Comparison of Recovery Patterns and Prognostic Indicators for Ischemic and Hemorrhagic Stroke in China

The ChinaQUEST (QUality Evaluation of Stroke Care and Treatment) Registry Study

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Background and Purpose—Limited data exist on the comparative recovery patterns and outcomes of patients with ischemic stroke and intracerebral hemorrhage in China.

Methods—Data on baseline characteristics and outcomes of 6354 patients at 3 and 12 months poststroke are from ChinaQUEST (QUality Evaluation of Stroke Care and Treatment), a multicenter, prospective, 62-hospital registry study in China. Logistic regression was used to determine factors associated with a poor outcome defined by death/dependency (modified Rankin Scale score of 3 to 5) on follow-up. Generalized estimating equations were used to assess variations in recovery pattern by stroke type.

Results—Baseline severity and rate of functional recovery in the early phase were significantly greater for intracerebral hemorrhage. However, patients with ischemic stroke were on average twice as likely to experience a good outcome (modified Rankin Scale score <3) by 12 months poststroke (OR: 1.98, CI: 1.76 to 2.24). In patients with ischemic stroke, diabetes and atrial fibrillation were strongly associated with a poor outcome at 12 months poststroke even after adjustment for confounding factors such as age, prior stroke/dependency, time to presentation, and stroke severity, whereas use of antiplatelets and lipid-lowering therapy after stroke were associated with improved outcome. For patients with intracerebral hemorrhage, low education and atrial fibrillation were associated with a poor outcome after adjustment for potential confounders and antihypertensive use was strongly associated with improved outcome.

Conclusions—Patients with intracerebral hemorrhage and ischemic stroke have different recovery patterns in China. However, they share similar prognostic factors and in the use of evidence-based secondary prevention therapies to maximize chances of a good outcome. **(*Stroke*. 2010;41:1877-1883.)**

Key Words: China ■ outcome ■ stroke

Like in many nations across the world, stroke is 1 of the leading causes of mortality and morbidity in China.[1] However, as China reaps the benefits of recent rapid economic development and resultant increases in life expectancy,[2] it is also confronted with the challenges of an escalating burden of chronic diseases in its massive population of 1.3 billion residents.[3] An assessment of clinical prognosis is useful for prioritizing (and rationalizing) healthcare resources, particularly for costly diseases such as stroke. However, although there have been many studies of the predictors of mortality and functional outcome for stroke using a plethora of outcome measures, including research in Asia[4–6] and in China,[7–17] these are often limited by sample size, geographic location, and stroke type. The aims of our study were therefore to compare recovery patterns and determine factors associated with a poor outcome for the major stroke types of ischemic stroke (IS) and intracerebral hemorrhage (ICH) in a broad range of hospitalized patients in China.

Methods

Study Design

ChinaQUEST (QUality Evaluation of Stroke Care and Treatment) was a multicenter, prospective, hospital (n=62) registry study in 37 cities in China, as described elsewhere.[18] In brief, consecutive patients (aged ≥15 years) admitted to a hospital with a recent acute stroke due to IS or ICH were included during a 5-month period in

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2006. Patients underwent 4 assessments at baseline (done as soon as possible after notification), time of discharge, and approximately 3 and 12 months poststroke. Baseline information on demographics and medical history was obtained predominantly by face-to-face interviews and medical records, whereas those pertaining to functional outcome as measured by modified Rankin Scale (mRS)[19] at 3 and 12 months were obtained mainly by telephone interview (>80%). Information on the likely cause and location of those patients who died during follow-up was obtained as soon as possible after notification. Death was ascertained by family (64.7%), a health professional (18.4%), records (eg, medical, police [11.8%]), death certificate (3.5%), or another source (1.5%). Written informed consent was obtained from all patients or an appropriate family member (in situations in which the patient was disabled) to participate. The study was approved by the ethics committees of Peking University First Hospital (Beijing), Ruijin Hospital (Shanghai), Prince of Wales Hospital (Hong Kong), and The University of Sydney. Good Clinical Practice guidelines in accordance with the Declaration of Helsinki were used and the privacy of patients was strictly protected.

Explanatory and Outcome Variables

Baseline characteristics considered included sociodemographic variables (age, sex, marital status, living alone, low level of education [primary education only or illiterate], active employment [part-time or full-time], annual household income), medical history, and clinical features. Medical history investigated included: hypertension, diabetes, hyperlipidemia, atrial fibrillation, prior stroke, prior coronary artery disease (includes any history of heart attack/myocardial infarction, angina, or coronary heart disease) either self-reported or diagnosed in-hospital poststroke (patients whose total cholesterol level was ≥5.20 mmol/L[20] in-hospital were also classified as hyperlipidemic); prior dependency, current cigarette smoking, regular alcohol consumption within the 3 months before stroke onset, and being overweight (body mass index ≥24 kg/m^2).[20] Clinical features considered included time of presentation to the hospital, severe admission (Glasgow Coma Scale [GCS]) score (defined as 3 to 8 of a maximum of 15), and total anterior cerebral syndrome (TACS) subtype of stroke as per the Oxfordshire Community Stroke Project classification. The influence of management strategies on 12-month outcomes was also examined. For ICH, the effects of intravenous steroids, neuroprotectants (including edaravone, ganglioside GM1, cattle encephalon glycoside and ignotine, cinepazide, citicoline), hemodiluting agents (such as mannitol), and traditional Chinese medicine (alternative/herbal medicine) use in-hospital, and antihypertensive use during the months poststroke were assessed; whereas for IS, the effect of intravenous thrombolysis in-hospital and antiplatelet and lipid-lowering therapy poststroke were additionally investigated. Outcome as measured by the mRS was assessed in 2 ways: dichotomized into good (survival or nondependency [mRS score of 0 to 2]) and poor (death or dependency [mRS score of 3 to 5]) and as a graduated score. The mRS is scored 0 to 5 with: 0, no symptoms; 1, no significant disability; 2, slight disability; 3, moderate disability; 4, moderately severe disability; and 5, severe disability.[21]

Statistical Analysis

Logistic regression was used to determine factors associated with poor outcome at 3 and 12 months poststroke. Univariate analyses were followed by multivariate analyses adjusting for age (as a continuous variable), sex, and initially significant factors in which checks were also made for plausible interactions between main effects. The effect of medical management on the combined outcome variable death/dependency as well as on death per se and dependency per se at 12 months poststroke was also assessed using this approach. Separate modeling using logistic generalized estimating equations was performed to examine recovery patterns between IS and ICH with a different quadratic trend to actual time of assessment (weeks since onset) included a priori as a covariate and good outcome as a model outcome. A different intercept and linear slope but a common quadratic term was fitted to the IS and ICH data. Inclusion of the quadratic term was supported by quasilikelihood under the independence model criterion scores. An exchangeable correlation structure was used to account for any within-patient correlation. Wald tests were performed to assess the statistical significance of differences. Data are presented with ORs and 95% CIs. Statistical significance was considered at $P<0.05$. Time course of recovery curves was constructed using the predicted values and 95% CI from the final generalized estimating equations model. All analyses were conducted using STATA 10.1 (StataCorp LP, College Station, Texas).

