












RESEARCH ARTICLE

Trends in Cardiac Biomarker Testing in China for Patients with Acute Myocardial Infarction, 2001 to 2011: China PEACE-Retrospective AMI Study

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 HKM and LJ are joint senior authors on this work. XL, SH, JAS, ZL, NRD, and JL also contributed equally to this work.

 Membership of the China PEACE Collaborative Group is provided in the Supporting Information.

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Abstract

Objectives- To describe trends in the availability of biomarker testing in Chinese hospitals and how practice complies with established standards for the diagnosis of acute myocardial infarction (AMI).

Background- Cardiac biomarker testing is standard in high-income countries, but little is known about the availability and use of cardiac biomarker testing in low- and middle-income countries (LMICs) such as China.

Methods- Based on a nationally representative sample of Chinese hospitals in 2001, 2006 and 2011, we describe the temporal trends and regional differences in the hospital capability and rates of use of cardiac biomarker testing, as well as the variation in use across hospitals with testing capability, for patients labeled with the diagnosis of AMI.

Results- We sampled 175 hospitals (162 participated in the study) and 18,631 AMI admissions. 14,370 patients were included in analysis of biomarker use. The proportion of hospitals with biomarker testing capability was 57.4% in 2001 (25.0% troponin and 32.4% creatine kinase MB fraction (CK-MB) only) and 96.3% (81.4% troponin and 14.9% CK-MB only) in 2011. The proportion of hospitals with troponin testing capability in 2011 was significantly higher in urban compared with rural hospitals (96.8% vs. 71.4%, $p < 0.001$). In 2011, only 55.9% of hospitals with troponin testing capability (71 out of 127 hospitals) used the assay for more than 80% of their patients with AMI. Among hospitals with either biomarker testing capability, there was marked variation in use in both rural (from 7.1% to 100.0% of patients) and urban hospitals (from 57.9% to 100.0% of patients). In 2011, 36.1% of the patients with AMI did not have troponin tested and 4.9% did not have either biomarker measured.

Conclusions- The recommended biomarker tests for AMI diagnosis are not universally available and the testing is not consistently applied when it is available in China.

