Trends in Early Aspirin Use Among Patients With Acute Myocardial Infarction in China, 2001–2011: The China PEACE-Retrospective AMI Study

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Background—Aspirin is an effective, safe, and inexpensive early treatment of acute myocardial infarction (AMI) with few barriers to administration, even in countries with limited healthcare resources. However, the rates and recent trends of aspirin use for the early treatment of AMI in China are unknown.

Methods and Results—Using data from the China Patient-centered Evaluative Assessment of Cardiac Events Retrospective Study of Acute Myocardial Infarction (China PEACE-Retrospective AMI Study), we identified a cohort of 14,041 patients with AMI eligible for early aspirin therapy. Early use of aspirin for AMI increased over time (78.4% in 2001, 86.5% in 2006, and 90.0% in 2011). However, about 15% of hospitals had a rate of use of <80% in 2011. Treatment was less likely in patients who were older, presented with cardiogenic shock at admission, presented without chest discomfort, had a final diagnosis of non-ST-segment elevation acute myocardial infarction, or did not receive reperfusion therapy. Hospitalization in rural regions was also associated with aspirin underuse.

Conclusions—Despite improvements in early use of aspirin for AMI in China, there remains marked variation in practice and opportunities for improvement that are concentrated in some hospitals and patient groups.

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Abstract

**Background**- Aspirin is an effective, safe, and inexpensive early treatment of acute myocardial infarction (AMI) with few barriers to administration, even in countries with limited healthcare resources. However, the rates and recent trends of aspirin use for the early treatment of AMI in China are unknown.

**Methods and Results**- Using data from the China Patient-centered Evaluative Assessment of Cardiac Events Retrospective Study of Acute Myocardial Infarction (China PEACE-Retrospective AMI Study), we identified a cohort of 14,041 patients with AMI eligible for early aspirin therapy. Early use of aspirin for AMI increased over time (78.4% in 2001, 86.5% in 2006, and 90.0% in 2011). However, about 15% of hospitals had a rate of use of <80% in 2011. Treatment was less likely in patients who were older, presented with cardiogenic shock at admission, presented without chest discomfort, had a final diagnosis of non-ST-segment elevation acute myocardial infarction, or did not receive reperfusion therapy. Hospitalization in rural regions was also associated with aspirin underuse.

**Conclusions**- Despite improvements in early use of aspirin for AMI in China, there remains marked variation in practice and opportunities for improvement that are concentrated in some hospitals and patient groups.
Figure 1. Flow diagram of the study sample. AMI indicates acute myocardial infarction.
Figure 2. Trends in early aspirin use for acute myocardial infarction in 2001, 2006, and 2011 by Chinese Geographic Regions. P<0.001 for trend for all 5 regions. CR indicates Central rural; C/WU, Central/Western-urban; ER, Eastern-rural; EU, Eastern-urban; WR, Western-rural.
**Table. Bivariate Analysis of Characteristics Associated With Patients Receiving Early Aspirin**

| Characteristics                      | Total (%) (N=14,041) | Early Aspirin User (%) (N=12,260) | Early Aspirin Non-User (%) (N=1,781) | P Value |
|--------------------------------------|----------------------|----------------------------------|-------------------------------------|---------|
| Demographic                          |                      |                                  |                                     |         |
| Age, y                               |                      |                                  |                                     | <0.001  |
| <55                                  | 22.1                 | 23.0                             | 16.3                                |         |
| 55 to 64                             | 23.6                 | 24.0                             | 20.9                                |         |
| 65 to 74                             | 30.1                 | 29.9                             | 31.0                                |         |
| ≥75                                  | 24.2                 | 23.1                             | 31.8                                |         |
| Gender                               |                      |                                  |                                     | <0.001  |
| Male                                 | 69.9                 | 70.7                             | 64.4                                |         |
| Female                               | 30.1                 | 29.3                             | 35.7                                |         |
| Cardiac risk factors                 |                      |                                  |                                     |         |
| Prior hypertension                   | 49.5                 | 49.9                             | 46.8                                | 0.015   |
| Prior diabetes                       | 17.4                 | 17.3                             | 18.1                                | 0.388   |
| Current smoker                       | 34.7                 | 35.8                             | 27.3                                | <0.001  |
| Medical histories                    |                      |                                  |                                     |         |
| Ischemic stroke                      | 10.0                 | 9.7                              | 12.0                                | 0.003   |
| Myocardial infarction                | 10.8                 | 10.9                             | 10.3                                | 0.460   |
| Primary PCI                          | 1.9                  | 2.0                              | 1.3                                 | 0.059   |
| Clinical characteristics at admission|                      |                                  |                                     |         |
| Chest discomfort                     | 91.9                 | 93.5                             | 81.5                                | <0.001  |
| Cardiac arrest                       | 1.0                  | 0.8                              | 2.0                                 | <0.001  |
| Cardiogenic shock                    | 4.2                  | 4.0                              | 5.9                                 | <0.001  |
| Blood pressure mmHg                  |                      |                                  |                                     | 0.080   |
| SBP<180 and DBP<110                  | 91.6                 | 91.8                             | 90.6                                |         |
| SBP≥180 or DBP≥110                   | 8.4                  | 8.2                              | 9.4                                 |         |