Table 1. Baseline Characteristics of Patients*

	Ischemic Stroke (N=4782)	Intracerebral Hemorrhage (N=1572)
Sociodemographic		
Age, mean (SD), years	64.6±11.8	61.1±12.9
Female	1810 (38)	632 (40)
Married	3958 (83)	1318 (84)
Living alone	234 (5)	77 (5)
Low education†	2226 (47)	820 (52)
Active employment before stroke	809 (17)	318 (20)
Annual household income		
≥20 000 CNY (approximately $2857 US)	1427 (30)	300 (19)
Declined to respond/unknown	631 (13)	209 (13)
Medical history		
Hypertension	3623 (76)	1332 (85)
Diabetes mellitus	1198 (25)	168 (11)
Hyperlipidemia	2168 (45)	409 (26)
Atrial fibrillation	442 (9)	53 (3)
Prior stroke	1383 (29)	355 (23)
Prior coronary artery disease‡	1134 (24)	246 (16)
Prior dependency	644 (13)	210 (13)
Current smoker	1375 (29)	399 (25)
Regular alcohol use§	1304 (27)	411 (26)
Overweight (body mass index ≥24 kg/m^2)	2192 (46)	637 (41)
Clinical features		
Time from symptom onset to hospital presentation		
<6 hours	1427 (30)	922 (59)
Unknown	237 (5)	29 (2)
Severe GCS score on admission‖	218 (5)	360 (23)
Clinical classification—TACS¶	506 (11)	290 (18)

*Values are reported as mean±SD or no. (%) of subjects; percentages based on nonmissing values: 1 missing value of body mass index for ICH; 16 and 64 missing values of GCS for IS and ICH, respectively.

†Defined as being illiterate or having received primary education only.

‡Coronary artery disease includes prior heart attack or angina.

§Within the 3 months before stroke onset.

‖Severe score ≤8 in range 3 (low) to 15 (high, normal).

¶Oxfordshire Community Stroke Project clinical classification.

Table 2. Logistic Regression Analyses on Prognostic Baseline Factors for 12-Month Death/Dependency by Stroke Type

	Ischemic Stroke		Intracerebral Hemorrhage	
	Crude* OR (95% CI)	Adjusted† OR (95% CI)	Crude‡ OR (95% CI)	Adjusted§ OR (95% CI)
Sociodemographic				
Age	1.06 (1.05–1.07)	1.05 (1.04–1.05)	1.04 (1.03–1.05)	1.03 (1.02–1.05)
Female	1.39 (1.22–1.58)	1.08 (0.91–1.29)	1.02 (0.82–1.26)	0.80 (0.60–1.08)
Married	0.60 (0.51–0.70)	0.93 (0.76–1.13)	0.70 (0.52–0.93)	0.86 (0.61–1.21)
Living alone	1.03 (0.77–1.38)	…	1.43 (0.87–2.35)	…
Low education	1.59 (1.40–1.81)	1.10 (0.94–1.29)	1.85 (1.49–2.30)	1.37 (1.04–1.79)
Active employment prior to stroke	0.31 (0.25–0.39)	0.83 (0.64–1.08)	0.46 (0.35–0.61)	0.82 (0.57–1.18)
Annual household income‖				
≥20 000 CNY (approximately $2857 US)	0.88 (0.76–1.03)	…	1.10 (0.83–1.47)	…
Declined to respond/unknown	1.12 (0.91–1.38)	…	1.09 (0.78–1.52)	…
Medical history				
Hypertension	1.15 (0.99–1.34)	…	1.33 (0.99–1.79)	…
Diabetes mellitus	1.37 (1.19–1.58)	1.42 (1.20–1.68)	1.36 (0.96–1.93)	…
Hyperlipidemia	0.75 (0.65–0.85)	0.76 (0.65–0.89)	0.75 (0.59–0.95)	0.80 (0.60–1.05)
Atrial fibrillation	2.89 (2.36–3.55)	1.43 (1.11–1.84)	2.04 (1.10–3.77)	2.35 (1.16–4.77)
Prior stroke	2.18 (1.90–2.50)	1.68 (1.44–1.97)	1.67 (1.30–2.16)	1.25 (0.92–1.69)
Prior coronary artery disease	1.84 (1.58–2.13)	1.18 (0.99–1.41)	1.13 (0.84–1.52)	…
Prior dependency	3.11 (2.60–3.73)	2.33 (1.90–2.86)	2.90 (2.06–4.07)	2.78 (1.89–4.08)
Current smoker	0.57 (0.49–0.66)	0.93 (0.77–1.12)	0.78 (0.61–1.00)	0.95 (0.70–1.30)
Regular alcohol use	0.55 (0.47–0.64)	0.82 (0.68–1.00)	0.67 (0.53–0.86)	0.91 (0.66–1.24)
Overweight (body mass index ≥24 kg/m^2)	0.86 (0.76–0.98)	0.97 (0.83–1.12)	0.82 (0.66–1.02)	…
Clinical features				
Time from symptom onset to hospital presentation¶				
<6 hours	1.70 (1.48–1.95)	1.28 (1.09–1.50)	1.83 (1.47–2.28)	1.61 (1.25–2.08)
Unknown	0.64 (0.46–0.90)	0.62 (0.42–0.90)	1.77 (0.79–3.98)	2.03 (0.82–5.01)
Severe GCS score on admission	12.27 (8.53–17.65)	7.71 (5.15–11.55)	11.23 (7.90–15.96)	10.82 (7.45–15.73)
Clinical classification—TACS	4.26 (3.45–5.25)	3.50 (2.74–4.46)	3.02 (2.21–4.14)	1.99 (1.38–2.89)

*Models run on N=4645, excluding 137 missing outcome values; with the exception of model for "severe GCS score on admission," which was run on 4582, excluding a further 63 missing values of GCS.

†Model run on N=4582, excluding 137 missing outcome values and 63 missing values of GCS.

‡Models run on N=1524, excluding 48 with missing outcome values with the exception of model for "severe GCS score on admission," which was run on 1509, excluding a further 15 missing values of GCS, and the model for "overweight," which was run on 1523, excluding 1 missing value of overweight.

§Model run on N=1509, excluding 48 missing outcome values and 15 missing values of GCS.

‖Reference group: annual household income <20 000 CNY (approximately $2857 US).

¶Reference group: time from symptom onset to hospital presentation ≥6 hours.

Results

In total, 13 038 patients were screened for eligibility. Of these, 30.9% were ineligible, 16.1% refused to participate, 1.5% died rapidly before enrolment, and the remainder 1.5% were not included for other reasons. This resulted in 6508 enrolled patients, of whom 154 were further excluded due to uncertainty of diagnosis and missing data, bringing the total study population to 6354 cases. Table 1 shows the baseline characteristics of the study population by stroke type. Compared with patients with IS, nearly twice as many patients with ICH patients to the hospital within 6 hours of onset and >4 times as many had a severe GCS score on admission.

Tables 2 and 3 present univariate and multivariate associations of baseline characteristics with a poor outcome at 12 months poststroke, respectively. No significant interaction effects were detected in the multivariate analyses. Associations between baseline characteristics and a poor outcome did not differ greatly between 3 and 12 months (data not shown) with the exception of multivariate analyses for the earlier time point, in which for IS, females (OR=1.22, P=0.02) and low-educated patients (OR=1.25, P=0.005) additionally had a higher risk of death or dependency, but subjects with hyperlipidemia did not (OR=0.91, P=0.20); and for ICH, hypertension (OR=1.51, P=0.02) and prior stroke (OR=1.37, P=0.04) were additionally associated with a poor outcome, whereas atrial fibrillation was omitted from the multivariate model because it did not reach significance in the univariate analyses.

