Comparison of In-Hospital Mortality and Length of Stay in Acute ST-Segment–Elevation Myocardial Infarction Among Urban Teaching Hospitals in China and the United States

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Background—The aim of the study is to compare in-hospital outcomes of acute ST-segment–elevation myocardial infarction (STEMI) between China and the United States.

Methods and Results—Urban teaching hospitals were queried for adult patients with a primary diagnosis of acute STEMI during 2007–2010. The primary outcome was in-hospital mortality, and the secondary outcome was length of stay. Multivariable analyses adjusting for potential confounders were conducted for comparison between countries. Subgroup analysis was performed in acute STEMI patients receiving revascularization. In total, 32 228 patients in China and 76 117 patients in the United States were included. Overall in-hospital mortality was 8.23% in China and 7.96% in the United States (P<0.001). Multivariable analyses revealed that the 2 countries had similar overall in-hospital mortality (odds ratio, 0.97; 95% CI, 0.87–1.09; P=0.59), whereas China had lower 3-day mortality (odds ratio, 0.78; 95% CI, 0.70–0.89; P<0.001). In patients receiving primary percutaneous coronary interventions, Chinese hospitals had significant higher overall mortality (odds ratio, 2.39; 95% CI, 1.85–3.07; P<0.001) and 3-day mortality (odds ratio, 2.39; 95% CI, 1.78–3.20; P<0.001). For total acute STEMI patients, acute STEMI patients receiving percutaneous coronary intervention and coronary artery bypass grafting, median length of stay in China and the United States were 10 versus 3, 9 versus 3, and 25 versus 9 days, respectively (all P<0.001).

Conclusions—Overall in-hospital mortality in acute STEMI patients was comparable among urban teaching hospitals between China and the United States during 2007–2010. In addition, 3-day mortality was lower in China. However, worse outcomes in patients undergoing early revascularization and longer length of stay in China need to be given more attention. (J Am Heart Assoc. 2019;8:e012054. DOI: 10.1161/JAHA.119.012054.)

Key Words: ST-segment–elevation myocardial infarction • revascularization • In-hospital mortality • length of stay

Aacute ST-segment–elevation myocardial infarction (STEMI) is an acute and life-threatening condition that serves as the leading contributor of death globally, resulting in substantial medical as well as economic burdens.1,2 Although clinical outcomes, including adjusted 30-day mortality and readmission rates, have improved during the past years in the United States, the overall 30-day mortality rate remains high.3,4 For acute STEMI patients, urgent revascularization is required for better survival and improved healthcare resource utilization, given that timely access to revascularization could reduce the extent of ischemic injury and protect cardiac function. The primary reperfusion treatments for acute STEMI are thrombolysis, percutaneous coronary intervention (PCI), and coronary artery bypass graft (CABG), among which PCI is suggested as the preferred treatment according to the recommended guidelines in China and the United States.5,6 CABG serves as a remedial measure for high-risk conditions, including cardiogenic shock, severe multivessel coronary artery disease, or PCI failure. It was previously reported that only ≤5% of patients admitted for acute STEMI received CABG.7,8

In the United States, most acute STEMI patients could receive primary PCI (PPCI) as the initial reperfusion therapy.
Outcomes of STEMI Between China and United States

Han et al

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Knowing differences between the 2 countries provided opportunities for improvement of acute management and quality of care in hospitalized patients with acute STEMI in China and the United States. This may be achieved by establishing efficient regional systems of revascularization centers or increasing patients' awareness of alarm symptoms at presentation.

Methods

Data Source

The authors declare that data in the United States are available.12 Data in China will not be available because of the nature of sensitivity. Data in China are from 109 urban teaching hospitals that represented 765 grade III class A hospitals using a multistage stratified cluster sampling method during 2007–2010. These hospitals were from 4 eastern provinces, 10 western provinces, 7 southern provinces, and 10 northern provinces. Hospitals in China were generally categorized into 9 types: grade I class A, grade I class B, grade I class C, grade II class A, grade II class B, grade II class C, grade III class A, grade III class B, and grade III class C. The grade III class A hospital was considered as the highest rank hospital that was characterized by a large-scale general hospital integrating medical service, education, and research with more than 500 beds.13 Data in the United States are from the 2007–2010 National Inpatient Sample (NIS) database, which is the largest all-payer inpatient database in the United States. It represents a 20% stratified probability sample of all nonfederal acute care hospitals with 7 to 8 million inpatient admissions from 47 states. An indicator of “HOSP_LOC-TEACH” in the NIS database can be used to identify patients admitted to urban teaching hospitals. No institutional review board approval or informed consent was sought because of the de-identified database used in this study.

Patients and Outcomes

The International Classification of Diseases, Ninth Revision (ICD-9) diagnosis and procedure codes were used to query database from 2 countries for patients aged ≥18 years with a primary diagnosis of acute STEMI. Diagnostic codes 410.1x, 410.2x, 410.3x, 410.4x, 410.5x, 410.6x, 410.8x, and 410.9x were used to identify acute STEMI. We extracted patient-level characteristics, including age (18–64 and ≥65 years), sex, and coexisting comorbidities (diabetes mellitus, hypertension, cardiac dysrhythmias, congestive heart failure, congenital heart disease, blood transfusion, liver disease, gastrointestinal bleeding, and cardiogenic shock), that could potentially affect in-hospital mortality of acute STEMI. In addition, revascularization strategies were also obtained from the medical records (procedure codes 00.66, 36.01, 36.02, 36.05, 36.06, 36.07,

and median door-to-balloon time has declined from 96 minutes in 2005 to 64 minutes in 2010 nationally, conforming to the recommended time of ≤90 minutes.9 However, the situation of early reperfusion among acute STEMI patients in China is not so good. Researchers have reported an average door-to-balloon time of >130 minutes in China.10,11 According to the nationally representative China PEACE-Retrospective Acute Myocardial Infarction Study, rates of PPCI in acute STEMI were 10.2% in 2001, 17.0% in 2006, and 27.6% in 2011.2 Although quality of care has improved with implementation of evidence-based treatments, the rate of early reperfusion in China is lower than that in the United States.

Regarding the disparities discussed above, no study has compared clinical outcomes in acute STEMI patients between China and the United States so far. The present study aims to explore the potential country-based differences in in-hospital mortality and length of stay (LOS) in total acute STEMI patients and acute STEMI patients receiving reperfusion treatments, including PPCI and CABG, in the era before the first launch of the Chest Pain Center (CPC) in China in 2011. Such a comparison could provide direct insights into the inherent differences and resource availability in practice between the 2 countries with different medical systems. Knowing differences between the 2 countries provided opportunities for improvement of acute management and quality of care in hospitalized patients with acute STEMI in China and the United States.

What Is New?

