

Stroke is the leading cause of death in China.<sup>1</sup> Over 70% of prevalent strokes in China are ischemic,<sup>2</sup> for which thrombolytic therapy is the most effective evidence-based treatment.<sup>3</sup> However, prehospital or in-hospital delay may preclude the use of thrombolytics and weaken the treatment effect. Previous studies in high-income countries indicated

factors with EMS activation, and assess the association between EMS utilization and timeliness of arrival and treatment.

### Methods

The data that support the findings of this study are available from the corresponding author upon request.

Details of Chinese Stroke Center Alliance program have been previously reported elsewhere.<sup>9</sup> All participating hospitals received research approval to collect data without requiring individual patient informed consent under the common rule or a waiver of authorization and exemption from their institutional review board. Study population (Figure I in the online-only Data Supplement), study variables, and definitions are described in the Methods in the online-only Data Supplement. Given the extensive data set, comparison using  $P < 0.05$  indicates statistical significance but may not have any clinical significance. Therefore, baseline characteristics were compared using absolute standardized differences with absolute standardized difference  $\geq 10$  considered to be clinically significant.<sup>10</sup> We used generalized estimating equations logistic regression modeling with adjustment for within-hospital clustering in both unadjusted and adjusted models. Sensitivity analyses among cases with documented-only or with mode-imputed National Institutes of Health Stroke Scale scores were conducted to determine whether findings are different from primary results.

### Results

Among the 560 447 patients with ischemic stroke from 1955 hospitals (Table I in the online-only Data Supplement), only

69 841 (12.5%) were EMS transported. No regional discrepancies were found (Figure II in the online-only Data Supplement). Compared with EMS-transported patients, self-transported patients were younger, had lower monthly income, milder stroke severity, and were less likely to have a history of cardiovascular diseases such as atrial fibrillation/flutter, coronary heart disease/myocardial infarction and heart failure (Table II in the online-only Data Supplement).

All covariates other than gender and carotid stenosis were statistically significantly associated with EMS usage. Strong predictors of EMS usage were cardiovascular diseases, such as atrial fibrillation/flutter, heart failure, coronary heart disease/myocardial infarction, and dyslipidemia. Lower stroke severity was the most substantial barrier to EMS use. Other factors associated with less EMS activation were shown in Figure 1. Similar findings were obtained in sensitivity analyses (Table III in the online-only Data Supplement).

EMS-transported patients experienced significantly shorter prehospital delay than self-transported patients. However, we did not observe superiority of EMS transportation in the door-to-needle time measure (Table). Nevertheless, if prehospital notification had been sent, there would be fewer minutes of in-hospital delay (61 [40–91] versus 65 [45–95];  $P = 0.0001$ ). The proportion of patients with an onset-to-door