With regard to management, multivariate analyses showed that in-hospital use of intravenous steroids was associated with a poor outcome for both stroke types, whereas there was no relation of intravenous neuroprotectants and outcome

Table 3. Prognostic Management Factors for 12-Month Death/Dependency by Stroke Type

	Ischemic Stroke			Intracerebral Hemorrhage		
	No.* Yes/No	OR (95% CI)		No.§ Yes/No	OR (95% CI)	
		Crude†	Adjusted‡		Crude‖	Adjusted¶
Death/dependency						
In-hospital therapy						
Intravenous thrombolysis	154/322	1.14 (0.92–1.42)	…	…	…	…
Intravenous hemodiluting agents	770/930	3.72 (3.18–4.34)	2.91 (2.44–3.48)	762/703	1.71 (0.96–3.03)	…
Intravenous steroids	74/71	2.38 (1.70–3.35)	1.72 (1.14–2.60)	105/49	2.12 (1.45–3.10)	2.04 (1.30–3.20)
Intravenous neuroprotectant	1122/2438	1.22 (1.03–1.45)	1.07 (0.87–1.30)	552/553	0.80 (0.62–1.04)	…
Intravenous traditional Chinese medicine	1184/2478	1.30 (1.08–1.56)	1.26 (1.02–1.57)	327/317	0.91 (0.72–1.15)	…
Therapy during 3 months poststroke						
Antihypertensive	1034/2423	0.86 (0.74–0.99)	0.86 (0.72–1.02)	514/619	0.37 (0.29–0.48)	0.47 (0.34–0.64)
Antiplatelet	1155/2951	0.34 (0.28–0.41)	0.54 (0.43–0.69)	…	…	…
Lipid lowering	397/1230	0.60 (0.52–0.70)	0.81 (0.67–0.97)	…	…	…
Death						
In-hospital therapy						
Intravenous thrombolysis	51/434	1.04 (0.76–1.44)	…	…	…	…
Intravenous hemodiluting agents	311/1427	4.10 (3.30–5.10)	2.34 (1.82–3.01)	405/1106	1.94 (0.93–4.05)	…
Intravenous steroids	46/106	4.04 (2.79–5.85)	3.09 (1.95–4.91)	60/98	1.79 (1.23–2.61)	1.59 (0.99–2.56)
Intravenous neuroprotectant	377/3265	1.05 (0.83–1.35)	…	264/866	0.50 (0.37–0.66)	0.66 (0.47–0.94)
Intravenous traditional Chinese medicine	400/3384	1.16 (0.89–1.51)	…	141/516	0.51 (0.39–0.67)	0.52 (0.37–0.72)
Therapy during 3 months poststroke						
Antihypertensive	301/3240	0.50 (0.41–0.61)	0.58 (0.45–0.74)	199/969	0.16 (0.12–0.21)	0.20 (0.15–0.28)
Antiplatelet	323/3904	0.15 (0.12–0.19)	0.29 (0.22–0.38)	…	…	…
Lipid-lowering	95/1584	0.40 (0.31–0.50)	0.77 (0.58–1.04)	…	…	…
Dependency in surviving patients						
In-hospital therapy						
Intravenous thrombolysis	103/322	1.16 (0.90–1.48)	…	…	…	…
Intravenous hemodiluting agents	459/930	2.93 (2.46–3.50)	2.72 (2.23–3.31)	357/703	1.47 (0.74–2.92)	…
Intravenous steroids	28/71	1.35 (0.86–2.12)	…	45/49	1.92 (1.23–3.00)	1.88 (1.13–3.13)
Intravenous neuroprotectant	745/2438	1.28 (1.05–1.56)	1.07 (0.86–1.33)	288/553	1.22 (0.88–1.69)	…
Intravenous traditional Chinese medicine	784/2478	1.37 (1.11–1.69)	1.27 (1.00–1.61)	186/317	1.38 (1.05–1.83)	1.21 (0.88–1.65)
Therapy during 3 months poststroke						
Antihypertensive	733/2423	1.17 (0.98–1.39)	…	315/619	1.14 (0.79–1.63)	…
Antiplatelet	832/2951	0.66 (0.51–0.84)	0.81 (0.61–1.07)	…	…	…
Lipid-lowering	302/1230	0.76 (0.64–0.89)	0.81 (0.67–0.97)	…	…	…

*No. of patients on therapy based on outcome status: N=1433/3212 (yes/no) for death/dependency, N= 491/4291 (yes/no) for death, and N= 942/3212 (yes/no) for dependency.

†Model run on N=4645 for death/dependency, on N=4782 for death, and on N=4154 for dependency.

‡Model run on N=4582 for death/dependency, on N=4718 for death, and on N=4104 for dependency, omitting missing values of GCS; models were adjusted for age, sex, and baseline variables shown to be significantly associated ($P<0.05$) with outcome in univariate analyses.

§No. of patients on therapy based on outcome status: N=784/740 (yes/no) for death/dependency, N=415/1157 (yes/no) for death, and N=369/740 (yes/no) for dependency.

‖Model run on N=1524 for death/dependency, on N=1572 for death, and on N=1109 for dependency.

¶Model run on N=1509 for death/dependency, on N=1556 for death, and on N=1096 for dependency, omitting missing values of GCS; models were adjusted for age, sex, and baseline variables shown to be significantly associated ($P<0.05$) with outcome in univariate analyses.

(Table 3). Intravenous traditional Chinese medicine and hemodiluting agent use were associated with a poor outcome for IS, but antiplatelet and lipid lowering therapy post-IS significantly reduced this risk. In addition, although antihypertensive use poststroke halved the risk of poor outcome for ICH, there was only weak evidence for benefit in IS.

Figure 1 shows the distribution of death and mRS scores for patients with IS and ICH in-hospital and at follow-up with a higher case-fatality in patients with ICH evident at all time points. By 12 months, 415 and 369 patients with ICH were dead and dependent, respectively; whereas 491 and 942 patients with IS were dead and dependent, respectively. In

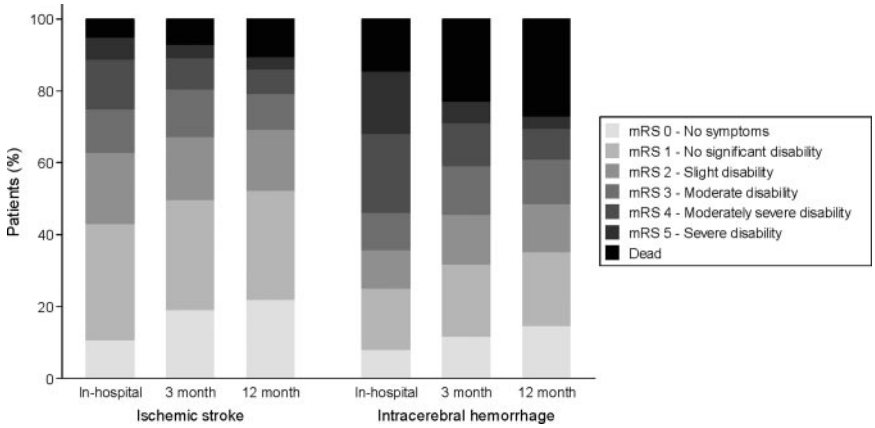

Figure 1. mRS scores by stroke type in-hospital and at 3 and 12 months post-stroke. Graph based on nonmissing values.

logistic generalized estimating equations modeling, the incorporation of a quadratic time term resulted in a better model (lower quasilikelihood under the independence model criterion value). The Wald tests comparing the time course of recovery (slopes or overall) of the 2 stroke types (Figure 2) were significant ($P<0.001$), thereby providing strong evidence that pattern of recovery after stroke was significantly different between patients with IS and those with ICH. The ORs for a good outcome at 3 and 12 months poststroke for patients with IS compared with patients with ICH were 2.62 (95% CI 2.36 to 2.91) and 1.98 (95% CI 1.76 to 2.24), respectively.