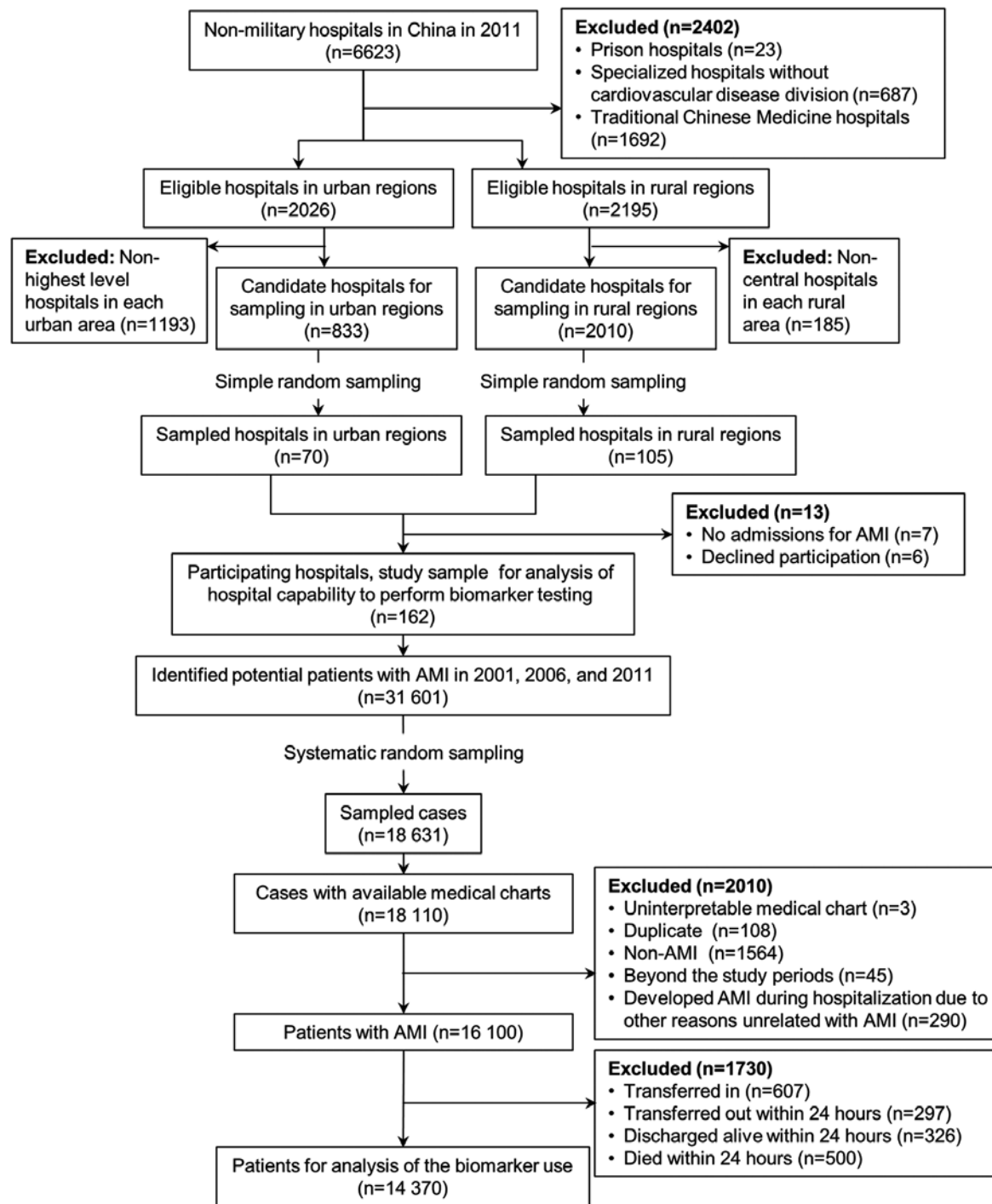


Figure 1. Hospital and patient sample. AMI = acute myocardial infarction.

Table 1. Hospitals characteristics (2011).

	Overall n (%) / median (IQR)	Rural hospitals n (%) / median (IQR)	Urban hospitals n (%) / median (IQR)	P value
Total No. 162				
Level of hospital				< 0.001
Secondary	97 (59.9%)	92 (92.9%)	5 (7.9%)	
Tertiary	65 (40.1%)	7 (7.1%)	58 (92.1%)	
Type of hospital				< 0.001
Teaching	93 (57.4%)	39 (39.4%)	54 (85.7%)	
CCU in hospital	94 (58.0%)	38 (38.4%)	56 (88.9%)	< 0.001
No. of beds in CCU, median (IQR)	7 (5,10)	4 (4,5)	7 (6,12)	0.001
No. of beds in CCU				
≤ 5	28 (17.3%)	20 (20.2%)	8 (12.7%)	
6–10	43 (26.5%)	15 (15.2%)	28 (44.4%)	
>10	23 (14.2%)	3 (3.0%)	20 (31.7%)	
No CCU	68 (42.0%)	61 (6.6%)	7 (11.1%)	
Cath lab in hospital	79 (48.8%)	24 (24.2%)	55 (87.3%)	< 0.001
No. of qualified cardiac interventionists	3 (2,5)	1 (0,3)	4 (3,6)	0.030
CABG be performed in hospital	33 (20.4%)	1 (.0%)	32 (50.8%)	< 0.001
Independent emergency department	151 (93.2%)	91(91.9%)	60 (95.2%)	0.413
Economic-geographic region				< 0.001
Central	48 (29.6%)	35 (35.4%)	13 (20.6%)	
Eastern	64 (39.5%)	32(32.3%)	32 (50.8%)	
Western	50 (30.9%)	32 (32.3%)	18 (28.6%)	
Routine diagnostic test of CK-MB for suspected ACS				0.211
No	10 (6.2%)	8 (8.1%)	2 (3.2%)	
Yes	148 (91.4%)	88 (88.9%)	60 (95.2%)	
Unknown	4 (2.5%)	3 (3.0%)	1 (1.6%)	
Average time delay in reporting results on CK-MB, hour	1 (1,2)	1 (1,2)	1 (1,2)	0.064
Routine diagnostic test of troponin for suspected ACS				0.009
No	31 (19.1%)	27 (27.3%)	4 (6.3%)	
Yes	128 (79.0%)	69 (69.7%)	59 (93.7%)	
Unknown	3 (1.9%)	3 (3.0%)	0	
Average time delay in reporting results on troponin, hour	1 (1,2)	1 (1,2)	1 (1,2)	

