Sex Differences in Clinical Profiles and Quality of Care Among Patients With ST-Segment Elevation Myocardial Infarction From 2001 to 2011: Insights From the China Patient-Centered Evaluative Assessment of Cardiac Events (PEACE)-Retrospective Study

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Background—China is experiencing a marked increase in ST-segment elevation myocardial infarction hospitalizations, with 30% occurring among women and higher risk of in-hospital death in relatively younger age groups (<70). Yet, little is known about sex differences in ST-segment elevation myocardial infarction presentation and management.

Methods and Results—In a nationally representative sample of patients with ST-segment elevation myocardial infarction admitted to 162 Chinese hospitals in 2001, 2006, and 2011, we examined sex differences in hospitalization rates, clinical profiles, and quality of care. Among 11,986 patients, the proportion of women was unchanged between 2001 and 2011. The estimated national rates of hospital admission per 100,000 people increased from 4.6 in 2001 to 18.0 in 2011 among men (3.9-fold increase) and from 1.9 to 8.0 among women (4.2-fold increase) (Ptrend<0.0001). The median age of women increased from 68 years in 2001 to 72 years in 2011 (P<0.001); however, there was no age change in men (63 years in 2011) (Ptrend=0.48). After accounting for age, women had a higher frequency of comorbidities. Although there were significant sex differences in the time interval of >12 hours between symptom onset and admission time in 2001, since 2006 delays in presentation were comparable between women and men. Fewer women without contraindications received evidence-based therapies than men, including reperfusion (57.5% versus 44.2%), early aspirin (88.8% versus 85.9%), and clopidogrel (56.9% versus 52.5%, P<0.001 for all) and the differences were largely unchanged over time.

Conclusions—Women experienced a higher increase in hospitalization rates for ST-segment elevation myocardial infarction in China between 2001 and 2011 and were less likely to receive evidence-based therapies, especially reperfusion. In addition to efforts to improve quality of care generally, understanding the reasons for this sex disparity and addressing these differences in care should be a priority.

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Abstract

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**Conclusions**- Women experienced a higher increase in hospitalization rates for ST-segment elevation myocardial infarction in China between 2001 and 2011 and were less likely to receive evidence-based therapies, especially reperfusion. In addition to efforts to improve quality of care generally, understanding the reasons for this sex disparity and addressing these differences in care should be a priority.
Figure 1. Age distribution of the study sample according to sex and year.
Figure 2. Temporal trends of age-adjusted results in sex differences in cardiovascular risk factors. LDL-C indicates low-density lipoprotein cholesterol; OR, odds ratio.
Figure 3. Temporal trends of age-adjusted results in sex differences in presenting characteristics. HR indicates heart rate; OR, odds ratio; SBP, systolic blood pressure.
Figure 4. Temporal trends of sex differences in reperfusion therapy among ideal candidates. A, Primary PCI. B, Fibrinolytic therapy. C, Any reperfusion. PCI indicates percutaneous coronary intervention.
### Table 1. Patient Characteristics According to Sex and Study Year