• Chest Pain Center and regional acute ST-segment–elevation myocardial infarction (STEMI) networks based on international guidelines have been well established to ensure optimal reperfusion treatment for acute STEMI patients in the United States.
• China has made impressive progressive improvements in quality of medical care and outcomes, especially for the management of life-threatening conditions like acute STEMI; however, the first Chest Pain Center based on regional cooperative treatment was not launched in China until 2011.
• Overall in-hospital mortality in acute STEMI patients is comparable between China and the United States during 2007–2010; however, 3-day mortality is lower in China.

What Are the Clinical Implications?

• Longer acute STEMI-related length of hospital stay need further improvement in China.
• Higher in-hospital mortality is observed in patients receiving primary percutaneous coronary interventions in China.
• Well-established regional systems of acute STEMI care and educational interventions to patients with acute STEMI or at high-risk for acute STEMI are needed in China.
outcomes of STEMI between China and the United States. For comparison of in-hospital mortality, overall all-cause in-hospital mortality, total LOS, and preoperative and postoperative LOS. Preoperative LOS was defined as interval from admission to revascularization strategies, and postoperative LOS was defined as interval from revascularization strategies to discharge. If the operation date was the same as the admission or discharge date, then preoperative or postoperative LOS was counted as zero.

**Statistical Analysis**

A continuous variable with skewness distribution like LOS is expressed as median with corresponding interquartile range, and the Wilcoxon rank-sum test was used to compare differences between the 2 countries. Categorical variables are described using percentages, and the chi-square test was used to compare difference in proportions. The Cochran–Armitage trend test was used to assess linear trend of overall in-hospital mortality from year 2007 to 2010 in China and the United States. For comparison of in-hospital mortality and LOS, we fitted generalized linear mixed models to account for patients clustered within hospitals, adjusting for age, sex, coexisting comorbidities, and revascularization strategies. Analyses were further repeated in different age groups (18–64 and ≥65 years), aiming at comparison with the Medicare population or non-Medicare-aged adults who were likely on Medicaid or private insurance in the United States. All analytical models included the United States as the reference group. A similar method for direct comparison of outcomes from different data sources between the 2 countries was previously applied. For in-hospital mortality, an odds ratio (OR) >1 meant that patients in Chinese hospitals had a higher death rate than patients in US hospitals. For LOS that was log-transformed, the coefficients were explained as percentage differences between China and the United States. Adjustments in the model for LOS were the same as those in the model for in-hospital mortality. We also constructed mixed models incorporating an interaction term for China/US indicator and year with adjustments, including age, sex, coexisting comorbidities, and revascularization strategies, to examine temporal change of outcomes in the 2 countries. We further performed subgroup analyses in acute STEMI patients receiving revascularization (PPCI or CABG). Because of differential LOS between 2 countries, LOS was restricted to 3 days, which was the median LOS in the United States, and in-hospital mortality between countries was further compared at 3 days among total patients and patients following PPCI. Analytical methods in subgroup analyses were the same as those applied in the total acute STEMI patients.

Sensitivity analyses were conducted using the propensity-score matching method, which attempted to remove bias attributable to confounding and get accurate estimation of differences in outcomes between the 2 countries. A logistic regression model was used to calculate the conditional probability of being in the China group with variables in the primary analyses as independent variables. Patients in Chinese hospitals and the US hospitals were then 1:1 matched using a greedy matching algorithm. Considering that large sample issues for P values in large data sets could lead to significant but not clinically relevant differences, we used standardized differences to compare baseline differences before and after matching. In the matched sample, we conducted a Wilcoxon signed-rank test for LOS and conditional logistic regression for in-hospital mortality. Finally, for the matched subjects, we performed sensitivity analyses by assuming unmeasured confounders that might result in different magnitudes of bias and explored their effects on all significant results. This method aimed to test what the unmeasured covariate would have to be like in order to alter the conclusions of the study. Detailed description can be found in Data S1.

All statistical tests were 2-tailed, and P<0.05 was considered statistically significant. All the analyses were performed in SAS software (version 9.4; SAS Institute Inc., Cary, NC).

**Results**

**Characteristics of the Study Sample**

Finally, 32 228 (29.75%) patients from 109 grade III class A hospitals in China and 76 117 (70.25%) patients from 448 urban teaching hospitals in the NIS database in the United States were included (Figure 1). Patients in the Chinese hospitals were younger (62.58 versus 63.00 years; Table 1) and tended to be male (74.39% versus 67.52%). Compared with the US patients, Chinese patients had lower rates of coexisting comorbidities like diabetes mellitus, hypertension, cardiac dysrhythmias, congenital heart disease, blood transfusion, liver disease, gastrointestinal bleeding, and cardiogenic shock, except for congestive heart failure (24.11% in China versus 19.63% in the United States). Rates of PCI (37.22% versus 70.10%) and CABG (1.85% versus 7.41%) were significantly lower in China. In addition, the rate of PPCI among patients undergoing hospitalized PCI was

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Outcomes of STEMI Between China and United States

Han et al

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65.98% in the United States, whereas it was only 32.88% in China.

Trend of In-Hospital Mortality in China and the United States

During the year 2007–2010, overall in-hospital mortality of acute STEMI patients in both China and the United States significantly decreased (Figure 2; $P$ for trend $<0.001$ for China and $P$ for trend $=0.011$ for the United States). For patients receiving PPCI or CABG, no improvements were found. Mortality trend in patients aged $\geq 5$ years was similar to trend in total acute STEMI patients. In patients aged 18 to 64 years, overall in-hospital mortality tended to level off (Figures S1 and S2). The mixed model with an interaction term of China/US indicator and year revealed that the association between country and overall in-hospital mortality changed over time ($P_{\text{interaction}}=0.004$, 0.004, and 0.050 for total patients, patients aged 18 to 64 years, and patients aged $\geq 65$ years, respectively). Further analyses revealed marginal significance in 2009 (Table S1).

Comparison of In-Hospital Mortality Between China and the United States

The unadjusted model indicated that China had a higher risk of overall in-hospital mortality compared with the United States (8.23% versus 7.96%; $P=0.001$), but the difference disappeared after adjusting for age, sex, coexisting comorbidities, and revascularization strategies (OR, 0.97; 95% CI, 0.87–1.09; $P=0.59$; Table 2). Risk predictors of overall in-hospital mortality are shown in Table S2. The 3-day mortality was 4.62% and 5.07% in China and the United States, respectively. After controlling for potential confounders, China had lower 3-day in-hospital mortality (OR, 0.78; 95% CI, 0.70–0.89; $P=0.001$). In patients undergoing PPCI, the unadjusted model suggested that odds of death in China was comparable to that in the United States (4.31% versus 4.50%; $P=0.49$). The mixed model adjusting for potential confounders showed that both odds of overall mortality (OR, 2.39; 95% CI, 1.85–3.07; $P=0.001$) and 3-day mortality (OR, 2.39; 95% CI, 1.78–3.20; $P=0.001$) were higher in the Chinese hospitals. In addition, the adjusted ORs for overall in-hospital mortality were 1.60 (95% CI, 1.01–2.54; $P=0.04$) for patients aged 18 to 64 years and 2.59 (95% CI, 2.00–3.40; $P=0.001$) for patients aged $\geq 65$ years. The adjusted ORs for 3-day in-hospital mortality were 1.91 (95% CI, 1.12–3.24; $P=0.04$) for patients aged 18 to 64 years and 2.49 (95% CI, 1.79–3.46; $P=0.001$) for patients aged $\geq 65$ years. For patients receiving CABG, a significant difference was found in the $\geq 65$-years age group (OR, 1.77; 95% CI, 1.06–2.95; $P=0.03$).

