Risk Factors Associated With Outcomes of Non-cardioembolic Ischemic Stroke In Patients Stratified By Essen Stroke Risk Score

Yanting Ping Ping
Zhejiang University School of Medicine Second Affiliated Hospital
Qianqian Yang Yang
Hangzhou First People's Hospital
Yuwen Huang Huang
Zhejiang University School of Medicine Second Affiliated Hospital
Huimin Xu Xu
Zhejiang University School of Medicine Second Affiliated Hospital
Haibin Dai (haibindai@zju.edu.cn)
Zhejiang University School of Medicine Second Affiliated Hospital https://orcid.org/0000-0002-5768-2714

Research article

Keywords: Ischemic stroke, Essen Stroke Risk Score, Combined vascular event, Risk factor, Clopidogrel

Posted Date: January 30th, 2020

DOI: https://doi.org/10.21203/rs.2.22244/v1

Abstract

Background: Identifying risk factors of cardiovascular events is crucial for stroke prevention and they can be used as predictive factors of stroke outcomes.In this study, it is to evaluate the risk factors that predict outcomes of acute non-cardioembolic ischemic stroke in patients stratified by Essen Stroke Risk Score (ESRS).

Methods: A retrospective study was carried out in acute non-cardioembolic ischemic stroke patients in a Chinese tertiary-care teaching hospital. ESRS stratification and factors that might influence the outcomes of stroke, as indicated by fatal or non-fatal combined vascular events of recurrent stroke, myocardial infarction, or primary intracranial hemorrhage, were documented. Univariate analysis and multivariable regression analysis was used to identify independent predictors of stroke outcomes.

Results: A total of 878 patients with acute non-cardioembolic ischemic stroke who completed a mean follow-up of 5.2 years were enrolled, and 163 patients experienced at least one component of the combined vascular event. In patients with an ESRS ≤ 3, age ≥ 65 years (OR , 2.935; 95% CI 1.625-5.301, P < 0.001) and clopidogrel treatment (OR , 1.685 ; 95% CI , 1.026-2.768; P = 0.041) were significantly associated with stroke outcomes. In patients with an ESRS > 3, age ≥ 65 years (OR , 2.107, 95% CI , 1.208-3.673 ; P = 0.008) and history of diabetes (OR , 1.465 ; 95% CI , 1.041–2.062 ; P = 0.027) were risk factors for stroke outcomes , whereas clopidogrel treatment (OR , 0.542; 95% CI , 0.356–0.824; P = 0.003) was a protective factor for stroke outcomes.

Conclusions: According to this study, clopidogrel treatment, blood pressure control, and glycemic control are protective factors for stroke outcomes in high-risk patients (ESRS>3).

Background

Stroke is the leading cause of death and disability in China in recent years. Due to its high morbidity, mortality, and disability rates, it exerts a heavy economic and mental burden on society and families. Ischemic stroke accounts for 69.6% and 77.8% among incident and prevalent strokes in China[1]. Patients who survive their first stroke have a significantly higher risk of recurrent stroke compared with the general population[2, 3]. Indeed, the annual recurrence rate of ischemic stroke is as high as 17.7% in China[4]. The mortality and incidence of cardio-cerebrovascular complications in patients with recurrent stroke are significantly increased compared to those with first stroke[5, 6]. Therefore, early prevention, as well as analysis of risk factors of recurrence and development of optimal treatment strategies, is hugely significant for improving stroke outcomes.

Antiplatelet therapy is the primary regimen for the secondary prevention of non-cardioembolic ischemic stroke. Aspirin, clopidogrel, aspirin/dipyridamole compound preparations, and ticlopidine are the main antiplatelet agents with abundant evidence for secondary prevention[7], while aspirin and clopidogrel are the most commonly used agents in Chinese clinical practice[8]. The Guidelines for Secondary Prevention

in China 2014 recommended aspirin (50–325 mg/d) or clopidogrel (75 mg/d) as the preferred monotherapy[8]. However, the guidelines did not clearly indicate the differences in the efficacy of the different antiplatelet drugs and the optimal applicable population.

In the secondary prevention of stroke, risk stratification for stroke patients has important guiding significance. The CAPRIE study showed that clopidogrel is significantly superior to aspirin in reducing cardiovascular events[9], and also confirmed that patients at high risk of ischemic stroke with history of myocardial infarction or stroke, diabetes, or smoking benefitted more from clopidogrel than from aspirin[10–12]. The Essen Stroke Risk Score (ESRS), generated from CAPRIE study, is commonly used internationally to stratify stroke risk and to guide and optimize medication strategies. However, high risk was corresponded to an ESRS > 2 in CAPRIE trial but as an ESRS > 3 in Reduction of Atherothrombosis for Continued Health (REACH) study[13]. No study has examined the classification of stroke patients based on ESRS risk stratification to select antiplatelet strategies in a real-world Chinese population. Therefore, we conducted a retrospective study on patients with ischemic stroke in China with 5-year post-discharge follow-up to further investigate the value of ESRS stratification for antiplatelet strategies selection and to obtain a more comprehensive understanding of the effectiveness of antiplatelet strategies in the secondary prevention of stroke in China. The primary results, published in 2017, confirmed that selecting antiplatelet drug (clopidogrel and aspirin) for secondary prevention according to risk stratification by ESRS in Chinese stroke patients is reasonable[14]. In addition, identifying risk factors of cardiovascular events is crucial for stroke prevention and they can be used as predictive factors of stroke outcomes. Risk factors frequently investigated and reported include age, obesity, smoking, hypertension, dyslipidemia, diabetes, metabolic syndrome and atrial fibrillation, history of previous cerebrovascular events, and stroke subtypes, etc[15]. Nonetheless, the factors affecting cardiovascular events of acute stroke in Chinese patients with different ESRS stratifications has not yet been explored. Accordingly, we conducted a further analysis of the risk factors affecting outcomes of acute non-cardioembolic ischemic stroke and also discussed the influencing factors in different ESRS stratification patients so as to manage the risk factors in these patients.