| Characteristic            | Men, %a |           |           | P for Trends | Women, %a |           |           | P for Trends |
|---------------------------|---------|-----------|-----------|--------------|-----------|-----------|-----------|--------------|
|                           | 2001 (n=1364) | 2006 (n=2541) | 2011 (n=4507) |              | 2001 (n=569) | 2006 (n=1040) | 2011 (n=1965) |              |
| Demographic               |         |           |           |              |           |           |           |              |
| Age, yb                   | 63 (53, 70) | 64 (54, 73) | 63 (53, 73) | 0.476        | 68 (62, 74) | 71 (65, 76) | 72 (64, 78) | <0.0001      |
| Cardiovascular risk factors|         |           |           |              |           |           |           |              |
| Hypertension              | 38.8    | 45.9      | 47.3      | <0.0001      | 47.8      | 53.4      | 60.6      | <0.0001      |
| Diabetes                  | 11      | 15.4      | 18.3      | <0.0001      | 21.1      | 25.8      | 26.9      | 0.010        |
| Current smoker            | 38.7    | 41.3      | 48        | <0.0001      | 6         | 9         | 11.9      | <0.0001      |
| Medical history           |         |           |           |              |           |           |           |              |
| Coronary heart disease    | 22.6    | 19.1      | 20.5      | 0.355        | 26.2      | 22.2      | 21.8      | 0.054        |
| Myocardial infarction     | 10.3    | 9.7       | 11.6      | 0.058        | 9.5       | 8.8       | 9.3       | 0.970        |
| PCI                       | 0.4     | 0.9       | 2.7       | <0.0001      | 0.9       | 0.9       | 1.5       | 0.138        |
| Stroke                    | 9.2     | 10.3      | 11.5      | 0.010        | 10        | 11.7      | 13.9      | 0.070        |
| Symptom onset to admission, hour |         |           |           |              |           |           |           |              |
| <6                        | 42.2    | 40.9      | 41.3      | 0.467        | 30.9      | 34.1      | 36.9      | 0.003        |
| 6 to 12 hours             | 8.9     | 9.6       | 10.5      | 0.027        | 10.7      | 12.5      | 11.3      | 0.921        |
| >12 hours                 | 48.9    | 49.5      | 48.1      | 0.430        | 58.3      | 53.4      | 51.7      | 0.008        |
| Clinical characteristics   |         |           |           |              |           |           |           |              |
| Chest discomfort           | 93.1    | 93.2      | 93.4      | 0.652        | 91.2      | 89.7      | 89.3      | 0.219        |
| Cardiogenic shock          | 3.4     | 5.5       | 6         | 0.0005       | 6.2       | 7.6       | 7.9       | 0.205        |
| Cardiac arrest             | 0.9     | 1.3       | 1.5       | 0.078        | 0.7       | 0.8       | 1.1       | 0.335        |
| Acute stroke               | 0.7     | 1.5       | 1         | 0.930        | 1.1       | 2.6       | 1.1       | 0.318        |
| Heart rate ≥100 bpm        | 15.7    | 14.8      | 11.6      | <0.0001      | 20.2      | 22.0      | 18.4      | 0.098        |
| SBP ≥140 mm Hgb            | 31.3    | 31.4      | 32.6      | 0.256        | 37.3      | 39.3      | 39.7      | 0.326        |
| Characteristic                  | Men, %a | Women, %a | P for Trends | Men, %a | Women, %a | P for Trends |
|--------------------------------|---------|-----------|--------------|---------|-----------|--------------|
|                               | 2001 (n=1364) | 2006 (n=2541) | 2011 (n=4507) | 2001 (n=569) | 2006 (n=1040) | 2011 (n=1965) |
| LDL-C level                   |         |           |              |         |           |              |
| <130                           | 35.2    | 55.8      | 67.6         | <0.0001 | 25.8      | 50.1         | 59.3         | <0.0001 |
| ≥130                           | 11.7    | 15.4      | 18.2         | <0.0001 | 12.8      | 18.5         | 22.4         | <0.0001 |
| Unrecorded                     | 53.2    | 28.7      | 14.2         | <0.0001 | 61.3      | 31.4         | 18.3         | <0.0001 |
| eGFR, mL/min per 1.73 m²b      |         |           |              |         |           |              |
|                               | 75.5 (60.0, 94.6) | 77.9 (61.7, 97.9) | 88.1 (68.9, 109.8) | <0.0001 | 63.7 (49.1, 81.9) | 66.4 (48.2, 84.2) | 76.1 (55.7, 100.1) | <0.0001 |
| Hospital characteristics      |         |           |              |         |           |              |
| Teaching hospital             | 85      | 80.6      | 80.1         | 0.0001  | 83.5      | 79.7         | 77.8         | 0.003   |
| PCI-capable hospital          | 32.8    | 55.1      | 72.9         | <0.0001 | 34.3      | 52.6         | 69           | <0.0001 |
| Hospital with CCU             | 81.1    | 76.3      | 79.4         | 0.952   | 78.6      | 77.4         | 78.6         | 0.791   |
| Economic–geographic region    |         |           |              |         |           |              |
| Central                       | 19.5    | 21        | 23.2         | <0.0001 | 16.9      | 17.9         | 22           | <0.0001 |
| Eastern                       | 65.7    | 58.4      | 54.7         | <0.0001 | 71.5      | 63.3         | 59.3         | <0.0001 |
| Western                       | 14.8    | 20.6      | 22.1         | <0.0001 | 11.6      | 18.8         | 18.7         | <0.0001 |
| Urban/rural                   |         |           |              |         |           |              |
| Urban                         | 63.9    | 60.6      | 63.4         | 0.586   | 64        | 60.9         | 57.9         | 0.006   |
| Rural                         | 36.1    | 39.4      | 36.6         |         | 36        | 39.1         | 42.1         |         |
Table 2. In-Hospital Treatments Among Ideal Patients According to Sex and Year