### Table 1. Basic Characteristics of Acute STEMI Patients in China and the United States

| Variables                  | China (%)   | United States (%) | Absolute Standardized Difference |
|----------------------------|-------------|-------------------|----------------------------------|
| Age, y (mean, SD)          | 62.58 (12.94) | 63.00 (14.16)     | 0.03                             |
| Age $\geq 65$ y            | 46.67       | 42.89             | 0.08                             |
| Female                     | 25.61       | 32.48             | 0.15                             |
| Year                       |             |                   |                                  |
| 2007                       | 27.45       | 26.80             |                                  |
| 2008                       | 26.86       | 26.02             |                                  |
| 2009                       | 22.95       | 25.04             |                                  |
| 2010                       | 22.74       | 22.14             |                                  |
| Diabetes mellitus          | 12.82       | 26.48             | 0.35                             |
| Hypertension               | 31.32       | 61.62             | 0.64                             |
| Congestive heart failure   | 24.11       | 19.63             | 0.11                             |
| Congenital heart disease   | 1.34        | 1.32              | $<0.01$                          |
| Blood transfusion          | 4.31        | 6.25              | 0.09                             |
| Liver disease              | 0.31        | 0.88              | 0.07                             |
| Gastrointestinal bleeding  | 1.75        | 5.01              | 0.18                             |
| Cardiogenic shock          | 2.94        | 9.85              | 0.29                             |
| PCI                        | 37.22       | 70.10             | 0.70                             |
| CABG                       | 1.85        | 7.41              | 0.27                             |

CABG indicates coronary artery bypass grafting; PCI, percutaneous coronary intervention; SD, standard difference; STEMI, ST-segment–elevation myocardial infarction.
Comparison of LOS Between China and the United States

Acute STEMI patients in China had a significantly longer LOS for all analyses. For total patients, median LOS was 10 days in China and 3 days in the United States (105% longer in China; \( P < 0.001 \); Table 3). For PPCI patients, median LOS was 9 days in China and 3 days in the United States (138% longer in China; \( P < 0.001 \)). For CABG patients, median LOS was 25 days in China and 9 days in the United States (91% longer in China; \( P < 0.001 \)). Similarly, preoperative and postoperative LOSs in China were significantly longer than those in the United States (Table 4).

Propensity-Score Matching and Sensitivity Analyses

Absolute standardized difference suggested that permissible similarity regarding covariates between China and the United States was well established in all propensity-matched samples (all absolute standardized difference < 0.1; Table S3). C-statistics were above 0.76 in all models, and success rates of matching were sufficient. Results of propensity-score matching were comparable to findings in the primary analyses (Table S4). Tables S5 and S6 show that significantly lower 3-day mortality in the Chinese patients is sensitive to moderate bias. Sensitivity analyses also indicated that significant result in patients undergoing PPCI was sensitive to a confounder that could increase more than 300% the odds of being in the China group or death, suggesting that higher overall in-hospital mortality in Chinese hospitals would be unlikely to be qualitatively altered by moderate bias from unmeasured confounders. Similarity, for patients undergoing PPCI aged 18 to 65 and \( \geq 65 \) years, results were insensitive to small-moderate bias and moderate bias from unmeasured confounders.

Table 2. Comparison of Unadjusted and Adjusted In-Hospital Mortality for Patients With Acute STEMI in China and the United States

|                      | China (%) | United States (%) | Unadjusted OR (95% CI) | \( P \) Value | Adjusted OR (95% CI)* | \( P \) Value |
|----------------------|-----------|-------------------|------------------------|--------------|------------------------|--------------|
| Total STEMI          | 8.23      | 7.96              | 1.23 (1.11, 1.37)      | <0.001       | 0.97 (0.87, 1.09)      | 0.59         |
| Aged 18 to 64 y      | 3.33      | 3.93              | 1.11 (0.96, 1.28)      | 0.17         | 0.97 (0.82, 1.14)      | 0.70         |
| Aged \( \geq 65 \) y | 13.83     | 13.31             | 1.12 (1.01, 1.25)      | 0.03         | 0.94 (0.84, 1.06)      | 0.34         |
| Overall STEMI (within 3 d) | 4.62 | 5.07              | 1.07 (0.96, 1.20)      | 0.23         | 0.78 (0.70, 0.89)      | <0.001       |
| Aged 18 to 64 y      | 2.06      | 2.30              | 1.13 (0.96, 1.34)      | 0.14         | 0.99 (0.82, 1.20)      | 0.92         |
| Aged \( \geq 65 \) y | 7.54      | 8.74              | 0.92 (0.81, 1.03)      | 0.14         | 0.71 (0.62, 0.81)      | <0.001       |
| PPCI                 | 4.31      | 4.50              | 1.08 (0.87, 1.35)      | 0.49         | 2.39 (1.85, 3.07)      | <0.001       |
| Aged 18 to 64 y      | 1.53      | 2.55              | 0.65 (0.43, 0.97)      | 0.03         | 1.60 (1.01, 2.54)      | 0.04         |
| Aged \( \geq 65 \) y | 8.68      | 7.96              | 1.17 (0.92, 1.49)      | 0.19         | 2.59 (2.00, 3.40)      | <0.001       |
| PPCI (within 3 days) | 2.43      | 2.69              | 0.98 (0.75, 1.28)      | 0.89         | 2.39 (1.78, 3.20)      | <0.001       |
| Aged 18 to 64 y      | 0.95      | 1.46              | 0.71 (0.44, 1.15)      | 0.16         | 1.91 (1.12, 3.24)      | 0.02         |
| Aged \( \geq 65 \) y | 4.76      | 4.86              | 1.01 (0.75, 1.35)      | 0.97         | 2.49 (1.79, 3.46)      | <0.001       |
| CABG                 | 4.03      | 5.62              | 0.79 (0.49, 1.28)      | 0.33         | 1.57 (0.93, 2.66)      | 0.09         |
| Aged 18 to 64 y      | 0.29      | 3.12              | 0.09 (0.01, 0.68)      | 0.02         | 0.27 (0.04, 2.09)      | 0.21         |
| Aged \( \geq 65 \) y | 9.24      | 8.44              | 1.28 (0.76, 2.16)      | 0.35         | 1.77 (1.06, 2.95)      | 0.03         |

CABG indicates coronary artery bypass grafting; OR, odds ratio; PPCI, primary percutaneous coronary intervention; STEMI, ST-segment-elevation myocardial infarction.
*Adjusted for age, sex, diabetes mellitus, hypertension, cardiac dysrhythmias, congestive heart failure, congenital heart disease, blood transfusion, liver disease, gastrointestinal bleeding, cardiogenic shock, PCI, and CABG.
†All analytical models included the United States as the reference group.