Methods

Study design

Detailed information on the design and methods of this study was reported previously[14]. Briefly, patients with a hospital discharge diagnosis of acute ischemic stroke or a hospital discharge diagnosis of International Classification of Diseases, 10th Revision (ICD-10) code 163 admitted to the Second Affiliated Hospital of Zhejiang University School of Medicine from January 2009 to December 2011, were considered to be eligible for study enrollment. Acute ischemic stroke was diagnosed according to the 2010 Chinese Society of Neurology Diagnostic Criteria for Cerebral Infarction[16] and confirmed by magnetic resonance angiography (MRA), brain magnetic resonance imaging (MRI), and clinical symptoms. Patients 1) with cardioembolic cerebral infarction; 2) with hematological system diseases

and active hemorrhage, hemorrhagic stroke, hemorrhagic transformation after cerebral infarction, or complication with symptomatic intracranial hemorrhage; 3) terminal malignancy; 4) whose discharge medication did not include aspirin and/or clopidogrel, or included both aspirin and clopidogrel; and 5) neurological disorders due to other organic diseases were excluded.

Data collection

Baseline Data Collection

General data of participants were collected, including age, sex, smoking history, hypertension, diabetes, coronary heart disease, history of stroke, history of transient ischemic attack, and peripheral vascular disease. In addition, the ESRS scores were obtained based on the patients' clinical data at the time of discharge[7, 17]. All patients were stratified as ESRS ≤ 3, and ESRS > 3 according to ESRS score.

Study Endpoints And Follow-up Data Collection

From July 1, 2014 to December 31, 2015, patients were followed up by telephone calls to collect multiple information of patients over 5 years after discharge. The outcome of acute stroke was defined as the first of any of recurrent stroke, myocardial infarction, or primary intracranial hemorrhage. All patients were asked whether they had had a combined vascular event of recurrent stroke, myocardial infarction, or primary intracranial hemorrhage. Furthermore, patient self-reported antiplatelet drug usage status, and controls for risk factors such as blood pressure, glycemic control, dyslipidemia (according to latest medical visit) and smoking were also documented. The control of hypertension is defined as blood pressure < 140/90 mmHg, while < 130/80 mmHg in diabetic patients; glycemic control is defined as fasting blood glucose (FBG) < 6.2 mmol/L or postprandial blood glucose (PBG) < 7.8 mmol/L or glycated hemoglobin < 6.3%; serum lipid control is defined as low density lipoprotein (LDL) < 2.69 mmol/L or decrease by 30% − 40% or more; smoking at follow-up refers to the smokers (smoke ≥ 1 per day with duration > 6 months), who smoked cigarettes regularly in the past month or with a smoking cessation period ≤ 6 months [18].

Statistical analysis

Univariate regression was used to analyze the relationship between each risk factor and stroke recurrence. All data were subject to statistical analysis with SPSS 20.0 software. Patients' 5-year follow-up results were compared by chi-square test. Measurement data were compared by ANOVA and are expressed as mean ± standard deviation, and a t-test was performed. Multivariate logistic regression analysis was further performed on those risk factors showing $P < 0.1$ in the univariate analysis in all patients and in different ESRS stratification patients. $P < 0.05$ was considered statistically significant.

Results

Baseline characteristics of patients with stroke outcomes of combined vascular events

A total of 1175 patients with acute non-cardioembolic ischemic stroke admitted to the Second Affiliated Hospital of Zhejiang University School of Medicine from January 2009 to December 2011 were enrolled, and 878 patients who completed the 5-year follow-up were included for analysis (Fig. 1). Over a mean follow-up of 5.2 years, 163 patients experienced one component of the combined vascular event. The baseline characteristics of patients with and without stroke outcomes are compared in Table 1. There was a significant ($P < 0.001$) difference in age between patients with stroke outcomes and those without stroke outcomes, with higher proportions of patients aged ≥ 65 years old in those with stroke outcomes. In addition, the proportion of patients with an ESRS > 3 was also higher among patients with stroke outcomes ($P < 0.001$).