Discussion

This study presents an overview of the outcome and recovery patterns in hospitalized patients after acute stroke in China. Trajectories of recovery were significantly different by stroke type with patients with ICH improving faster initially than patients with IS, a finding consistent with existing literature.[22–25] Conversely, prognostic factors were comparable between the 2 stroke types heavily driven by age, prior dependency, and initial severity. In addition, multivariate associations between baseline characteristics and poor outcome at 3 months were almost analogous to those at 12 months. A possible explanation for this similarity is that the great majority (95%) of patients achieve most neurological recovery within 11 weeks after stroke onset[26]; thus, a model of outcomes at the 2 time points would be almost identical.

In terms of individual factors, age, prior stroke, prior dependency, diabetes, atrial fibrillation, severe admission GCS score, and TACS were all found to be correlated with poor outcome at 12 months for IS, consistent with other studies in China, Asia, and Europe[6,13,16,27–29] Our results also indicate that females were disadvantaged at 3 months post-stroke but by 12 months poststroke, their risk of poor outcome was essentially identical to that of males. This initial increase in risk for females is also analogous to recent reports from a large hospital-based registry in Korea and has been attributed to baseline demographic differences between males and females.[30]

Remarkably, hypertension was not significantly associated with poor outcome at either time point. Although similar results have been found in China,[31] a systematic review showed that high systolic and diastolic blood pressure was associated with death/dependency in patients with IS.[32] However, it is important to note that the reported U-shaped relationship between outcome after IS and blood pressure such that the worst outcomes occur at the lowest and highest blood pressures[33] is complicated by reverse causality in which patients with the most severe strokes have the lowest blood pressures. In addition, we also found that hyperlipid-

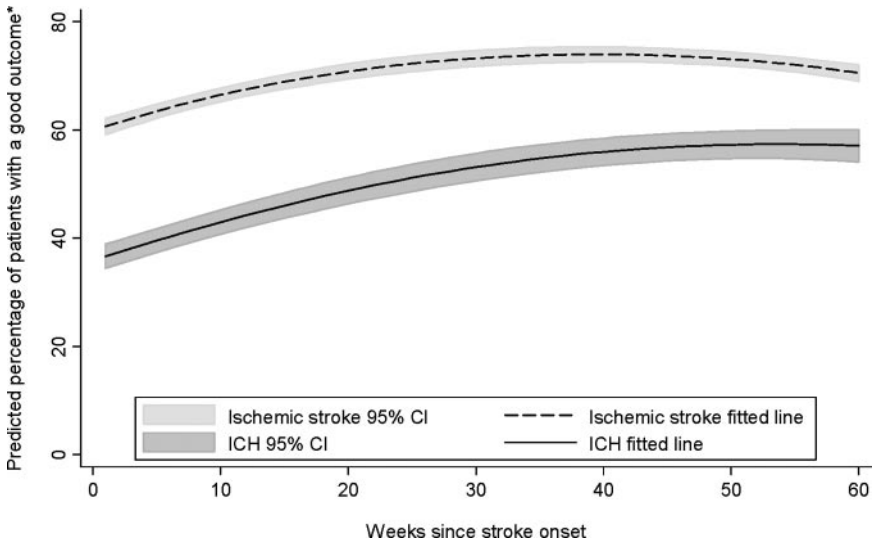

Figure 2. Time course of recovery by stroke type. *Good outcome defined as mRS scores of <3; graphs based on nonmissing values.

emia offered better prognosis at 12 months but exerted no effect on 3-month outcome. Although comparable with results from the Chinese Chengdu Stroke Registry,[11] the result is contrary to expectations and may reflect improved quality of care for those who already have high cardiovascular risk and/or for the wealthy who can afford expensive blood tests necessary to diagnose hyperlipidemia. Indeed, when comparing patients with IS with and without reported hyperlipidemia, those with hyperlipidemia were significantly wealthier, better educated, and had significantly more cardiovascular comorbidities.

Interestingly, early time to hospital presentation was found to pose a negative influence on both 3- and 12-month outcomes in patients with IS. Our finding contrasts with a recent study of Japanese patients[34] and when an early presentation would allow an opportunity for initiation of thrombolysis. It is likely, however, that this association is partially confounded by patients with severe stroke being more likely to present earlier than those with mild stroke. Indeed, in our study, 60% of those with severe IS (GCS 3 to 8) presented within 6 hours of onset, whereas only 28% of those with mild IS (GCS >8) presented early. Moreover, the assessment of thrombolysis as a significant prognostic indicator is complicated by its use in only a small number of subjects. Although antihypertensive use in the postacute setting was only marginally protective against poor outcome, we recognize that this may have been due to limitations of the composite end point used in the primary analysis. Indeed, when death alone was examined, antihypertensive use was highly protective, whereas when dependency alone was assessed, there was a trend toward a detrimental effect, although this maybe confounded by increased antihypertensive therapy use in those with high cardiovascular risk.

For patients with ICH, age, prior dependency, severe GCS score on admission, and TACS all increased the risk of poor outcome at 3 and 12 months. Although there are few comparable studies in patients with ICH, initial stroke severity as measured by the National Institutes of Health Stroke Scale was predictive of a poor outcome in studies in Hong Kong[8] and with age and prior stroke in Japan.[4] Surprisingly, an early time to hospital presentation was also associated with a poor outcome, but this finding corresponds with results reported by Naganuma et al and has been attributed to greater hematoma growth in the early hours of ICH.[34]

In contrast to IS, low education was found to be consistently associated with increased risk of poor outcome at both 3 and 12 months post-ICH. One possible explanation is that ICH is a more severe condition than IS and that access and engagement in rehabilitation may be more relevant to optimal recovery. Hypertension at baseline was correlated with poor outcome at 3 months post-ICH, but this effect did not extend to 12-month outcomes, a result that corresponds with data observed in other studies in the region.[31,35] Nevertheless, antihypertensive use during the 3 months post-ICH provided significant protection against poor outcome at 12 months.

Our study does have limitations that deserve comment. First, we were unable to assess important physiological and clinical characteristics such as lesion location and size, known to be important predictors of outcome.[4,5,36] Nonetheless, to some extent these features are captured within the TACS classification. Second, the study only included patients presenting to participating hospitals who consented to the study. The requirement of informed consent may have precluded those who died rapidly on admission and those with minor strokes who did not wish to participate. However, given the extensive geographic coverage of the study and the large number of patients enrolled in the study, we believe the results are still valuable in providing an overview of the characteristics associated with poor outcome among hospitalized patients with stroke. Third, outcome on follow-up was assessed predominantly by telephone, which may question the validity of these scores, and death was predominantly ascertained by family. Nevertheless, assessment of the mRS by telephone has been reported to achieve good agreement with face-to-face assessment in patients with stroke.[37] In addition, the consistency of our results with similar studies in China, Asia, and beyond provides further reassurance of the validity of our data.

In summary, although ICH and IS have different recovery trajectories in China, they share similar prognostic factors. These findings may assist clinicians in the management of their patients and for resource allocation in low-income settings.