ACS = acute coronary syndrome; CABG = coronary artery bypass grafting; Cath lab = catheterization lab; CCU = Coronary Care Unit; CK-MB = creatine kinase MB fraction; IQR = interquartile range

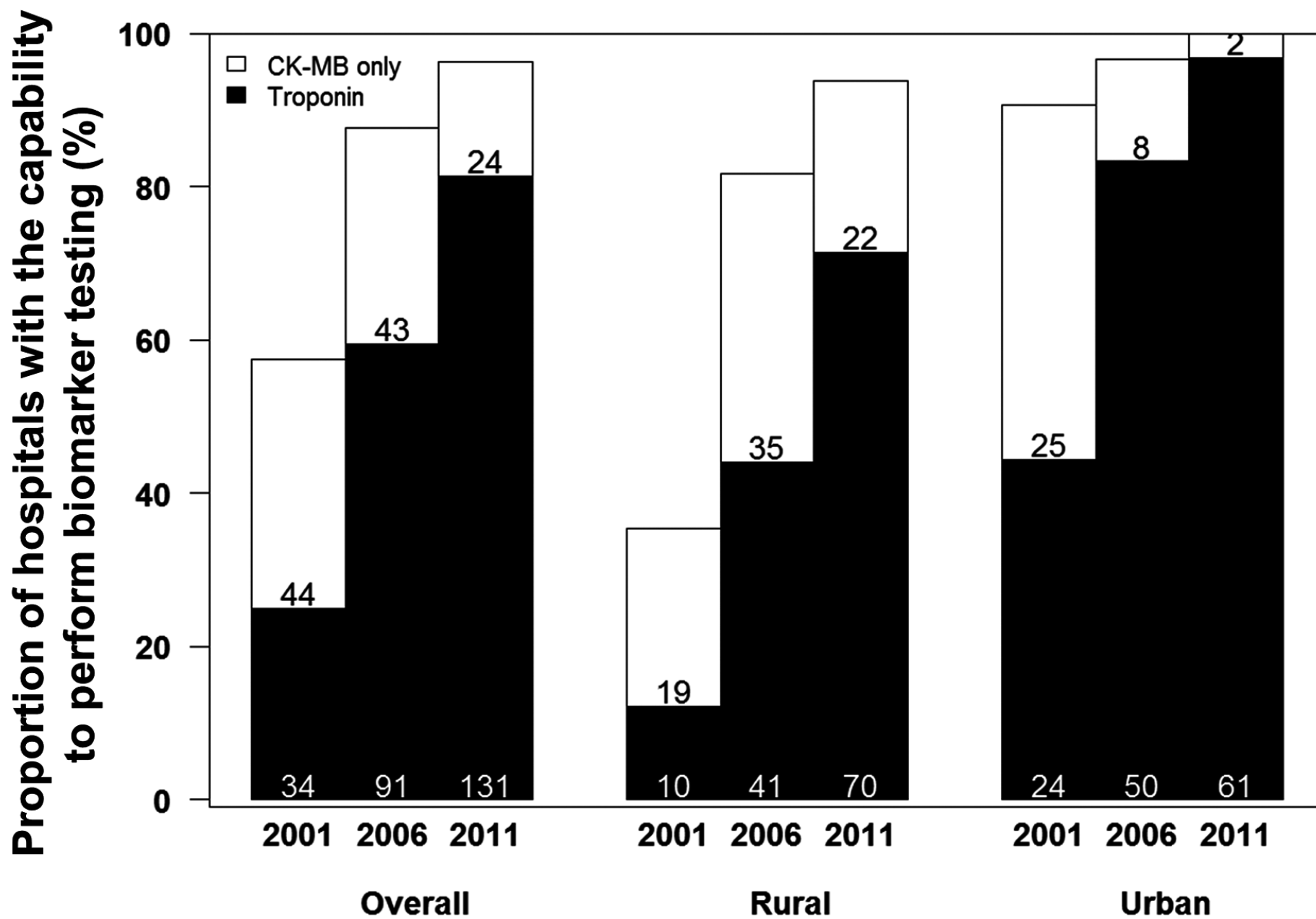


Figure 2. Temporal trends in proportion of hospitals with the capability to perform biomarker testing (n = 162). CK-MB = creatine kinase MB fraction.