Table 1
Stroke outcomes in populations with different baseline characteristics

Variable		**Without stroke outcomes (n = 715)**	**With stroke outcomes (n = 163)**	**P-value**
Age (years)	< 65	401 (56.1)	52 (31.9)	< 0.001
	≥ 65	314 (43.9)	111 (68.1)	
Male		461 (64.5)	109 (66.9)	0.563
Risk factors	Arterial hypertension	511 (71.5)	128 (78.5)	0.068
	Diabetes mellitus	239 (33.4)	53 (32.5)	0.824
	Smoking	260 (36.4)	54 (33.1)	0.437
	Prior TIA/stroke	715 (100)	163 (100)	-
	Peripheral arterial disease	272 (38.0)	58 (35.6)	0.559
	Prior MI	14 (2.0)	4 (2.5)	0.687
	Other CVD, excluding MI and AF	62 (8.7)	19 (11.7)	0.235
ESRS	≤ 3	363 (50.8)	57 (35.0)	< 0.001
	> 3	352 (49.2)	106 (65.0)	
Antiplatelet drug	Clopidogrel	214 (29.9)	43 (26.4)	0.369
	Aspirin	501 (70.1)	120 (73.6)	

Note: TIA = transient ischaemic attack; MI = myocardial infarction; CVD = cardiovascular disease; AF = atrial fibrillation; ESRS = Essen Stroke Risk Score

Results of univariate logistic regression analysis

Univariate analysis of all patients showed that age ≥ 65 years old (OR, 2.726; 95% CI, 1.900–3.911; P < 0.001), drug withdrawal (OR, 1.565; 95% CI, 1.022–2.395; P = 0.032), and an ESRS > 3 (OR, 1.918; 95% CI, 1.346–2.732; P < 0.001) were risk factors for stroke outcomes. In contrast, blood pressure control (OR, 0.623; 95% CI 0.438–0.887; P = 0.008) and smoking at follow-up (OR, 0.314; 95% CI, 0.112–0881 ; P = 0.020) were protective factors for stroke outcomes (Fig. 2).

The factors affecting stroke outcomes varied in patients with different ESRS stratifications. In patients with an ESRS ≤ 3, age ≥ 65 years (OR, 2.935; 95% CI, 1.625–5.301; P < 0.001) and antiplatelet drug selection of clopidogrel (OR, 1.685 ; 95% CI, 1.026–2.768 ; P = 0.041) were significantly associated with stroke outcomes. In patients with an ESRS > 3, age ≥ 65 years old (OR, 2.107 ; 95% CI, 1.208–3.673 ; P = 0.008) and history of diabetes (OR, 1.465 ; 95% CI, 1.041–2.062 ; P = 0.027) were significantly associated with stroke outcomes, whereas clopidogrel treatment (OR, 0.542 ; 95% CI, 0.356–0.824 ; P = 0.003) was a protective factor for stroke outcomes, which was very different from that in patients with an ESRS ≤ 3 (Fig. 3).

Results of multivariate logistic regression analysis

According to the results of univariate analysis, the possible factors influencing stroke outcomes were further subjected to multivariate analysis. In patients with an ESRS ≤ 3, only age ≥ 65 years old was significantly associated with stroke outcomes (OR, 2.841 ; 95% CI, 1.451–5.562 ; P = 0.002). In contrast, in patients with an ESRS > 3, clopidogrel treatment (aspirin vs. clopidogrel: OR, 2.179 ; 95% CI 1.272–3.731; P = 0.005), blood pressure control (OR, 0.517 ; 95% CI, 0.310–0.862 ; P = 0.011), and glycemic control (OR, 0.434 ; 95% CI, 0.200–0.941, P = 0.035) were protective factors for stroke outcomes. The results of multivariate logistic analysis of the factors influencing ischemic stroke outcomes among patients with different ESRS stratifications are shown in Fig. 4.

Discussion

The ESRS was derived from the data of the CAPRIE study which compared clopidogrel with aspirin in patients with high risk of ischemic events. The risk score, validated in patients with recent cerebrovascular events using large data set, can effectively and feasibly predict the risk of cardiovascular events [9, 17, 19, 20]. It has also been validated in Chinese outpatients with ischemic stroke that ESRS can also stratify the risks of recurrent stroke and complicated vascular events[21]. This retrospective study of ischemic stroke patients with 5-year post-discharge follow-up confirmed that antiplatelet drug selection in secondary prevention of stroke is an independent risk factor for stroke recurrence in patients with ESRS > 3.

It is worth emphasizing that this study is the first to find that antiplatelet treatment with clopidogrel is a protective factor for stroke recurrence in patients with an ESRS > 3. In patients with an ESRS ≤ 3, the stroke recurrence rate was lower in the aspirin group than in the clopidogrel group, but multivariate logistic regression analysis showed no significant difference in the effects of the two drugs on

recurrence. In patients with an ESRS > 3, both univariate and multivariate analysis showed that clopidogrel was related to a reduced rate of stroke recurrence. The post-first stroke subgroup analysis of the CAPRIE study showed that the efficacies of clopidogrel and aspirin were similar in the low-risk group (ESRS 0–2) but that clopidogrel was more effective than aspirin in the high-risk group (ESRS 3–6)[17]. Our results confirmed that clopidogrel was more effective than aspirin in the high-risk group (ESRS > 3), which is consistent with the subgroup analysis results of the CAPRIE study. Studies indicate that the selection of antiplatelet drug in secondary prevention is important for preventing stroke recurrence in high-risk patients.