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Comparison of Recovery Patterns and Prognostic Indicators for Ischemic and Hemorrhagic Stroke in China: The ChinaQUEST (QUality Evaluation of Stroke Care and Treatment) Registry Study

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中国缺血性和出血性卒中患者恢复模式和预后因素的比较研究：
中国卒中照料与治疗质量评估 (QUEST) 注册研究

Comparison of Recovery Patterns and Prognostic Indicators for Ischemic and Hemorrhagic Stroke in China
The ChinaQUEST (QUality Evaluation of Stroke Care and Treatment) Registry Study

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背景和目的：有关中国缺血性和出血性卒中患者的恢复模式及预后的资料缺乏。

方法：中国 QUEST 研究是一项由中国 62 家医院参加的多中心、前瞻性的注册研究，获得 6354 例患者的基线特征及卒中后 3 和 12 个月的结局资料。运用 logistic 回归分析确定与预后不良 (即在随防中死亡或者生活依赖，改良 Rankin 量表 [mRS] 评分为 3-5 分]) 相关的因素。运用广义估计方程式来评定不同卒中类型在恢复方式方面的变异。

结果：基线水平的严重程度和早期阶段的功能恢复率在脑出血患者中明显高。缺血性卒中在 12 个月时预后好 (mRS 评分 < 3) 的患者是脑出血患者的 2 倍 (OR：1.98, 95% CI：1.76 -2.24)。对于缺血性卒中，校正了年龄、卒中史 / 生活依赖、起病时间和卒中的严重程度等混杂因素后，糖尿病和心房颤动仍与 12 个月时的不良预后明显相关，而卒中后应用抗血小板药物和降脂药物则可以改善预后。对于脑出血者，校正混杂因素后，文化程度低和心房颤动与预后不良相关，使用降压药则明显改善预后。

结论：中国脑出血和缺血性卒中患者的恢复模式不同。然而，他们有着相似的预后指标及利用循证的二级预防治疗以使良好预后的机会最大化。

关键词：中国，结局，卒中

(*Stroke*. 2010;41:1877-1883.　上海交通大学附属仁济医院神经内科 宋叶平 译 李焰生 校)

如世界上其他很多国家一样，卒中是中国致死和致残的首位病因 [1]。然而，当前快速的经济发展使得预期寿命相应地增加 [2]，中国也同样面临着 13 亿的巨大人口基数中慢性疾病所带来的不断增加的负担 [3]。对临床预后的评估有利于最优化 (及合理化) 分配医疗保健资源，特别像卒中这样耗费巨大的疾病。然而，尽管有大量运用评估预后的方法进行卒中死亡率和功能预后预测的研究，包括在亚洲 [4-6] 和中国 [7-17] 的研究，这些研究往往受到样本量、地理位置及卒中类型的限制。因此，本研究旨在中国进行大规模的住院缺血性卒中和脑出血患者的恢复模式的比较，以及确定预后不良的相关因素。

方法

研究设计

同前述 [18]，中国卒中照料与治疗质量评估 (QUality Evaluation of Stroke Care and Treatment，QUEST) 是一项在中国 37 个城市进行的多中心、前瞻性、多家医院 (n=62) 参加的注册研究。简而言之，入选的是在 2006 年连续 5 个月期间内因急性缺血性卒中或脑出血被收治入院的患者 (年龄≥ 15 岁)。分别在基线 (知晓后尽快评估)、出院时、卒中后 3 个月和 12 个月对患者进行四次评估。人口统计学数据和既往史方面的基线信息的获取主要通过面对面问诊和病历记录。根据改良 Rankin 量表 (mRS)[19] 评定

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的 3 个月和 12 个月时功能结局信息则主要通过电话随访获得 (>80%)。有关随访期死亡患者的可能原因和定位的信息在知晓后尽快获取。死亡的证实来自于家人 (64.7%)、医疗机构 (18.4%)、记录 (如临床和警署 11.8%)、死亡证明 (3.5%) 或其他途径 (1.5%)。知情同意书由所有参加该研究的患者本人或一个比较合适的家属 (当患者本人有障碍时) 签署。本项研究被北京大学第一附属医院、瑞金医院 (上海)、威尔斯亲王医院 (香港) 和悉尼大学的伦理委员会批准。良好的临床实践指导方案符合赫尔辛基宣言及严格保护患者隐私。

解释性和结局变量

基线特征包括社会人口统计学变量 (年龄、性别、婚姻状况、独居、文化程度低 [小学文化或文盲]、就业 [兼职或全职]、家庭年收入)，既往史及临床特征。通过患者自诉或卒中后住院诊断，了解的既往史包括：高血压病、糖尿病、高脂血症 (住院检查总胆固醇水平≥ 5.20 mmol/L[20] 同样被归为高血脂)、心房颤动、卒中史、冠状动脉疾病史 (包括任何心脏病发作、心肌梗死、心绞痛或冠心病)；也包括生活独立情况、吸烟、在卒中发生前 3 个月有规律的饮酒史及超重 (体重指数≥ 24 kg/m^2)[20]。临床特征包括：起病后至医院就诊的时间、入院时的严重程度评分 (Glasgow 昏迷量表 [GCS] 评分定义为 3-8 分，最高 15 分)、牛津郡社区卒中项目 (Oxfordshire Community Stroke Project，OCSP) 分型中的全前循环综合症 (total anterior circulation syndrome，TACS) 亚型。同时分析治疗方案对卒中后 12 个月的影响。在脑出血患者中，评估住院期间静脉用皮质激素、神经保护剂 (包括依达拉奉、神经节苷脂 GM1、脑苷肌肽、桂哌齐特、胞磷胆碱)、血液稀释剂 (如甘露醇)、传统中药 (选择性 / 草药) 及卒中后数月降压治疗情况；对于缺血性卒中患者，还要评估入院后接受静脉内溶栓、卒中后使用抗血小板和降脂治疗的情况。用两种 mRS 评定方法判断预后：预后良好 (存活且生活独立 [mRS 评分 0-2 分]) 和预后不良 (死亡或者生活依赖 [mRS 评分 3-5 分]) 的二原分法；另为直接评分累加，mRS 评分计为 0-5 分 (0，无症状；1，无明显残疾；2，轻度残疾；3，中度残疾；4，中度严重残疾；5，严重残疾)[21]。

统计分析

运用 logistic 回归分析来确定与卒中后 3 个月和 12 个月时的预后不良相关的因素。单变量分析后，再行多变量分析校正年龄 (作为连续变量)、性别及有初始意义的因素。还用此方法分析治疗方案对预后变量卒中后 12 个月的死亡、生活依赖及联合预后 (死亡 / 生活依赖) 的影响。用 logistic 广义估计方程式单独的建模来检验缺血性卒中和脑出血之间的恢复模式，用不同的二次趋势至评估的确切时间 (自发病后数周)，包括一个先验模型的结果如一个协变量及好的结果。缺血性卒中和脑出血数据有不同的截距和斜率但有相同的二次项。在独立模型的评分标准下，拟似然支持二次项的包含体。用可交换相关结构来解释任何住院患者的相关性。用 *U* 检验来评估统计差异的显著性。数据用优势比 (OR) 和 95%