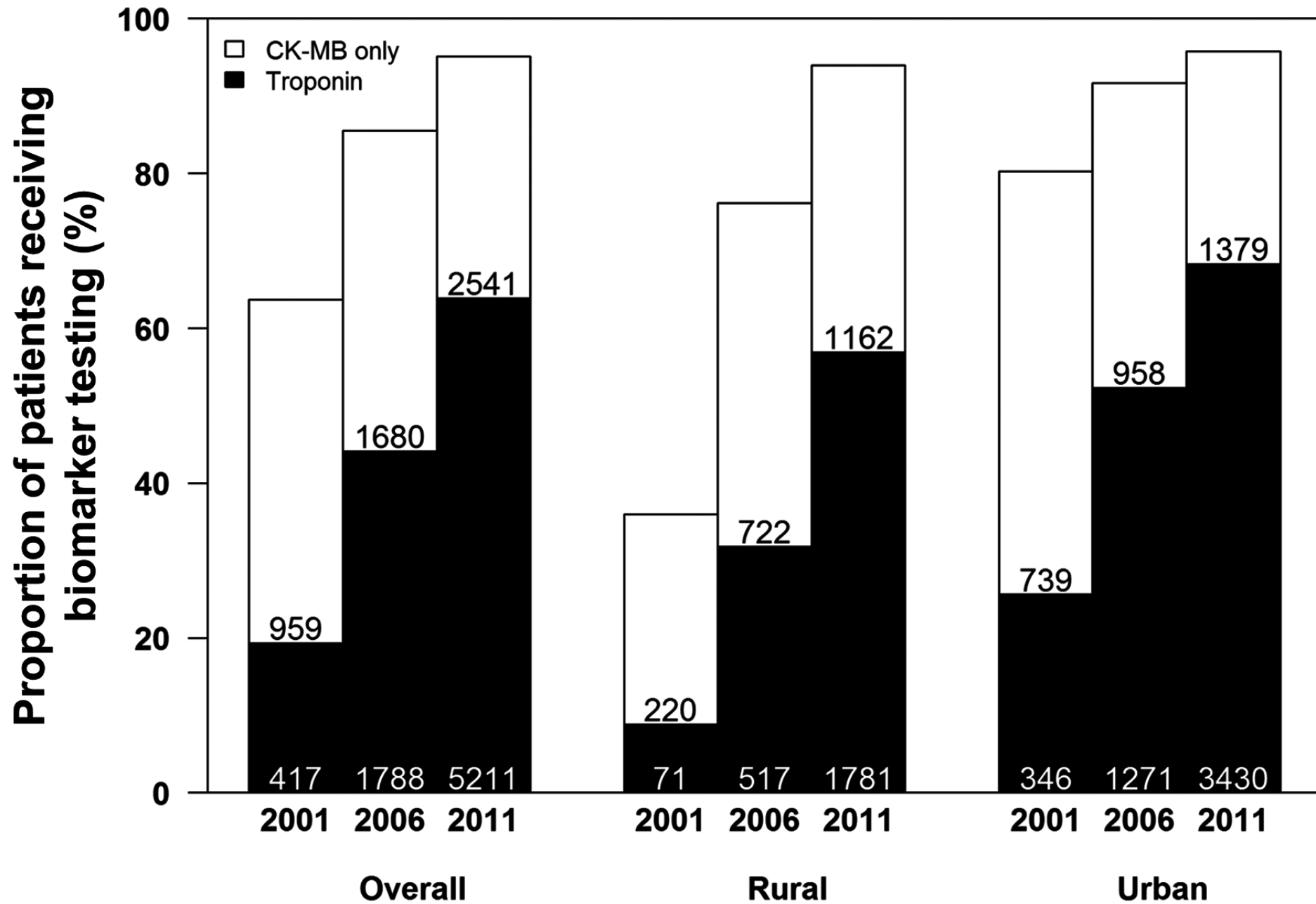


Figure 3. Temporal trends in proportion of patients receiving cardiac biomarker testing.

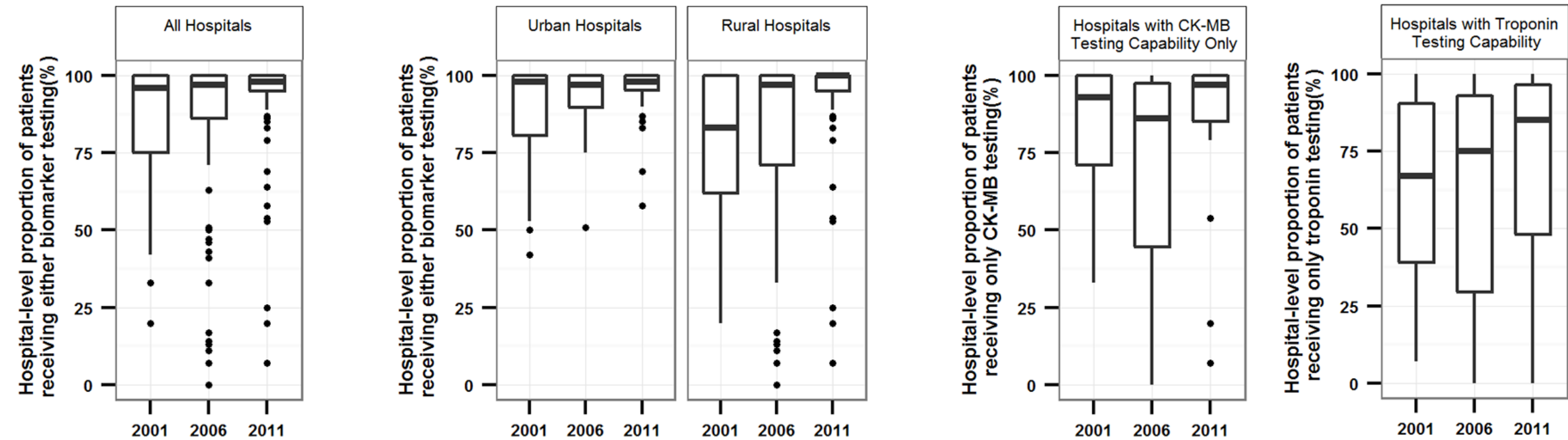


Figure 4. Hospital-level proportions of patients receiving biomarker testing among hospitals with testing capability. In all hospitals (A), by rural and urban location (B) and by the biomarker tests available (C).

Conclusions

- This nationally representative observational study demonstrated that the hospital capability to perform biomarker testing in China increased significantly over the last decade. However, many rural hospitals still do not have the capability to measure biomarkers, especially troponin, which is considered the international standard for AMI diagnosis.
- These findings signal a need for work to determine the best approaches to diagnosis in resource-poor settings, with full consideration of the costs and benefits of testing.