**Table. Continued**

| Characteristics                      | Total (%) (N=14,041) | Early Aspirin User (%) (N=12,260) | Early Aspirin Non-User (%) (N=1,781) | P Value |
|--------------------------------------|----------------------|----------------------------------|-------------------------------------|---------|
| AMI type                             |                      |                                  |                                     | <0.001  |
| STEMI                                | 85.4                 | 86.1                             | 80.6                                |         |
| NSTEMI                               | 14.6                 | 13.9                             | 19.4                                |         |
| Reperfusion therapy                  |                      |                                  |                                     | 0.027   |
| No reperfusion                       | 69.3                 | 67.4                             | 82.5                                |         |
| Fibrinolytic therapy                 | 20.3                 | 21.4                             | 12.4                                |         |
| Primary PCI                          | 10.4                 | 11.2                             | 5.2                                 |         |
| Hospital characteristics             |                      |                                  |                                     |         |
| Teaching hospital                    | 80.8                 | 80.7                             | 75.5                                | <0.001  |
| PCI-capable hospital                 | 60.7                 | 62.2                             | 50.3                                | <0.001  |
| Economic geographic region           |                      |                                  |                                     | 0.915   |
| Eastern                              | 59.2                 | 58.6                             | 62.7                                |         |
| Center                               | 21.3                 | 21.5                             | 19.4                                |         |
| Western                              | 19.6                 | 19.8                             | 17.9                                |         |
| Urban/Rural                          |                      |                                  |                                     | <0.001  |
| Urban                                | 61.1                 | 62.3                             | 52.8                                |         |
| Rural                                | 38.9                 | 37.7                             | 47.2                                |         |
| Year                                 |                      |                                  |                                     | <0.001  |
| 2001                                 | 15.0                 | 13.6                             | 24.9                                |         |
| 2006                                 | 28.3                 | 28.1                             | 29.6                                |         |
| 2011                                 | 56.7                 | 58.3                             | 45.5                                |         |

AMI indicates acute myocardial infarction; DBP, diastolic blood pressure; NSTEMI, non ST-segment elevation myocardial infarction; PCI, percutaneous coronary intervention; SBP, systolic blood pressure; STEMI, ST-segment elevation myocardial infarction.
Figure 3. Trends of early aspirin therapy in rural and urban regions in 2001, 2006, and 2011 (hospitals with sample size <5 patients were excluded).
Figure 4. Factors associated with early use of aspirin in multivariable model (c-statistic 0.683). Variables in the final multivariable model are shown along the vertical axis. The strength of effect is shown along the horizontal axis with the vertical line demarking an odds ratio (OR) of 1 (OR=1, no association); estimates to the left (OR<1) indicates that patients with the characteristic have a lower likelihood of receiving aspirin than those without the characteristic, while those to the right (OR>1) indicates that patients with the characteristic have a higher likelihood of receiving aspirin than those without the characteristic. Each square and line represents the point estimate of the effect of that variable in the model, while the line shows the 95% CI. CI indicates confidence interval; NSTEMI, non-ST-segment elevation myocardial infarction; OR, odds ratio; PCI, percutaneous coronary intervention.

| Variables                      | OR(95% CI)         | Less likely to use aspirin | More likely to use aspirin |
|-------------------------------|--------------------|----------------------------|---------------------------|
| Year                          |                    |                            |                           |
| 2001                          | 1 [reference]      |                            |                           |
| 2006                          | 1.92 (1.44- 2.56)  |                            |                           |
| 2011                          | 2.74 (2.08- 3.62)  |                            |                           |
| Age                           |                    |                            |                           |
| <55                           | 1 [reference]      |                            |                           |
| 55-64                         | 0.87 (0.72- 1.06)  |                            |                           |
| 65-74                         | 0.83 (0.67- 1.03)  |                            |                           |
| ≥75                           | 0.66 (0.52- 0.83)  |                            |                           |
| Clinical characteristics at admission |              |                            |                           |
| Non-STEMI                     | 0.73 (0.63- 0.85)  |                            |                           |
| Chest discomfort              | 2.76 (2.32- 3.28)  |                            |                           |
| Cardiogenic shock             | 0.67 (0.52- 0.85)  |                            |                           |
| Reperfusion therapies         |                    |                            |                           |
| No reperfusion                | 1 [reference]      |                            |                           |
| Primary PCI                   | 1.76 (1.05- 2.94)  |                            |                           |
| Fibrinolytic therapy          | 1.96 (1.63- 2.35)  |                            |                           |
| Urban/Rural                   |                    |                            |                           |
| Rural                         | 0.68 (0.49- 0.93)  |                            |                           |
Conclusion

- In China, we found a marked improvement in early aspirin therapy among patients with AMI over the past decade. However, use remained suboptimal in certain patient groups and care settings.
- Despite generally good performance, even this treatment could benefit from a quality improvement focus.