表 1 患者的基线特征*

	缺血性卒中 (N=4782)	脑出血 (N=1572)
社会人口统计学		
年龄，均值 (标准差)，岁	64.6 ± 11.8	61.1 ± 12.9
女性	1810 (38)	632 (40)
已婚	3958 (83)	1318 (84)
独居	234 (5)	77 (5)
文化程度低 †	2226 (47)	820 (52)
卒中前就业	809 (17)	318 (20)
家庭年收入		
≥ 20 000 人民币 (约 2857 美元)	1427 (30)	300 (19)
拒绝回答 / 不知道	631 (13)	209 (13)
既往史		
高血压	3623 (76)	1332 (85)
糖尿病	1198 (25)	168 (11)
高脂血症	2168 (45)	409 (26)
心房颤动	442 (9)	53 (3)
卒中史	1383 (29)	355 (23)
冠心病史 ‡	1134 (24)	246 (16)
生活依赖	644 (13)	210 (13)
目前吸烟	1375 (29)	399 (25)
规律的饮酒 §	1304 (27)	411 (26)
超重 (体重指数≥ 24 kg/m^2)	2192 (46)	637 (41)
临床特征		
从症状发生到医院就诊的时间		
<6 小时	1427 (30)	922 (59)
不知道	237 (5)	29 (2)
入院时 GCS 评分严重 ‖	218 (5)	360 (23)
临床分型 -TACS¶	506 (11)	290 (18)

* 显示的值是均值 ± 标准差或者各项百分位数；百分数基于无缺失值；脑出血的体重指数有一个缺失值；缺血性卒中和脑出血的 GCS 的缺失值分别是 16 和 64。

† 定义为文盲或者仅为小学文化程度。

‡ 冠心病包括心脏病发作及心绞痛史。

§ 在卒中发生前 3 个月内。

‖GCS 评分≤ 8 在 3 分 (低值) 到 15 分 (高值，正常) 范围内。

¶OCSP 临床分型。

表 2 两种卒中 12 个月预后为死亡 / 生活依赖的基线预测因素的 logistic 回归分析

	缺血性卒中		脑出血	
	原始* OR 值 (95% CI)	校正 † OR 值 (95% CI)	原始 ‡ OR 值 (95% CI)	校正 § OR(95% CI)
社会人口统计学				
年龄	1.06 (1.05–1.07)	1.05 (1.04–1.05)	1.04 (1.03–1.05)	1.03 (1.02–1.05)
女性	1.39 (1.22–1.58)	1.08 (0.91–1.29)	1.02 (0.82–1.26)	0.80 (0.60–1.08)
已婚	0.60 (0.51–0.70)	0.93 (0.76–1.13)	0.70 (0.52–0.93)	0.86 (0.61–1.21)
独居	1.03 (0.77–1.38)	...	1.43 (0.87–2.35)	...
文化程度低	1.59 (1.40–1.81)	1.10 (0.94–1.29)	1.85 (1.49–2.30)	1.37 (1.04–1.79)
卒中前就业	0.31 (0.25–0.39)	0.83 (0.64–1.08)	0.46 (0.35–0.61)	0.82 (0.57–1.18)
家庭年收入 ‖				
≥20 000 人民币	0.88 (0.76–1.03)	...	1.10 (0.83–1.47)	...
(约 2857 美元)	1.12 (0.91–1.38)	...	1.09 (0.78–1.52)	...
既往史				
高血压	1.15 (0.99–1.34)	...	1.33 (0.99–1.79)	...
糖尿病	1.37 (1.19–1.58)	1.42 (1.20–1.68)	1.36 (0.96–1.93)	...
高脂血症	0.75 (0.65–0.85)	0.76 (0.65–0.89)	0.75 (0.59–0.95)	0.80 (0.60–1.05)
心房颤动	2.89 (2.36–3.55)	1.43 (1.11–1.84)	2.04 (1.10–3.77)	2.35 (1.16–4.77)
卒中史	2.18 (1.90–2.50)	1.68 (1.44–1.97)	1.67 (1.30–2.16)	1.25 (0.92–1.69)
冠心病史	1.84 (1.58–2.13)	1.18 (0.99–1.41)	1.13 (0.84–1.52)	...
生活依赖	3.11 (2.60–3.73)	2.33 (1.90–2.86)	2.90 (2.06–4.07)	2.78 (1.89–4.08)
目前吸烟	0.57 (0.49–0.66)	0.93 (0.77–1.12)	0.78 (0.61–1.00)	0.95 (0.70–1.30)
规律的饮酒	0.55 (0.47–0.64)	0.82 (0.68–1.00)	0.67 (0.53–0.86)	0.91 (0.66–1.24)
超重 (体重指数≥ 24 kg/m^2)	0.86 (0.76–0.98)	0.97 (0.83–1.12)	0.82 (0.66–1.02)	...
临床特征				
从症状发生到医院就诊的时间 ¶				
<6 小时	1.70 (1.48–1.95)	1.28 (1.09–1.50)	1.83 (1.47–2.28)	1.61 (1.25–2.08)
不知道	0.64 (0.46–0.90)	0.62 (0.42–0.90)	1.77 (0.79–3.98)	2.03 (0.82–5.01)
入院时 GCS 评分严重	12.27(8.53–17.65)	7.71(5.15–11.55)	11.23(7.90–15.96)	10.82(7.45–15.73)
临床分型 -TACS	4.26 (3.45–5.25)	3.50 (2.74–4.46)	3.02 (2.21–4.14)	1.99 (1.38–2.89)

*剔除了 137 名预后缺失值，此模型 N=4645；排除了“入院时严重的 GCS 评分”(再剔除 63 名 GCS 缺失值) 的模型 N=4582。

† 剔除了 137 名预后缺失值和 63 名 GCS 缺失值，此模型 N=4582。

‡ 剔除 48 名预后缺失值，此模型 N=1524；排除了“入院时严重的 GCS 评分”(再剔除 15 名 GCS 缺失值) 的模型 N=1509；剔除 1 名超重缺失值的模型 N=1523。

§ 剔除 48 名预后缺失值和剔除 15 名 GCS 缺失值，此模型 N=1509。

‖ 参照组：家庭年收入 < 20 000 人民币 (约 2857 美元)。

¶ 参照组：从症状发生到医院就诊的时间≥ 6 小时。

可信区间 (CI) 表示。统计的显著性设为 P<0.05。用最后的广义估计方程式模型得出的预测值和 95% CI 来构建恢复的时间过程曲线。所有的分析采用 STATA 10.1(StataCorp LP, College Station, Texas)。

结果

总共有 13 038 名患者被筛选，其中 30.9% 不合格，16.1% 拒绝参加，1.5% 在入选前很快死亡，还有 1.5% 的患者因为其他原因没有被包括，故有 6508 例患者入选。这些患者中因为诊断不明确或数据丢失再剔除了 154 例，最终研究人数是 6354。表 1 显示不同卒中类型人群的基线特征。相对于缺血性卒中，脑出血患者在发病后 6 小时内就诊者是前者的两倍、入院时 GCS 评分严重者是前者的四倍。

表 2 和表 3 分别显示基线特征与卒中 12 个月预后不良的单变量和多变量相关分析。多变量分析中没有发现显著的相互作用效应。基线特征跟预后不良的相关性在 3 个月和 12 个月时并没有很大的不同 (数据未显示)，但对更早时间的多变量分析显示：在缺血性卒中患者中，女性 (OR=1.22, P=0.02) 和文化程度较低者 (OR=1.25, P=0.005) 的死亡和生活依赖的风险增高，而高脂血症不增加风险 (OR=0.91, P=0.20)；在脑出血患者中，高血压 (OR=1.51, P=0.02) 和卒中史 (OR=1.37, P=0.04) 与预后不良相关，而心房颤动由于在单变量分析中未达到显著性意义故在多变量分析中被删除。