In addition, blood pressure control and glycemic control in this study were also protective factors for stroke recurrence in patients with an ESRS > 3. Xu et al.[22]showed that hypertension is associated with an increased risk of stroke recurrence and that blood pressure control can halve the risk of stroke recurrence. In a substudy targeting patients with first ischemic stroke in a cardiovascular health study, diabetes was associated with an increased risk of stroke recurrence [23]. The results of this study are thus consistent with those of these previous reports. Smoking at follow-up was a protective factor for stroke outcomes in the univariate analysis but not in the multivariate analysis. This was because 82.5% of the patients smoking at follow-up were under the age of 65 years.

This study has certain limitations. Only 878 of the initial 1753 eligible patients were included in the analyses. The sample size was small and the rate of loss to follow-up was high. The research hospital was a tertiary hospital in a provincial capital, and the patients came from the provincial capital and surrounding cities and counties, leading to selection bias. Patient self-reported outcomes and controls of risk factors in telephone follow-up might be threatened by reporting bias, and we only considered controls of risk factors at the follow-up time-point instead of the entire follow-up period. The study participants were ischemic stroke patients admitted to hospital, whose overall condition was relatively severe, leading to information bias and resulting in fewer stroke patients in the low-risk group with an ESRS < 3. In addition, confounding factors such as revascularization treatments, length of hospital stay, antiplatelets switching and compliance after discharge, that were not included in the present study also might influence the stroke outcomes. More studies are needed to further improve and enrich the findings in this study and to verify the feasibility of the conclusions.

Conclusions

According to this study, clopidogrel treatment, blood pressure control, and glycemic control are protective factors for stroke outcomes in high-risk patients (ESRS > 3). In the secondary prevention of non-cardioembolic ischemic stroke, antiplatelet agent should be selected according to the risk stratification of patients. For high-risk patients (ESRS > 3), clopidogrel should be considered as a valuable option to reduce the risk of vascular events. Meanwhile, blood pressure and glucose should be controlled better to reduce the risks of vascular events. However, the evidence-based data are insufficient in terms of antiplatelet drugs application and more studies are needed. In particular, precise strategies still need to be elucidated for antiplatelet therapy in Chinese and Asian populations.

Abbreviations

ESRS, Essen Stroke Risk Score; MRA, magnetic resonance angiography; MRI, brain magnetic resonance imaging; FBG, fasting blood glucose; PBG, postprandial blood glucose; LDL, low density lipoprotein.

Declarations

Ethics approval and consent to participate

The studies involving human participants were reviewed and approved by Institute Ethics Committee of Second Affiliated Hospital, Zhejiang University School of Medicine (No. 2012-16). The requirement for informed consent was waived due to the retrospective character of the analysis.

Consent for publication

Not applicable.

Availability of data and material

The datasets generated and/or analyzed during the current study are not publicly available due but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

This study was supported by research grants from the National Natural Science Foundation of China (81573402, 81703479 and 81773700), the Health Bureau of Zhejiang Province (WKJ-ZJ-1719), and the Special Research Fund of Jiangsu Chia-Tai Tianqing Pharmacy. The funders had no role in the study design or conduct, data collection and analysis, decision to publish, or in the preparation or approval of the manuscript.

Authors' contributions

PY, YQ and HY wrote the manuscript. XH and DH formulated and revised the manuscript. All Authors read and approved the manuscript.

Acknowledgements

None.