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Table 3. Comparison of Unadjusted and Adjusted Total LOS for Patients With Acute STEMI in China and the United States

|                  | China          | United States | Unadjusted Coefficient | P Value | Adjusted* Coefficient | P Value |
|------------------|----------------|---------------|------------------------|---------|-----------------------|---------|
| Total STEMI      | 10 (6–14)†     | 3 (2–5)       | 0.85                   | <0.001  | 1.05                  | <0.001  |
| Aged 18 to 64 y  | 9 (6–14)       | 3 (2–4)       | 0.99                   | <0.001  | 1.16                  | <0.001  |
| Aged ≥65 y       | 10 (6–15)      | 4 (2–7)       | 0.71                   | <0.001  | 0.96                  | <0.001  |
| PPCI+STEMI       | 9 (7–13)       | 3 (2–4)       | 1.30                   | <0.001  | 1.38                  | <0.001  |
| Aged 18 to 64 y  | 6 (5–9)        | 3 (2–4)       | 1.35                   | <0.001  | 1.41                  | <0.001  |
| Aged ≥65 y       | 10 (7–15)      | 3 (2–5)       | 1.18                   | <0.001  | 1.31                  | <0.001  |
| CABG+STEMI       | 25 (17–34)     | 9 (7–13)      | 0.80                   | <0.001  | 0.91                  | <0.001  |
| Aged 18 to 64 y  | 25 (17–33)     | 8 (6–12)      | 0.90                   | <0.001  | 1.01                  | <0.001  |
| Aged ≥65 y       | 25 (17–35)     | 10 (7–15)     | 0.67                   | <0.001  | 0.77                  | <0.001  |

CABG indicates coronary artery bypass grafting; LOS, length of stay; OR, odds ratio; STEMI, ST-segment-elevation myocardial infarction; PPCI, primary percutaneous coronary intervention.

*Adjusted for age, sex, year, diabetes mellitus, hypertension, cardiac dysrhythmias, congestive heart failure, congenital heart disease, blood transfusion, liver disease, gastrointestinal bleeding, cardiogenic shock, PCI, and CABG.

†LOS was expressed as median and interquartile range.

All analytical models included the United States as the reference group.

Table 4. Comparison of Unadjusted and Adjusted Preoperative and Postoperative LOS for Patients With Acute STEMI in China and the United States

|                  | China          | United States | Unadjusted coefficient | P Value | Adjusted* coefficient | P Value |
|------------------|----------------|---------------|------------------------|---------|-----------------------|---------|
| Pre-PCI          | 3 (1–7)†       | 0             | 0.73                   | <0.001  | 0.77                  | <0.001  |
| Aged 18 to 64 y  | 3 (1–6)        | 0             | 0.74                   | <0.001  | 0.77                  | <0.001  |
| Aged ≥65 y       | 3 (1–7)        | 0             | 0.63                   | <0.001  | 0.69                  | <0.001  |
| Post-PCI         | 5 (3–8)        | 3 (2–4)       | 0.79                   | <0.001  | 0.88                  | <0.001  |
| Aged 18 to 64 y  | 5 (3–7)        | 3 (2–4)       | 0.81                   | <0.001  | 0.87                  | <0.001  |
| Aged ≥65 y       | 6 (3–9)        | 3 (2–5)       | 0.74                   | <0.001  | 0.88                  | <0.001  |
| Pre-CABG         | 11 (7–17)      | 2 (0–4)       | 1.18                   | <0.001  | 1.24                  | <0.001  |
| Aged 18 to 64 y  | 11 (7–18)      | 2 (0–4)       | 1.28                   | <0.001  | 1.33                  | <0.001  |
| Aged ≥65 y       | 11 (6–17)      | 2 (1–4)       | 1.07                   | <0.001  | 1.13                  | <0.001  |
| Post-CABG        | 13 (9–16)      | 6 (5–10)      | 0.38                   | <0.001  | 0.50                  | <0.001  |
| Aged 18 to 64 y  | 12 (9–16)      | 6 (4–8)       | 0.45                   | <0.001  | 0.56                  | <0.001  |
| Aged ≥65 y       | 13 (9–18)      | 7 (5–12)      | 0.36                   | <0.001  | 0.45                  | <0.001  |

CABG indicates coronary artery bypass grafting; PCI, percutaneous coronary intervention; Post, postoperative; Pre, preoperative; LOS, length of stay; STEMI, ST-segment-elevation myocardial infarction.

*Adjusted for age, sex, year, diabetes mellitus, hypertension, cardiac dysrhythmias, congestive heart failure, congenital heart disease, blood transfusion, liver disease, gastrointestinal bleeding, and cardiogenic shock.

†LOS was expressed as median and interquartile range.

All analytical models included the United States as the reference group.

The present study containing 108,345 acute STEMI patients discharged from urban teaching hospitals in China and the United States demonstrates that overall in-hospital mortality in both China and the United States tends to decrease during 2007–2010. Patients in China have less coexisting comorbidities. There are no statistically significant differences in overall in-hospital mortality between China and the United States. Patients in Chinese hospitals had lower 3-day mortality. Rates of PCI and PPCI during hospitalization in China are lower than those in the United States. In acute STEMI patients receiving PPCI, the Chinese hospitals have...
Outcomes of STEMI Between China and United States  Han et al

significantly higher overall and 3-day mortality. Total, preoperative, and postoperative LOSs are longer in China.

The most important findings are higher overall and 3-day in-hospital mortality rates in patients receiving PPCI in China across all age subgroups (18–65 and ≥65 years). PPCI is suggested as the first-line therapy according to the recommended guidelines in China and the United States. Early reperfusion through PPCI in acute STEMI patients could reduce the extent of ischemic injury, protect cardiac function, and thus lower in-hospital mortality.5 CPC and regional acute STEMI networks, which aimed to shorten total ischemic time and more quickly offer reperfusion strategies, have been well established in the United States.19 These organizations could better coordinate acute STEMI management and improve clinical outcomes through both prehospital and in-hospital measures. However, the first CPC based on regional cooperative treatment in China was set up in 2011. Therefore, during the study period 2007–2010, more delays to offer PPCI might account for higher mortality in patients with acute STEMI in China. First, median door-to-balloon time in China was supposed to be longer than that in the United States because of the lack of acute STEMI systems of care. In fact, researchers have reported an average door-to-balloon time of >130 minutes in China.10,11 Second, prehospital system delays, including traffic- or weather-related delays, lack of transportation availability, and absence of effective collaboration, between PCI-capable and non-PCI-capable hospitals might be more common in China, especially for rural patients.5,20–22 Third, because of cultural perception or affordability, some acute STEMI patients, especially the elderly, in China chose to endure the pain with poor knowledge of the importance of rapid action and finally missed the best treatment time. For the same reason, certain dying or terminal patients in China might withdraw from hospitalized treatment, which could underestimate the in-hospital mortality. Gasevic et al reported ethnic differences with higher short-term mortality in Chinese patients following PCI after acute myocardial infarction (OR, 2.36; 95% CI, 1.12–5.00; P=0.02).23 They discussed that genetic differences in antiplatelet drug responsiveness, being less likely to fill prescriptions and adhere to secondary prevention medications in Chinese patients, might be involved.