关于治疗，多变量分析显示住院期间两种卒中接受静脉使用激素均与预后不良相关，而静脉使用

表 3 两种卒中预后为 12 个月死亡 / 生活依赖的治疗预测因素

	缺血性卒中			脑出血		
	数量*	OR (95% CI)		数量 §	OR (95% CI)	
	是 / 否	原始 †	校正 ‡	是 / 否	原始 ‖	校正 ¶
死亡 / 生活依赖						
在院治疗						
静脉溶栓	154/322	1.14 (0.92–1.42)	…	…	…	…
静脉血液稀释剂	770/930	3.72 (3.18–4.34)	2.91 (2.44–3.48)	762/703	1.71 (0.96–3.03)	…
静脉激素	74/71	2.38 (1.70–3.35)	1.72 (1.14–2.60)	105/49	2.12 (1.45–3.10)	2.04 (1.30–3.20)
静脉神经保护剂	1122/2438	1.22 (1.03–1.45)	1.07 (0.87–1.30)	552/553	0.80 (0.62–1.04)	…
静脉传统中药	1184/2478	1.30 (1.08–1.56)	1.26 (1.02–1.57)	327/317	0.91 (0.72–1.15)	…
卒中后 3 个月治疗						
抗高血压	1034/2423	0.86 (0.74–0.99)	0.86 (0.72–1.02)	514/619	0.37 (0.29–0.48)	0.47 (0.34–0.64)
抗血小板	1155/2951	0.34 (0.28–0.41)	0.54 (0.43–0.69)	…	…	…
降脂	397/1230	0.60 (0.52–0.70)	0.81 (0.67–0.97)	…	…	…
死亡						
在院治疗						
静脉溶栓	51/434	1.04 (0.76–1.44)	…	…	…	…
静脉血液稀释剂	311/1427	4.10 (3.30–5.10)	2.34 (1.82–3.01)	405/1106	1.94 (0.93–4.05)	…
静脉激素	46/106	4.04 (2.79–5.85)	3.09 (1.95–4.91)	60/98	1.79 (1.23–2.61)	1.59 (0.99–2.56)
静脉神经保护剂	377/3265	1.05 (0.83–1.35)	…	264/866	0.50 (0.37–0.66)	0.66 (0.47–0.94)
静脉传统中药	400/3384	1.16 (0.89–1.51)	…	141/516	0.51 (0.39–0.67)	0.52 (0.37–0.72)
卒中后 3 个月治疗						
抗高血压	301/3240	0.50 (0.41–0.61)	0.58 (0.45–0.74)	199/969	0.16 (0.12–0.21)	0.20 (0.15–0.28)
抗血小板	323/3904	0.15 (0.12–0.19)	0.29 (0.22–0.38)	…	…	…
降脂	95/1584	0.40 (0.31–0.50)	0.77 (0.58–1.04)	…	…	…
存活患者生活依赖						
在院治疗						
静脉溶栓	103/322	1.16 (0.90–1.48)	…	…	…	…
静脉血液稀释剂	459/930	2.93 (2.46–3.50)	2.72 (2.23–3.31)	357/703	1.47 (0.74–2.92)	…
静脉激素	28/71	1.35 (0.86–2.12)	…	45/49	1.92 (1.23–3.00)	1.88 (1.13–3.13)
静脉神经保护剂	745/2438	1.28 (1.05–1.56)	1.07 (0.86–1.33)	288/553	1.22 (0.88–1.69)	…
静脉传统中药	784/2478	1.37 (1.11–1.69)	1.27 (1.00–1.61)	186/317	1.38 (1.05–1.83)	1.21 (0.88–1.65)
卒中后 3 个月治疗						
抗高血压	733/2423	1.17 (0.98–1.39)	…	315/619	1.14 (0.79–1.63)	…
抗血小板	832/2951	0.66 (0.51–0.84)	0.81 (0.61–1.07)	…	…	…
降脂	302/1230	0.76 (0.64–0.89)	0.81 (0.67–0.97)	…	…	…

*根据预后状况的治疗患者数：死亡 / 生活依赖 N=1433/3212(是 / 否)，死亡 N=491/4291(是 / 否)，生活依赖 N=942/3212(是 / 否)。

† 死亡 / 生活依赖模型 N=4645，死亡模型 N=4782，生活依赖模型 N=4154。

‡ 剔除 GCS 缺失值，死亡 / 生活依赖模型 N=4582，死亡模型 N=4718，生活依赖模型 N=4104；在单变量分析中校正模型后年龄、性别和基线变量与预后相关性有显著性意义 (P<0.05)。

§ 根据预后状况的治疗患者数：死亡 / 生活依赖 N=784/740(是 / 否)，死亡 N=415/1157(是 / 否)，生活依赖 N=369/740(是 / 否)。

‖ 死亡 / 生活依赖模型 N=1524，死亡模型 N=1572，生活依赖模型 N=1109。

¶ 剔除 GCS 缺失值，死亡 / 生活依赖模型 N=1509，死亡模型 N=1556，生活依赖模型 N=1096；在单变量分析中校正模型后年龄、性别和基线变量与预后相关性有显著性意义 (P<0.05)。

神经保护剂则与预后无相关 (表 3)。对于缺血性卒中，静脉使用中药或血液稀释剂与预后不良相关，卒中后接受抗血小板和降脂治疗可以显著降低风险。此外，尽管在卒中后进行抗高血压治疗可使脑出血预后不良的风险减半，但对缺血性卒中的益处微弱。

图 1 显示的是缺血性卒中和脑出血患者住院期间及随访中的死亡和 mRS 评分的分布，脑出血患者在各个时间点上死亡率均高。在 12 个月时，分别有 415 和 369 例脑出血患者死亡或生活依赖，缺血性卒中患者中则分别为 491 和 942 例。在 logistic 广义估计方程式模型中，二次项的合并构建一个更好的模型 (在独立模型标准值下，拟似然值较低)。U 检验显示两种卒中类型 (图 2) 的恢复时间曲线 (斜率或所有) 有显著性差异 (P<0.001)，因此强烈提示缺血性卒中和脑出血患者在卒中后恢复模式上有显著性差别。在卒中后 3 个月和 12 个月，缺血性卒中较

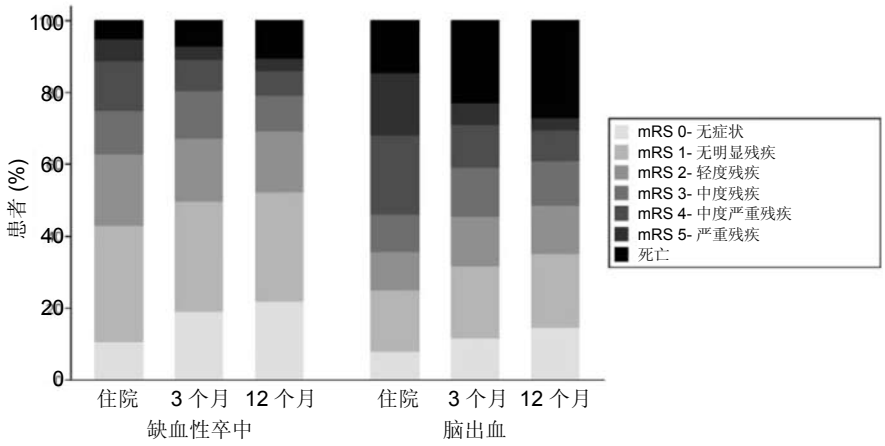

图 1　住院、卒中后 3 个月及 12 个月时的 mRS 评分。本图基于无缺失值。

脑出血预后良好的 OR 值分别为 2.62(95% CI 2.36-2.91) 和 1.98(95% CI 1.76-2.24)。

讨论

本研究展示了中国急性卒中住院患者的预后和恢复模式概况。不同卒中类型恢复轨迹显著不同，脑出血患者早期恢复较缺血性卒中者快，这与现有文献资料相符 [22-25]。相反，两种卒中的预后影响因素具有可比性，明显受到年龄、先前的生活依赖及发病的严重程度的影响。另外，3 个月时的预后不良与基线特征的多变量联系与 12 个月时的情况相似。这种相似的解释是 95% 的患者在卒中发生后 11 周内获得最大程度的神经功能恢复 [26]，因此，两个时间点上预后模型几乎相同。