References

1. Wang W, Jiang B, Sun H, Ru X, Sun D, Wang L, et al. Prevalence, Incidence, and Mortality of Stroke in China: Results from a Nationwide Population-Based Survey of 480 687 Adults. Circulation. 2017;135 8:759 – 71; doi: 10.1161/circulationaha.116.025250.
2. Ling X, Yan SM, Shen B, Yang X. A modified Essen Stroke Risk Score for predicting recurrent ischemic stroke at one year. Neurological research. 2018;40 3:204 – 10; doi: 10.1080/01616412.2018.1428389.
3. Boysen G, Truelsen T. Prevention of recurrent stroke. Neurological sciences : official journal of the Italian Neurological Society and of the Italian Society of Clinical Neurophysiology. 2000;21 2:67–72.
4. Wang Y, Xu J, Zhao X, Wang D, Wang C, Liu L, et al. Association of hypertension with stroke recurrence depends on ischemic stroke subtype. Stroke. 2013;44 5:1232-7; doi: 10.1161/STROKEAHA.111.000302.
5. Wang YL, Pan YS, Zhao XQ, Wang D, Johnston SC, Liu LP, et al. Recurrent stroke was associated with poor quality of life in patients with transient ischemic attack or minor stroke: finding from the CHANCE trial. CNS neuroscience & therapeutics. 2014;20 12:1029-35; doi: 10.1111/cns.12329.
6. Erdur H, Scheitz JF, Ebinger M, Rocco A, Grittner U, Meisel A, et al. In-hospital stroke recurrence and stroke after transient ischemic attack: frequency and risk factors. Stroke. 2015;46 4:1031-7; doi: 10.1161/STROKEAHA.114.006886.
7. Kernan WN, Ovbiagele B, Black HR, Bravata DM, Chimowitz MI, Ezekowitz MD, et al. Guidelines for the prevention of stroke in patients with stroke and transient ischemic attack: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2014;45 7:2160 – 236; doi: 10.1161/STR.0000000000000024.
8. Association CSoNoCM. Guidelines for Secondary Prevention of Ischemic Stroke and Transient Ischemic Attack in China 2014 Chinese Journal of Neurology. 2015;48 4:258 – 73; doi: 10.3760/cma.j.issn.1006-7876.2015.04.003.
9. Committee CS. A randomised, blinded, trial of clopidogrel versus aspirin in patients at risk of ischaemic events (CAPRIE). CAPRIE Steering Committee. Lancet. 1996;348 9038:1329-39; doi: 10.1016/s0140-6736(96)09457-3.
10. Ringleb PA, Bhatt DL, Hirsch AT, Topol EJ, Hacke W, Clopidogrel Versus Aspirin in Patients at Risk of Ischemic Events I. Benefit of clopidogrel over aspirin is amplified in patients with a history of ischemic events. Stroke. 2004;35 2:528 – 32; doi: 10.1161/01.STR.0000110221.54366.49.
11. Bhatt DL, Marso SP, Hirsch AT, Ringleb PA, Hacke W, Topol EJ. Amplified benefit of clopidogrel versus aspirin in patients with diabetes mellitus. The American journal of cardiology. 2002;90 6:625-8.
12. Ferreiro JL, Bhatt DL, Ueno M, Bauer D, Angiolillo DJ. Impact of smoking on long-term outcomes in patients with atherosclerotic vascular disease treated with aspirin or clopidogrel: insights from the CAPRIE trial (Clopidogrel Versus Aspirin in Patients at Risk of Ischemic Events). Journal of the American College of Cardiology. 2014;63 8:769 – 77.
13. Weimar C, Diener HC, Alberts MJ, Steg PG, Bhatt DL, Wilson PW, et al. The Essen stroke risk score predicts recurrent cardiovascular events: a validation within the REduction of Atherothrombosis for Continued Health (REACH) registry. Stroke. 2009;40 2:350-4.
14. Xu H, Ping Y, Lin H, He P, Li W, Dai H. Antiplatelet Strategies and Outcomes in Patients with Noncardioembolic Ischemic Stroke from a Real-World Study with a Five-Year Follow-Up. Translational stroke research. 2017;8 3:228 – 33; doi: 10.1007/s12975-016-0516-0.

15. Chin YY, Sakinah H, Aryati A, Hassan BM. Prevalence, risk factors and secondary prevention of stroke recurrence in eight countries from south, east and southeast asia: a scoping review. The Medical journal of Malaysia. 2018;73 2:90 – 9.
16. Association NBOC. China Guideline for Diagnosis and Treatment of Acute Ischemic Stroke(2010) Chinese Journal of Neurology. 2010;43 2:146 – 53; doi: 10.3969/j.issn.1674-7372.2010.04.012.
17. Diener HC, Ringleb PA, Savi P. Clopidogrel for the secondary prevention of stroke. Expert opinion on pharmacotherapy. 2005;6 5:755 – 64.
18. Amos A. Women and smoking. British medical bulletin. 1996;52 1:74–89; doi: 10.1093/oxfordjournals.bmb.a011534.
19. Chen P, Liu Y, Wang Y, Wang A, Zheng H, Zhao X, et al. A Validation of the Essen Stroke Risk Score in Outpatients with Ischemic Stroke. Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association. 2016;25 9:2189-95; doi: 10.1016/j.jstrokecerebrovasdis.2016.02.001.
20. Desai NR, Mega JL, Jiang S, Cannon CP, Sabatine MS. Interaction between cigarette smoking and clinical benefit of clopidogrel. Journal of the American College of Cardiology. 2009;53 15:1273-8; doi: 10.1016/j.jacc.2008.12.044.
21. COMMUNICATIONS F, PUBLIC AWARENESS/ADVOCACY SSO: World Stroke Congress Abstracts, 2018. In: World Stroke Congress. 2018.
22. Xu G, Liu X, Wu W, Zhang R, Yin Q. Recurrence after ischemic stroke in chinese patients: impact of uncontrolled modifiable risk factors. Cerebrovascular diseases. 2007;23 2–3:117 – 20; doi: 10.1159/000097047.
23. Kaplan RC, Tirschwell DL, Longstreth WT, Jr., Manolio TA, Heckbert SR, Lefkowitz D, et al. Vascular events, mortality, and preventive therapy following ischemic stroke in the elderly. Neurology. 2005;65 6:835 – 42; doi: 10.1212/01.wnl.0000176058.09848.bb.