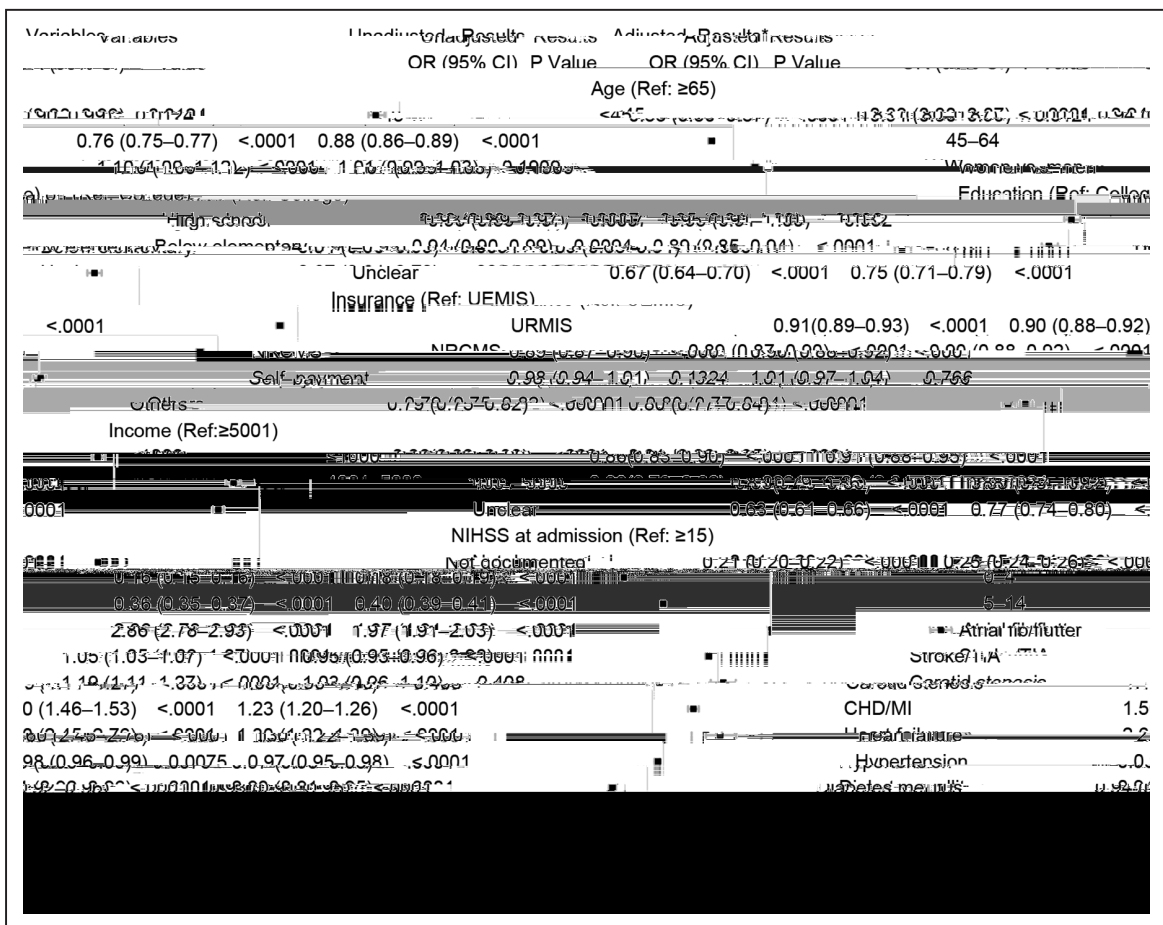


Figure 1. Factors associated with emergency medical service (EMS) usage. \*Adjusted for age, gender, education, insurance, family monthly income per capita, National Institutes of Health Stroke Scale (NIHSS) at admission, history of coronary heart disease (CHD)/myocardial infarction (MI), atrial fib/flutter, stroke/transient ischemic attack (TIA), heart failure, hypertension, carotid stenosis, diabetes mellitus, dyslipidemia, and peripheral vascular disease (PVD) when it is appropriate. NRCMS indicates new rural cooperative medical scheme; UEMIS, urban employ medical insurance scheme; and URMIS, urban residents medical insurance scheme.

time  $\leq 2$  hours among EMS-transported patients was almost 2-fold that of self-transported patients (30.2% versus 15.1%,  $P < 0.0001$ ). The adjusted results indicated that compared with self-transported patients, EMS transportation was associated with a 2.07-fold (95% CI, 1.95–2.20) or 2.32-fold (95% CI, 2.18–2.47) higher likelihood of onset-to-door time  $\leq 2$  hours or onset-to-door time  $\leq 3.5$  hours, respectively. EMS-transported patients were nearly 3 $\times$  (adjusted odds ratio, 2.96; 95% CI, 2.88–3.05) more likely to receive IV-tPA (intravenous recombinant tissue-type plasminogen activator). Similar results were found in treatment with IV-tPA within 3 hours among eligible patients with s with s with s T.215 >7r T.th s wi4709e>7rjusted o7 Tw (-)Tj.alTextim55treatment w

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shorter prehospital delay regardless of geographic distance.<sup>6</sup> Finally, undocumented National Institutes of Health Stroke Scale scores, symptoms or arrival time data may introduce selection bias. To address this issue, Tables VI and VII in the [online-only Data Supplement](#) comparing characteristics were provided and results showed comparable covariates. Results from the sensitivity analysis also confirmed the robustness of our primary analysis.

### **Conclusions**

Our study showed that only 1 in 8 patients with ischemic stroke was EMS transported to the hospital, a proportion that is much lower than that of high-income countries. EMS usage is associated with shorter prehospital delay and a higher likelihood of timely treatment. To improve EMS activation, more emphasis should be placed on developing an efficient EMS system and promoting culture-adapted stroke education programs.

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### **Disclosures**

None.

### **References**

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