As a commonly used revascularization method for treating coronary heart disease, CABG is infrequently performed in patients with acute STEMI. Rate of CABG in acute STEMI patients in the NIS sample was 7.41%, slightly higher than 6.30% in the Acute Coronary Treatment and Intervention Outcomes Network (ACTION) Registry-Get With The Guidelines (GWTG) and ≤5% in single-center experiences.7,8 Zheng et al compared CABG-related in-hospital mortality between China and the United States among urban teaching hospitals in the 2007–2008 and 2010 period and suggested that OR was 1.58 for all age ranges and 1.73 for aged ≥65 years, which was similar to our results in acute STEMI patients undergoing CABG (OR, 1.57 and 1.77).16 However, during the 2011–2013 period, Zheng et al found that this difference was not present. National efforts aiming to improve health outcomes in China may lower CABG mortality and therefore narrow the gap between China and the United States.24,25

It is well known that hospital LOS is a critical indicator for medical resource utilization. Prolonging hospitalization may waste the limited medical resources. In addition, researchers claimed that shorter LOS (2 days) was not related to adverse short outcomes in acute STEMI patients undergoing PPCI.26 Several studies have suggested longer LOS in China compared with Western countries16,27 which are consistent to results focusing on acute STEMI patients in this study. There are several possible explanations for the differences in LOS between China and the United States. First, structure of healthcare financing, including insurance type, insurance ownership, and reimbursement mechanism, may play an important role. For example, a diagnosis-related group-based payment system in the United States predetermined reimbursements for hospital charge and caused early discharge. Moreover, the reimbursement ratio for inpatient service was higher than that in the outpatient setting in China, prolonging the hospitalized LOS.27,28 Second, Chinese doctors were inclined to be conservative in terms of discharge from acute STEMI to avoid risks from this life-threatening condition, patients, or their families.29 Third, posthospitalization care, like nursing homes, home health, and cardiac rehabilitation for acute STEMI patients, is common in the United States whereas China needs improvements in postacute care.30,31

Although there are barriers in public health service arising from a large population base and unbalanced development, the Chinese healthcare system has made impressive progressive improvements in recent years, including reducing out-of-pocket payments, expanding insurance coverage, increasing reimbursement ratio, and narrowing gap of accessing to health services between rural and urban areas, which is probably promoted by the effective reform of the healthcare system.24,32,33 In addition, quality of medical care and outcomes have also been improved, especially for life-threatening conditions like acute STEMI.34 According to a quality-control report of the first half of 2018 released by the headquarters of the China Chest Pain Centers, around 460 CPCs have been certificated across the whole country. Average door-to-balloon time is 74 minutes, and other indicators, including symptom onset to first medical contact, first medical contact to ECG, and in-hospital mortality, have also improved.35 The Hospital Quality Monitoring System is encouraged to improve performance of all tertiary hospitals through ongoing quality assessments.36 On the basis of guideline-recommended treatments from Western countries,
many clinical researches funded by the government have been launched to generate clinical evidence in coronary artery disease based on characteristics of Chinese populations.\textsuperscript{37,38} Abundant patient resources and well-designed researches in China will provide clinical evidence with high quality that may improve treatments and outcomes for acute STEMI patients. Regardless of the difficulties to overcome, medical care in patients with acute STEMI might be better with sustained financial inputs and the national initiative to healthcare reform.

Limitations should be acknowledged in the present study. First, databases from different countries might vary in data collection and medical coding. Such differences posed a challenge to the design and analysis in the context of clinically abstracted information in a real-world setting. Nevertheless, we examined acute STEMI-related clinical outcomes between 2 countries in several situations or subgroups, and propensity-score matching analyses verified the main findings in the study. Second, unmeasured confounders, such as lifestyles, environments, and medications, that were related to the clinical outcomes and disproportionately distributed between the 2 countries cannot be excluded in observational studies. To take account of bias introduced by potential unmeasured confounders, we performed sensitivity analyses which assumed the presence of unmeasured confounders. The results showed that differences in mortality in patients undergoing PPCI between 2 groups remained statistically significant even under strong biases. Third, individual data from China could be linked together to count multiple admissions for acute STEMI more than once. However, the NIS could not trace an individual’s records. Considering the statistically large sample size, its influence was expected to be minor. Four, the NIS did not have present-on-admission flags because of the nature of discharge database. However, a literature review of previous publications using the NIS shared similar methods to capture the coexisting conditions for adjustments.\textsuperscript{39,40} Five, this study excluded the patients who transferred from other hospitals. Six, differential LOS between 2 countries is an important limitation of this study. Furthermore, analytical results regarding overall in-hospital mortality should be regarded as exploratory and hypothesis-generating. Additionally, when LOS was restricted to 3 days, the results were generally stable. Seven, this analysis was based on data from 2007 to 2010. Considering progress in care and outcomes of acute STEMI patients in China during recent years, whether an improved in-hospital prognosis relative to the United States is established may be worthy of expectation. More evidence is needed to verify this hypothesis.

In conclusion, overall in-hospital mortality of acute STEMI patients is comparable between China and the United States among urban teaching hospitals during 2007–2010. In addition, 3-day mortality was lower in China. Early revascularization and longer LOS need to be given more attention in China. Well-established regional systems of acute STEMI care and educational interventions for patients with acute STEMI or at high risk for acute STEMI are needed to improve acute management and quality of care in hospitalized patients with acute STEMI.

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Disclosures
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SUPPLEMENTAL MATERIAL
Table S1. Temporal trend of association between country and year for STEMI patients in China and the US.

|                      | 2007          | 2008          | 2009          | 2010          |
|----------------------|---------------|---------------|---------------|---------------|
| **Total STEMI**      |               |               |               |               |
| N                    | 29249         | 28455         | 26455         | 24186         |
| OR (95% CI)          | 1.00 (0.84,1.20) | 0.95 (0.81,1.12) | 1.22 (1.02,1.46) | 0.85 (0.69,1.05) |
| P                    | 1.00          | 0.55          | 0.03          | 0.14          |
| Aged 18-64 years     |               |               |               |               |
| N                    | 16104         | 15613         | 15172         | 13761         |
| OR (95% CI)          | 0.91 (0.70,1.17) | 0.80 (0.61,1.06) | 1.35 (1.01,1.82) | 0.86 (0.61,1.21) |
| P                    | 0.45          | 0.12          | 0.05          | 0.39          |
| Aged ≥ 65 years      |               |               |               |               |
| N                    | 13141         | 12838         | 11281         | 10423         |
| OR (95% CI)          | 1.01 (0.83,1.22) | 0.97 (0.82,1.15) | 1.12 (0.91,1.38) | 0.85 (0.68,1.07) |
| P                    | 0.95          | 0.71          | 0.27          | 0.16          |

* STEMI, ST-elevated acute myocardial infarction; US, United States; OR, odds ratio; CI, confidence interval.