Figures

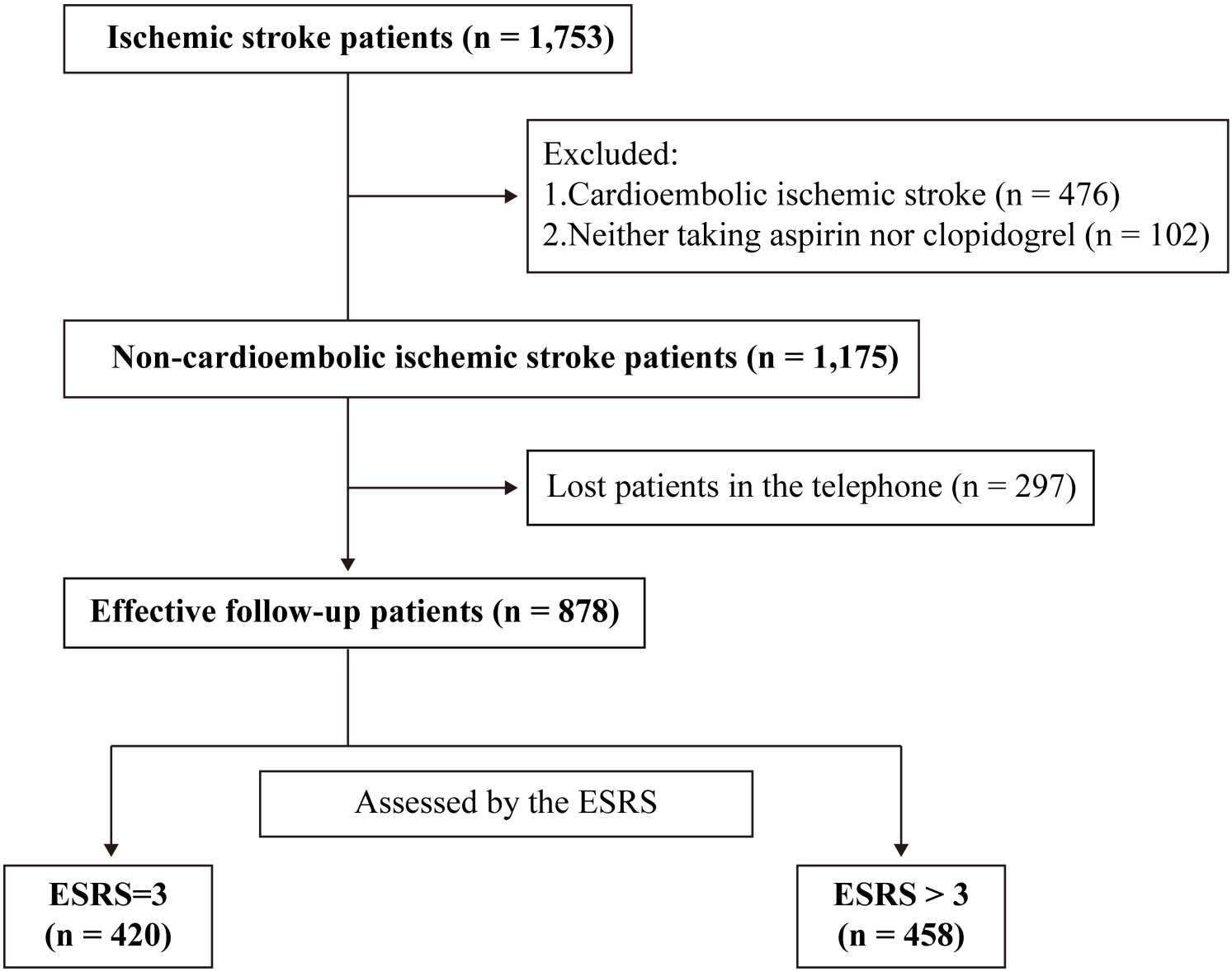


Figure 1

Flow diagram of patient disposition throughout the study.