就个体因素而言，年龄、卒中史、先前的生活依赖、糖尿病、心房颤动、入院时 GCS 评分严重及 TACS 均与缺血性卒中的 12 个月预后不良相关，这与在中国、亚洲及欧洲的其他研究 [6,13,16,27-29] 结果相符。本研究提示女性在卒中后 3 个月时的预后不良的风险较高，但到卒中后 12 个月时则与男性相同。这种女性在早期预后不良风险增高的现象与近来韩国的大规模在院注册的报道相类似，归因于男性与女性的人口统计学的基线水平的不同 [30]。

值得注意的是，高血压在各个时间点上都与预后不良无关。尽管中国已公布类似的结果 [31]，一篇系统综述显示缺血性卒中患者的收缩压和舒张压高与死亡 / 生活依赖相关 [32]。值得注意的是，有报道缺血性卒中后的预后与血压之间呈 U 形相关，即最差的预后出现于血压最高和最低时 [33]，而最严重的卒中患者的血压最低这种反向因果关系更使问题变得复杂。此外，我们发现高脂血症与 12 个月时预后良好相关，但在 3 个月时未显示相关。尽管与中国成都卒中注册研究 [11] 的结果相似，但本次结果与预期结果相反，可能反映了对已有心血管高危风险患

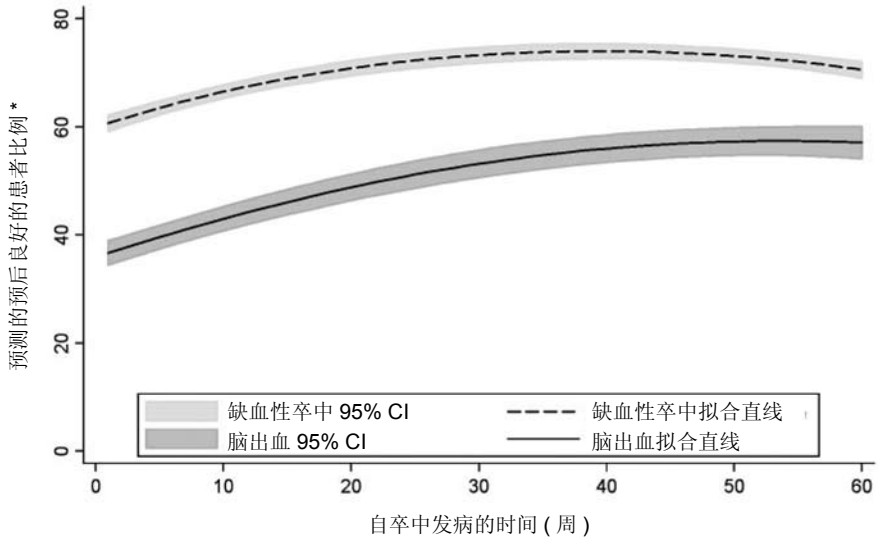

图 2　不同卒中的恢复时间曲线。*预后良好定义为 mRS<3；本图基于无缺失值。

者的照料质量改善，或是对有经济能力承担诊断高脂血症的必要血液检查费用的患者的照料质量改善。事实上，当比较有或无高脂血症的缺血性卒中患者时，那些伴有高脂血症的患者一般经济条件都相对较好、文化程度较高、伴有更多的心血管并发症。

有趣的是，在缺血性卒中，发病后较早就诊对于 3 个月和 12 个月的预后都是负面的影响，这与近来一项日本的研究 [34] 结果相反，因为发病后早就医应该增加溶栓治疗的机会。可能是严重卒中患者要比轻者就诊更早，而此原因影响了上述的相关性。事实上，本研究中 60% 严重缺血性卒中患者 (GCS 为 3-8) 在起病后 6 小时内就诊，而只有 28% 的轻者 (GCS>8) 早期就诊。此外，溶栓治疗只用于极少量患者，故溶栓治疗作为一个显著的预后影响因素的评估变得复杂。虽然在急性卒中发生后进行降压治疗对于预后有勉强的保护作用，我们认为这可能是由于最初的分析中应用的复合终点的局限性所致。如单独检测死亡，进行抗高血压治疗具有很好的保护作用，如单独评估生活依赖，抗高血压治疗有向不利效应发展的趋势，尽管这可能是因为受到那些高心血管风险人群中逐渐增加的抗高血压治疗的干扰。

对于脑出血，年龄、先前的生活依赖、入院时 GCS 评分严重及 TACS 均增加 3 个月和 12 个月时预后不良的风险。尽管鲜有脑出血患者的对比研究，香港 [8] 的研究发现用 NIHSS 评分评估的卒中严重程度能预示不良预后，日本的 [4] 研究发现年龄和卒中史亦能预示不良预后。令人惊奇的是，本研究发现发病后早就医与预后不良相关，此发现与 Naganuma 等 [34] 报道的结果相符，被归因为出血后早期血肿的扩大。

与缺血性卒中不同，文化程度低与脑出血后 3 个月和 12 个月预后不良相关。一个可能的解释是脑出血要比缺血性卒中更危急，获得和参与康复与恢复的联系更密切。基线时高血压与脑出血后 3 个月的预后不良相关，但这种效应并没有延伸至影响卒中后 12 个月的预后，这个结果与本领域内其他研究 [31,35] 得出的数据相符。毫无疑问，脑出血后 3 个月内进行抗高血压治疗对于 12 个月时的预后有显著的保护作用。

本研究的确有一定的局限性，值得提出。第一，我们无法评估已知重要的预后预测因子，如重要的生理和临床特征之病灶部位和体积 [4,5,36]，虽然这些特征一定程度上可归于 TACS 分级。第二，该研究仅包括到参与本研究的指定医院就诊的患者。知情同意的必要条件可能排除了入院后很快死亡的患者及那些不愿参加本研究的轻微患者，但鉴于本研究地理覆盖范围广及纳入患者数之众，我们相信本研究结果对于提供一个与卒中住院患者预后不良相关特征的概观仍是有价值的。第三，随访结果的评估主要是通过电话，这可能对评分的效力产生质疑，对于死亡的确定也主要是通过家人，但已有报道对卒中患者通过电话问询与面对面进行 mRS 评分有很好的一致性 [37]。另外，我们的研究与在中国、亚洲的类似研究的结果具有一致性也更进一步地确保了我们数据的有效性。

总之，尽管在中国脑出血和缺血性卒中患者有着不同的恢复轨迹，但他们有着类似的预后影响因素。这些发现可能对临床医生处理患者及对低收入群体的医疗资源分配有帮助。

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