# Adjusted for age, sex, year, diabetes, hypertension, cardiac dysrhythmias, congestive heart failure, congenital heart disease, blood transfusion, liver disease, gastrointestinal bleeding and cardiogenic shock.

†All analytic models included the US as the reference group.
Table S2. Multivariable analysis of in-hospital mortality of STEMI patients in China and the US.

| Variables                      | Total STEMI | Adjusted OR (95% CI) | P-value |
|--------------------------------|-------------|----------------------|---------|
| Age≥65 years                   |             | 2.78 (2.62,2.94)     | <0.001  |
| Female                         |             | 1.26 (1.20,1.33)     | <0.001  |
| Year                           |             |                      |         |
| 2008                           | 0.99 (0.91,1.07) | <0.001               |         |
| 2009                           | 1.07 (0.98,1.16) | <0.001               |         |
| 2010                           | 0.89 (0.82,0.97) | <0.001               |         |
| Diabetes                       | 1.09 (1.02,1.16) | 0.01                 |         |
| Hypertension                   | 0.75 (0.71,0.79) | <0.001               |         |
| Cardiac dysrhythmias           | 2.46 (2.32,2.60) | <0.001               |         |
| Prior heart failure            | 0.98 (0.93,1.04) | 0.48                 |         |
| Congenital heart disease       | 0.96 (0.79,1.17) | 0.69                 |         |
| Blood transfusion              | 1.37 (1.25,1.50) | <0.001               |         |
| Liver disease                  | 1.44 (1.11,1.88) | 0.01                 |         |
| Gastrointestinal bleeding      | 1.37 (1.25,1.52) | <0.001               |         |
| Cardiogenic shock              | 9.24 (8.68,9.45) | <0.001               |         |
| PCI                            | 0.19 (0.18,0.20) | <0.001               |         |
| CABG                           | 0.16 (0.14,0.18) | <0.001               |         |

* STEMI, ST-elevated acute myocardial infarction; US, United States; OR, odds ratio; CI, confidence interval; PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting.
Table S3. Characteristics of STEMI patients in the matched sample (based on total STEMI).

| Variables                      | China (%) (n=22,072) | US (%) (n=22,072) | Absolute Standardized Difference |
|-------------------------------|----------------------|-------------------|----------------------------------|
| Age ≥ 65 years                | 44.37                | 49.35             | 0.0998                           |
| Female                        | 28.90                | 30.06             | 0.0255                           |
| Year                          |                      |                   |                                  |
| 2007                          | 29.57                | 29.51             |                                  |
| 2008                          | 28.70                | 29.02             |                                  |
| 2009                          | 22.94                | 23.84             |                                  |
| 2010                          | 18.79                | 17.63             | 0.0333                           |
| Diabetes                      | 15.89                | 17.24             | 0.0364                           |
| Hypertension                  | 41.17                | 43.43             | 0.0458                           |
| Cardiac dysrhythmias          | 11.25                | 11.36             | 0.0034                           |
| Congestive heart failure      | 22.82                | 22.86             | 0.0009                           |
| Congenital heart disease      | 1.06                 | 1.10              | 0.0035                           |
| Blood transfusion             | 4.69                 | 5.21              | 0.0242                           |
| Liver disease                 | 0.39                 | 0.45              | 0.0098                           |
| Gastrointestinal bleeding     | 2.15                 | 2.32              | 0.0113                           |
| Cardiogenic shock             | 3.60                 | 3.66              | 0.0031                           |
| PCI                           | 51.10                | 48.94             | 0.0433                           |
| CABG                          | 2.70                 | 2.73              | 0.0020                           |

* STEMI, ST-elevated acute myocardial infarction; US, United States; PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting.
Table S4. Comparisons of in-hospital mortality for patients with STEMI in China and the US using propensity score matching method.

| Patients | Matched sample (n) | Success rate (%) | OR (95% CI)   | P-value |
|----------|--------------------|------------------|---------------|---------|
| Total STEMI | 22,072 | 68.49 | 0.95 (0.88, 1.03) | 0.23 |
| Aged 18-64 | 11,436 | 66.54 | 0.88 (0.75, 1.04) | 0.13 |
| Aged ≥ 65 | 10,303 | 68.52 | 0.98 (0.89, 1.07) | 0.59 |
| Total STEMI (within 3 days) | 22,072 | 68.49 | 0.77 (0.70, 0.85) | <0.001 |
| Aged 18-64 | 11,436 | 66.54 | 1.03 (0.83, 1.27) | 0.80 |
| Aged ≥ 65 | 10,303 | 68.52 | 0.70 (0.63, 0.78) | <0.001 |
| PPCI | 7,586 | 96.17 | 2.08 (1.57, 2.77) | <0.001 |
| Aged 18-64 | 4,428 | 91.83 | 1.80 (1.04, 3.12) | 0.04 |
| Aged ≥ 65 | 3,012 | 98.24 | 2.69 (1.89, 3.84) | <0.001 |
| PPCI (within 3 days) | 7,586 | 96.17 | 2.43 (1.66, 3.57) | <0.001 |
| Aged 18-64 | 4,428 | 91.83 | 2.88 (1.29, 6.43) | 0.01 |
| Aged ≥ 65 | 3,012 | 98.24 | 4.00 (2.31, 6.92) | <0.001 |
| CABG | 1,118 | 93.79 | 1.31 (0.64, 2.69) | 0.47 |
| Aged 18-64 | 648 | 93.37 | 1.00 (0.06, 16.00) | 1.00 |
| Aged ≥ 65 | 228 | 91.57 | 1.39 (0.68, 2.83) | 0.37 |

* STEMI, ST-elevated acute myocardial infarction; US, United States; OR, odds ratio; CI, confidence interval; PPCI, primary percutaneous coronary intervention; CABG, coronary artery bypass grafting.

# Matched on age, sex, year, diabetes, hypertension, cardiac dysrhythmias, congestive heart failure, congenital heart disease, blood transfusion, liver disease, gastrointestinal bleeding and cardiogenic shock.

†All analytic models included the US as the reference group.
Data S1.