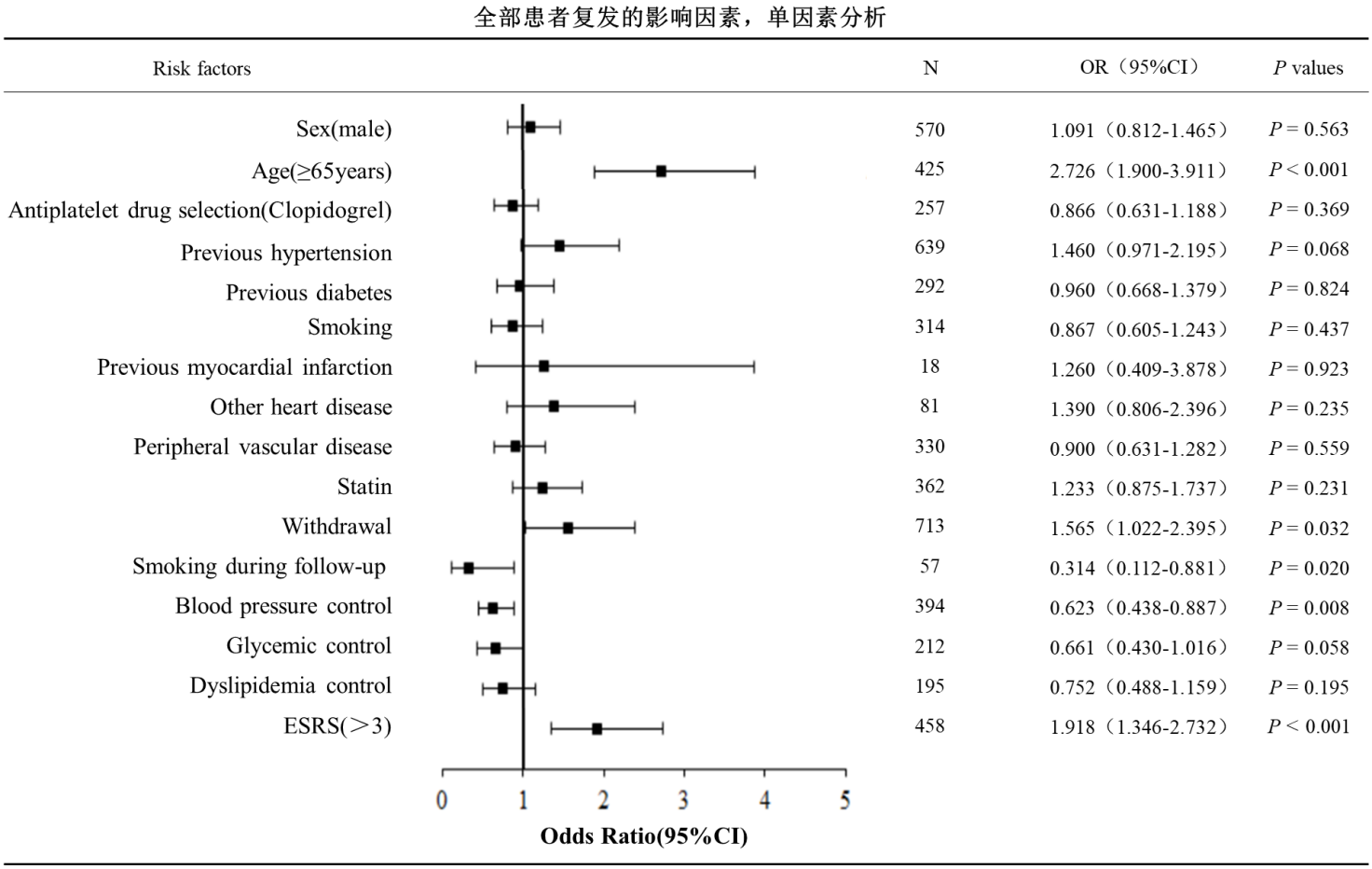
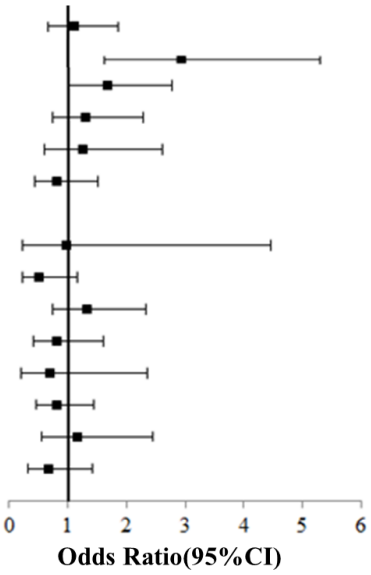


Figure 2

Univariate analysis of factors influencing recurrence in all patients.Values are expressed as percentage of patients with stroke recurrence; OR, odds ratio; P < 0.05 was considered statistically significant.

按照ESRS分为两组比较危险因素对卒中复发的影响

Risk factors	*N*	OR（95%CI）	*P* values
ESRS≤3			
Sex(male)	262	1.116（0.672-1.852）	*P* = 0.671
Age(≥65years)	91	2.935（1.625-5.301）	*P* < 0.001
Antiplatelet drug selection*(Clopidogrel)	102	1.685（1.026-2.768）	*P* = 0.041
Previous hypertension	228	1.288（0.730-2.272）	*P* = 0.382
Previous diabetes	63	1.244（0.592-2.614）	*P* = 0.563
Smoking	127	0.800（0.426-1.503）	*P* = 0.488
Previous myocardial infarction	1	————	*P* = 1.000
Other heart disease	15	0.979（0.215-4.457）	*P* = 0.978
Peripheral vascular disease	86	0.503（0.220-1.153）	*P* = 0.099
Statin	160	1.319（0.750-2.321）	*P* = 0.335
Not withdrawal	102	0.809（0.410-1.596）	*P* = 0.540
Smoking during follow-up	30	0.691（0.203-2.358）	*P* = 0.752
Blood pressure control	166	0.803（0.448-1.439）	*P* = 0.461
Glycemic control	86	1.166（0.557-2.444）	*P* = 0.683
Dyslipidemia control	89	0.663（0.312-1.410）	*P* = 0.283
ESRS>3			
Sex(male)	308	1.031（0.721-1.475）	*P* = 0.866
Age(≥65years)	334	2.107（1.208-3.673）	*P* = 0.008
Antiplatelet drug selection*(Clopidogrel)	155	0.542（0.356-0.824）	*P* = 0.003
Previous hypertension	411	0.865（0.432-1.733）	*P* = 0.682
Previous diabetes	229	1.465（1.041-2.062）	*P* = 0.027
Smoking	187	0.802（0.513-1.256）	*P* = 0.335
Previous myocardial infarction	17	1.023（0.326-3.205）	*P* = 1.000
Other heart disease	66	1.181（0.648-2.153）	*P* = 0.586
peripheral vascular disease	244	0.764（0.494-1.180）	*P* = 0.224
Statin	202	1.319（0.750-2.321）	*P* = 0.335
Not withdrawal	63	0.512（0.244-1.075）	*P* = 0.073
Smoking during follow-up	27	0.691（0.203-2.358）	*P* = 0.752
Blood pressure control	228	0.803（0.448-1.439）	*P* = 0.461
Glycemic control	146	1.166（0.557-2.444）	*P* = 0.683
Dyslipidemia control	106	0.663（0.312-1.410）	*P* = 0.283