| Characteristic | Overall, N (%) | $P$ Value | Men, % | $P$ for Trends | Women, % | $P$ for Trends |
|---------------|---------------|-----------|--------|----------------|----------|----------------|
|               | Men | Women | 2001 | 2006 | 2011 | 2001 | 2006 | 2011 | 2001 | 2006 | 2011 |
| Acute medication |     |       |       |       |       |       |       |       |       |       |       |
| Aspirin ≤24 hours | 7023 (88.8) | 2765 (85.9) | <0.0001 | 81.1 | 87.7 | 91.8 | <0.0001 | 78.0 | 85.0 | 88.8 | <0.0001 |
| Clopidogrel ≤24 hours | 4454 (56.9) | 1679 (52.5) | <0.0001 | 1.4 | 44.3 | 80 | <0.0001 | 0.8 | 36.5 | 75.5 | <0.0001 |
| β-Blockers ≤24 hours | 2371 (56.8) | 770 (52.6) | 0.005 | 47.8 | 62.7 | 56.1 | 0.095 | 46.4 | 54.8 | 53.1 | 0.202 |
| ACE-inhibitor/ARB | 5073 (65.8) | 1994 (63.8) | 0.044 | 60.8 | 69.6 | 65.2 | 0.214 | 59.2 | 66.7 | 63.6 | 0.332 |
| Statin | 6180 (76.5) | 2476 (75.1) | 0.117 | 30.3 | 75.0 | 91.5 | <0.0001 | 27.8 | 72.6 | 90.4 | <0.0001 |
| Reperfusion therapyb |     |       |       |       |       |       |       |       |       |       |       |
| With reperfusion | 2289 (57.5) | 646 (44.2) | <0.0001 | 56.3 | 58.0 | 57.6 | 0.702 | 47.3 | 42.2 | 44.4 | 0.758 |
| Primary PCI | 757 (19.0) | 203 (13.9) | <0.0001 | 8.7 | 15.1 | 24.2 | <0.0001 | 8.4 | 8.9 | 17.7 | <0.0001 |
| Fibrinolytic therapy | 1535 (38.6) | 443 (30.3) | <0.0001 | 47.7 | 43.0 | 33.5 | <0.0001 | 38.9 | 33.3 | 26.8 | 0.0002 |
| Procedurec |     |       |       |       |       |       |       |       |       |       |       |
| Nonprimary PCI | 1117 (21.8) | 299 (14.3) | <0.0001 | 9.6 | 19.4 | 24.4 | <0.0001 | 5.6 | 10.2 | 17.1 | <0.0001 |
| Cardiac catheterization | 2414 (47.0) | 669 (31.9) | <0.0001 | 34.2 | 41.7 | 51.1 | <0.0001 | 26.2 | 25.0 | 35.5 | <0.0001 |

• ACE, angiotensin-converting enzyme; ARB, angiotensin II receptor blocker; PCI, percutaneous coronary intervention.
• a Only among patients without contraindications for the treatment.
• b During hospitalization.
• c Only among patients admitted into a hospital capable of PCI.
Conclusions

• In a large, nationally representative observational study in China, women hospitalized with STEMI were older, had greater delays in care seeking, more comorbidities, and worse disease severity than men. Moreover, women were less likely to be candidates for, and less likely to receive, evidence-based therapies as compared with men.

• These disparities have changed little over the past decade despite large-scale efforts to increase access and quality.

• These findings underscore the need for improved systems to ensure the prompt diagnosis and use of evidence-based treatments for women with STEMI, particularly with respect to reperfusion therapies.