Supplemental Methods for Sensitivity Analysis

Δ Sensitivity analysis results for outcomes with $P \leq 0.05$

Supplementary table 5-12 showed sensitivity analysis results for in-hospital mortality with $P \leq 0.05$ in different datasets. Horizontal axis of the table represents a range of potential odds ratios (ORxu; x means being in the China group; u means a potential unmeasured factor) values that could characterize the effect of a hypothetical unmeasured confounder on the odds of being in the China group. The vertical axis of the table represents a range of potential odds ratio (ORyu; y means in-hospital mortality; u means a potential unmeasured factor) values that could characterize the effect of a hypothetical unmeasured factor on the odds of death. Supplementary table 7 indicated that difference in in-hospital mortality of patients undergoing PPCI between the two countries was sensitive to a confounder that could increase more than 300% odds of being in the China group or death. We therefore conclude that our results are stable with strong bias. Similarity, Supplementary table 8-9 indicated that the results were stable with small-moderate bias and sensitive to strong bias (cutoff-values of OR for an unmeasured confounder are 1.5 and 3.5), respectively. Supplementary table 10-12 suggested that higher 3-day in-hospital mortality in patients undergoing PPCI in Chinese hospitals were robust under strong bias.

Table S5. Sensitivity analysis results for in-hospital mortality with $P \leq 0.05$ (Total STEMI within 3 days).

|          | 1.00     | 1.50     | 2.00     | 2.50     | 3.00     | 3.50     |
|----------|----------|----------|----------|----------|----------|----------|
| 1.00     | 6.03e-10 | 6.03e-10 | 6.03e-10 | 6.03e-10 | 6.03e-10 | 6.03e-10 |
| 1.50     | 6.03e-10 | 6.25e-06 | 0.0006   | 0.0080   | 0.0362   | 0.0936   |
| 2.00     | 6.03e-10 | 0.0006   | 0.0936   | 0.5206   | 0.8610   | 0.9708   |
| 2.50     | 6.03e-10 | 0.0080   | 0.5206   | 0.9661   | 0.9992   | 1.0000   |
| 3.00     | 6.03e-10 | 0.0362   | 0.8610   | 0.9992   | 1.0000   | 1.0000   |
| 3.50     | 6.03e-10 | 0.0936   | 0.9708   | 1.0000   | 1.0000   | 1.0000   |

Table S6. Sensitivity analysis results for in-hospital mortality with $P \leq 0.05$ (Total STEMI aged≥65 within 3 days).

|          | 1.00     | 1.50     | 2.00     | 2.50     | 3.00     | 3.50     |
|----------|----------|----------|----------|----------|----------|----------|
| 1.00     | 3.42e-09 | 3.42e-09 | 3.42e-09 | 3.42e-09 | 3.42e-09 | 3.42e-09 |
| 1.50     | 3.42e-09 | 8.14e-06 | 0.0004   | 0.0045   | 0.0188   | 0.0480   |
| 2.00     | 3.42e-09 | 0.0004   | 0.0480   | 0.3168   | 0.6626   | 0.8686   |
| 2.50     | 3.42e-09 | 0.0045   | 0.3168   | 0.8560   | 0.9870   | 0.9992   |
| 3.00     | 3.42e-09 | 0.0188   | 0.6626   | 0.9870   | 0.9998   | 1.0000   |
| 3.50     | 3.42e-09 | 0.0480   | 0.8686   | 0.9992   | 1.0000   | 1.0000   |

Table S5 indicates that difference in in-hospital mortality of patients undergoing PPCI between the two countries was sensitive to a confounder that could increase more than 300% odds of being in the China group or death. We therefore conclude that our results are stable with strong bias. Similarity, Supplementary table 8-9 indicated that the results were stable with small-moderate bias and sensitive to strong bias (cutoff-values of OR for an unmeasured confounder are 1.5 and 3.5), respectively. Supplementary table 10-12 suggested that higher 3-day in-hospital mortality in patients undergoing PPCI in Chinese hospitals were robust under strong bias.
Table S7. Sensitivity analysis results for in-hospital mortality with $P \leq 0.05$ (patients undergoing PPCI).

|     | 1.00 | 1.50 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 |
|-----|------|------|------|------|------|------|------|------|
| 1.00| 1.07e-07 | 1.07e-07 | 1.07e-07 | 1.07e-07 | 1.07e-07 | 1.07e-07 | 1.07e-07 | 1.07e-07 |
| 1.50| 1.07e-07 | 2.10e-06 | 1.27e-05 | 4.22e-05 | 9.88e-05 | 0.0002 | 0.0003 | 0.0004 |
| 2.00| 1.07e-07 | 1.27e-05 | 0.0002 | 0.0010 | 0.0031 | 0.0069 | 0.0125 | 0.0196 |
| 2.50| 1.07e-07 | 4.22e-05 | 0.0010 | 0.0065 | 0.0212 | 0.0474 | 0.0834 | 0.1261 |
| 3.00| 1.07e-07 | 9.88e-05 | 0.0031 | 0.0212 | 0.0680 | 0.1428 | 0.2339 | 0.3285 |
| 3.50| 1.07e-07 | 0.0002 | 0.0069 | 0.0474 | 0.1428 | 0.2768 | 0.4179 | 0.5443 |
| 4.00| 1.07e-07 | 0.0003 | 0.0125 | 0.0834 | 0.2339 | 0.4179 | 0.5847 | 0.7134 |
| 4.50| 1.07e-07 | 0.0004 | 0.0196 | 0.1261 | 0.3285 | 0.5443 | 0.7134 | 0.8261 |

Table S8. Sensitivity analysis results for in-hospital mortality with $P \leq 0.05$ (patients undergoing PPCI aged 18-65 years).

|     | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.50 | 2.75 |
|-----|------|------|------|------|------|------|------|------|
| 1.00| 0.02202 | 0.0220 | 0.0220 | 0.0220 | 0.0220 | 0.0220 | 0.0220 | 0.0220 |
| 1.25| 0.02202 | 0.0273 | 0.0323 | 0.0369 | 0.0412 | 0.0451 | 0.0487 | 0.0519 |
| 1.50| 0.0220 | 0.0323 | 0.0432 | 0.0541 | 0.0648 | 0.0751 | 0.0848 | 0.0940 |
| 1.75| 0.0220 | 0.0369 | 0.0541 | 0.0724 | 0.0910 | 0.1094 | 0.1272 | 0.1442 |
| 2.00| 0.0220 | 0.0412 | 0.0648 | 0.0910 | 0.1184 | 0.1458 | 0.1725 | 0.1981 |
| 2.25| 0.0220 | 0.0451 | 0.0751 | 0.1094 | 0.1458 | 0.1825 | 0.2182 | 0.2523 |
| 2.50| 0.0220 | 0.0487 | 0.0848 | 0.1272 | 0.1725 | 0.2182 | 0.2626 | 0.3047 |
| 2.75| 0.0220 | 0.0519 | 0.0940 | 0.1442 | 0.1981 | 0.2523 | 0.3047 | 0.3539 |

Table S9. Sensitivity analysis results for in-hospital mortality with $P \leq 0.05$ (patients undergoing PPCI aged 65 years).