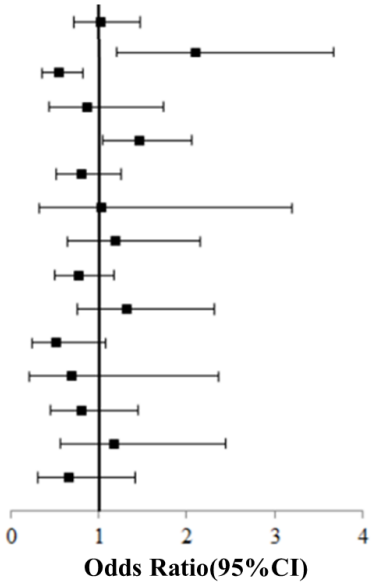


Figure 3

Univariate analysis of the risk factors on stroke recurrence between two groups classified by ESRS.Values are expressed as percentage of patients with stroke recurrence; OR, odds ratio; P < 0.05 was considered statistically significant.*relative to the aspirin group.

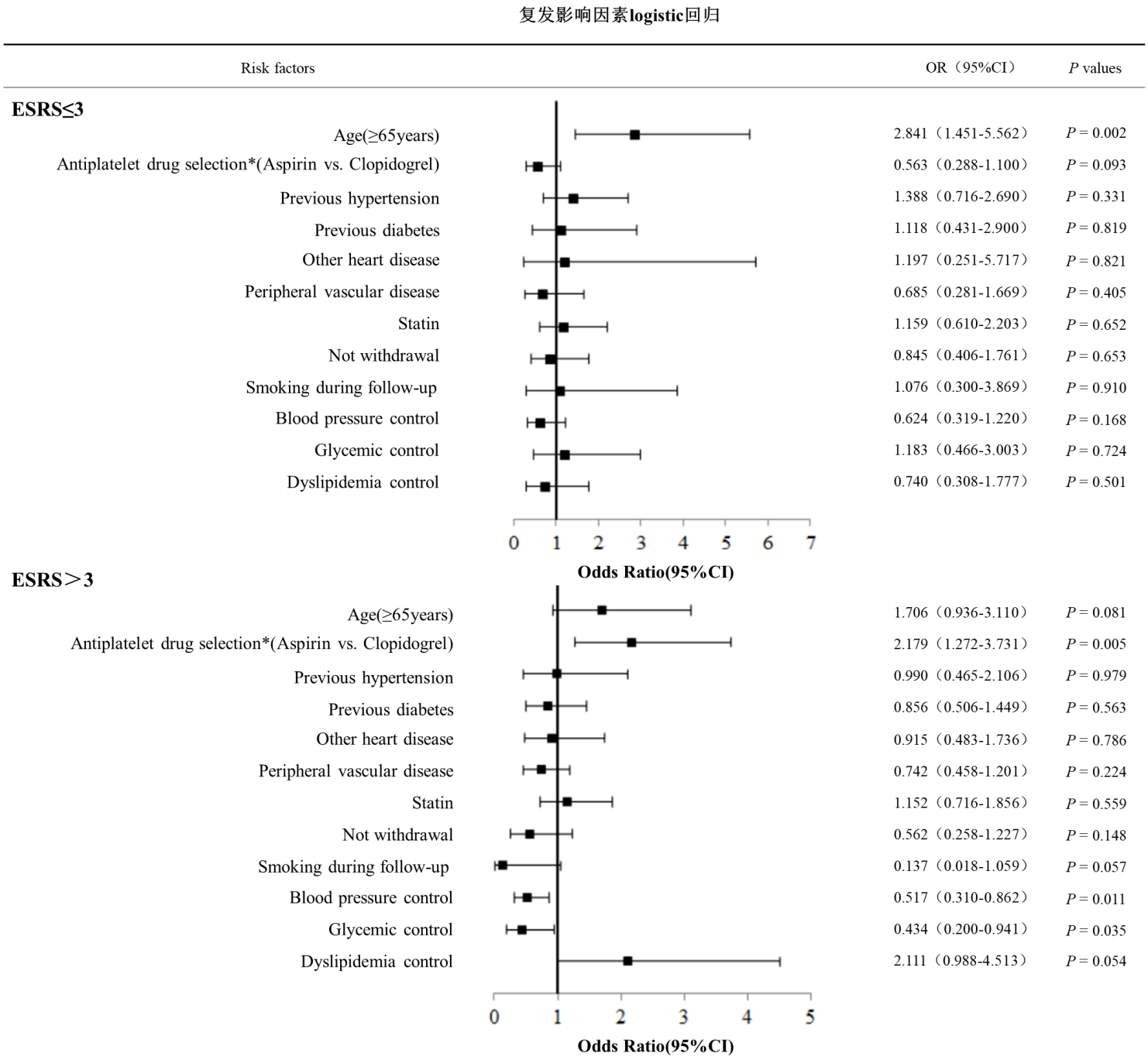


Figure 4

Logistic regression analysis of factors influencing recurrence between two groups classified by ESRS.*P < 0.05 was considered statistically significant, aspirin relative to the clopidogrel group.