)	27.40(980)	0.1626
Family History of	13.54(478)	11.17(387)	0.0026
Previous TIA	5.68(215)	7.01(258)	0.0186
Previous Ischemic	27.08(1025)	26.15(963)	0.3652
Previous Valvular	1.95(73)	1.07(39)	0.0022
NIHSS at	2(0-3)	2(0-3)	0.0776
Pre-event	0(0-0)	0(0-0)	0.0685

NIHSS, National Institute of Health Stroke Scale; IQR, interquartile range; ED, emergency department; EMS,emergency medical service; CHD, coronary heart disease

Discussion

The low proportion of patients using EMS (8.37%) indicates a lack of public awareness that TIA or minor stroke is a medical emergency in China. In our study, older patients(65-74years) were less likely to use EMS or attend ED than younger patients, this seem to be in contrast to findings from some studies[7, 14] that older people were more likely to use EMS. Efforts should be made to inform this population about the risk of developing large infarcts and subsequent disability in China. Patients with a higher income as opposed to those lower more likely to use EMS or attend ED, suggesting our health care maybe have economic differences.

Table2. Factors Related to the presenting to EMS or an ED after TIA or minor stroke: Multivariate Analysis

	Adjusted OR	95%CI	P
Age, y			
18–44	1		
45-64	0.897	0.724-1.112	0.3228
65-74	0.765	0.612-0.956	0.0187
75-84	1.053	0.833-1.332	0.6653
≥85	1.122	0.777-1.620	0.5387
Average monthly income per capita			
≤1000 Yuan	1		
1001-2000 Yuan	1.062	0.901-1.250	0.4740
≥2001 Yuan	2.590	2.244-2.990	<0.0001
Speech symptoms	1.343	1.208-1.493	<0.0001
Headache or vertigo	1.223	1.090-1.372	0.0006
Consciousness dysfunction	3.129	2.397-4.084	<0.0001
Family History of Stroke	1.290	1.107-1.504	0.0011
Atrial fibrillation	1.539	1.180-2.007	0.0015
Previous TIA	0.757	0.616-0.929	0.0078

OR, odds ratio; 95%CI, 95%confidence interval; ED, emergency department; EMS,emergency medical service.

Consciousness dysfunction, speech impairment, and headache or vertigo were associated with utilizing the EMS or attending an ED, perhaps these symptoms heightened sense of urgency. However, motor and sensory symptoms were not significant in this study. Public information on stroke symptoms is still needed, especially in high-risk populations. Furthermore, when patients are given information about stroke, more emphasis needs to be placed on the "call to action" and the emergency nature of stroke symptoms.

Population surveys have demonstrated that public perception and knowledge of TIA is poor[15, 16],and even those patients who recognized their symptoms as those of TIA did not always contact the EMS or attend an ED[17], a phenomenon that has also been documented after stroke[18, 19],which may explain why having a history of TIA did not have an effect on utilizing the EMS or attending an ED in our study.

More encouraging was the observation that patients with atrial fibrillation were more likely of utilizing the EMS or attending an ED , although this result seems to be in contrast to the usual poor awareness that the patients suffering from atrial fibrillation have increased risk of vascular diseases[20]. Having family history of stroke was an independent factor of utilizing the EMS or attending an ED in this study. Family members knew that the best response is to call an EMS or timely attend an ED in an emergency. This result is in agreement with another study[18] ,which showed that family history of stroke was a factor independently associated with a call for EMS within 1 hour after acute stroke.

Mass media educational campaigns do appear to work. An observational study assessing community stroke education with mass media campaigns observed increased ED attendance among patients with stroke and TIA[21], which appeared to that the media campaign have very great effect on ED attendance in patients with TIA. This suggested that the effective public educational campaigns including taxi driver should be utilized in China.

Although we think that our study data are valid, some potential limitations of this study should be discussed. TIAs and minor strokes before recurrence might have been under-reported as some patients are unable to give an account of previous TIA or minor stroke and corroborative accounts are not always available. A more comprehensive study of the factors associated with prehospital transport is needed in China, representing a mix of urban and rural hospitals and of research and community hospitals, including use of a standardized prospective interview questionnaire.

In conclusion, only half of those with high-risk TIA and minor stroke used EMS or attended ED in China. If the factors that influence utilizing the EMS or attending an ED can be better understood, interventions could be developed to increase these actions among this population. More effective work is needed to educate the public to seek medical review immediately after TIA and minor stroke in an attempt to avoid recurrent stroke and its devastating consequences.

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