|     | 1.00 | 1.50 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 |
|-----|------|------|------|------|------|------|------|------|
| 1.00| 5.24e-09 | 5.24e-09 | 5.24e-09 | 5.24e-09 | 5.24e-09 | 5.24e-09 | 5.24e-09 | 5.24e-09 |
| 1.50| 5.24e-09 | 8.32e-08 | 4.61e-07 | 1.47e-06 | 3.40e-06 | 6.39e-06 | 1.05e-05 | 1.55e-05 |
| 2.00| 5.24e-09 | 4.61e-07 | 6.39e-06 | 3.53e-05 | 0.0001 | 0.0003 | 0.0005 | 0.0010 |
| 2.50| 5.24e-09 | 1.47e-06 | 3.53e-05 | 0.0003 | 0.0010 | 0.0026 | 0.0053 | 0.0092 |
| 3.00| 5.24e-09 | 3.40e-06 | 0.0001 | 0.0010 | 0.0041 | 0.0110 | 0.0223 | 0.0380 |
| 3.50| 5.24e-09 | 6.39e-06 | 0.0003 | 0.0026 | 0.0110 | 0.0289 | 0.0573 | 0.0945 |
| 4.00| 5.24e-09 | 1.05e-05 | 0.0005 | 0.0053 | 0.0223 | 0.0573 | 0.1097 | 0.1739 |
| 4.50| 5.24e-09 | 1.55e-05 | 0.0010 | 0.0092 | 0.0380 | 0.0945 | 0.1739 | 0.2650 |
Table S10. Sensitivity analysis results for in-hospital mortality within 3 days with \( P \leq 0.05 \) (patients undergoing PPCI).

|       | 1.00 | 1.50 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 |
|-------|------|------|------|------|------|------|------|------|
| 1.00  | 1.44e-06 | 1.44e-06 | 1.44e-06 | 1.44e-06 | 1.44e-06 | 1.44e-06 | 1.44e-06 | 1.44e-06 |
| 1.50  | 1.44e-06 | 1.14e-05 | 4.09e-05 | 9.68e-05 | 0.0002 | 0.0003 | 0.0004 | 0.0005 |
| 2.00  | 1.44e-06 | 4.09e-05 | 0.0003 | 0.0010 | 0.0024 | 0.0045 | 0.0072 | 0.0104 |
| 2.50  | 1.44e-06 | 9.68e-05 | 0.0010 | 0.0042 | 0.0111 | 0.0220 | 0.0362 | 0.0529 |
| 3.00  | 1.44e-06 | 0.0002 | 0.0024 | 0.0111 | 0.0302 | 0.0595 | 0.0968 | 0.1385 |
| 3.50  | 1.44e-06 | 0.0003 | 0.0045 | 0.0220 | 0.0595 | 0.1152 | 0.1819 | 0.2523 |
| 4.00  | 1.44e-06 | 0.0004 | 0.0072 | 0.0362 | 0.0968 | 0.1819 | 0.2777 | 0.3723 |
| 4.50  | 1.44e-06 | 0.0005 | 0.0104 | 0.0529 | 0.1385 | 0.2523 | 0.3723 | 0.4832 |

Table S11. Sensitivity analysis results for in-hospital mortality within 3 days with \( P \leq 0.05 \) (patients undergoing PPCI aged 18-65 years).

|       | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 | 2.25 | 2.50 | 2.75 |
|-------|------|------|------|------|------|------|------|------|
| 1.00  | 0.0053 | 0.0053 | 0.0053 | 0.0053 | 0.0053 | 0.0053 | 0.0053 | 0.0053 |
| 1.25  | 0.0053 | 0.0065 | 0.0075 | 0.0085 | 0.0094 | 0.0102 | 0.0110 | 0.0117 |
| 1.50  | 0.0053 | 0.0075 | 0.0098 | 0.0121 | 0.0144 | 0.0166 | 0.0187 | 0.0207 |
| 1.75  | 0.0053 | 0.0085 | 0.0121 | 0.0160 | 0.0201 | 0.0241 | 0.0281 | 0.0320 |
| 2.00  | 0.0053 | 0.0094 | 0.0144 | 0.0201 | 0.0261 | 0.0324 | 0.0387 | 0.0450 |
| 2.25  | 0.0053 | 0.0102 | 0.0166 | 0.0241 | 0.0324 | 0.0411 | 0.0501 | 0.0591 |
| 2.50  | 0.0053 | 0.0110 | 0.0187 | 0.0281 | 0.0387 | 0.0501 | 0.0619 | 0.0738 |
| 2.75  | 0.0053 | 0.0117 | 0.0207 | 0.0320 | 0.0450 | 0.0591 | 0.0738 | 0.0888 |

Table S12. Sensitivity analysis results for in-hospital mortality within 3 days with \( P \leq 0.05 \) (patients undergoing PPCI aged \( \geq 65 \) years).

|       | 1.00 | 1.50 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 | 5.00 |
|-------|------|------|------|------|------|------|------|------|------|
| 1.00  | 2.94e-08 | 2.94e-08 | 2.94e-08 | 2.94e-08 | 2.94e-08 | 2.94e-08 | 2.94e-08 | 2.94e-08 | 2.94e-08 |
| 1.50  | 2.94e-08 | 1.93e-07 | 6.33e-07 | 1.43e-06 | 2.60e-06 | 4.09e-05 | 5.85e-06 | 7.80e-06 | 9.88e-06 |
| 2.00  | 2.94e-08 | 6.33e-07 | 4.09e-06 | 1.43e-05 | 3.48e-05 | 6.78e-05 | 0.0001 | 0.0002 | 0.0002 |
| 2.50  | 2.94e-08 | 1.43e-06 | 6.42e-05 | 0.0002 | 0.0004 | 0.0004 | 0.0007 | 0.0012 | 0.0017 |
| 3.00  | 2.94e-08 | 2.60e-06 | 3.48e-05 | 0.0002 | 0.0006 | 0.0014 | 0.0026 | 0.0042 | 0.0063 |
| 3.50  | 2.94e-08 | 4.09e-06 | 6.78e-05 | 0.0004 | 0.0014 | 0.0033 | 0.0063 | 0.0104 | 0.0156 |
| 4.00  | 2.94e-08 | 5.85e-06 | 0.0001 | 0.0007 | 0.0026 | 0.0063 | 0.0122 | 0.0203 | 0.0302 |
| 4.50  | 2.94e-08 | 7.80e-06 | 0.0002 | 0.0012 | 0.0042 | 0.0104 | 0.0203 | 0.0336 | 0.0498 |
| 5.00  | 2.94e-08 | 9.88e-06 | 0.0002 | 0.0017 | 0.0063 | 0.0156 | 0.0302 | 0.0498 | 0.0733 |
Figure S1. Temporary changes in in-hospital mortality of STEMI patients between China and US from 2007 to 2010 (aged 18-64 years).

Figure S2. Temporary changes in in-hospital mortality of STEMI patients between China and US from 2007 to 2010 (aged ≥ 65 years).