National assessment of early β-blocker therapy in patients with acute myocardial infarction in China, 2001-2011: The China Patient-centered Evaluative Assessment of Cardiac Events (PEACE)–Retrospective AMI Study

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Background Since 2007, clinical practice guidelines have recommended β-blocker therapy early in the course of acute myocardial infarction (AMI) for patients who are not at high risk for complications. Our objective was to perform a national quality assessment of early β-blocker use during hospitalization for AMI over the past decade in China.

Methods We conducted medical record review of a nationally representative sample of patients admitted to Chinese hospitals with AMI and studied those without absolute contraindications to β-blocker therapy in 2001, 2006, and 2011. We evaluated the use, type, and dose of β-blockers within the first 24 hours of admission over time and identified predictors of not using this treatment both in ideal candidates and in those with risk factors for cardiogenic shock.

Results Among 14,241 patients with AMI (representing 43,165 patients in 2001, 106,167 patients in 2006, and 221,874 patients in 2011 in China, respectively), 45.1% had no contraindications to early β-blocker therapy; 21.1% had risk factors for cardiogenic shock but no absolute contraindication. β-blocker use in ideal patients was 54.3% in 2001, 67.8% in 2006, and 61.8% in 2011 ($P = .28$ for trend). Predictors of nontreatment were older age, lower systolic blood pressure, lower heart rate, absence of chest discomfort, and admission to a nonteaching hospital. Use in patients with risk factors for cardiogenic shock was 42.6% in 2001, 59.5% in 2006, and 52.9% in 2011 ($P = .31$ for trend). Metoprolol was used most frequently (91.5%), but dosages were often below those recommended in guidelines.

Conclusions The use of early β-blocker therapy for patients with AMI in China is suboptimal, with underuse in patients who could benefit and substantial use among those who might be harmed. Patterns of use have not changed over time, thus creating an important target of efforts to improve quality of care for AMI. (Am Heart J 2015;170:506-515.e1.)

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Early administration of β-blockers in patients with acute myocardial infarction (AMI) has the potential to reduce mortality,[1-3] but indiscriminate use, especially in patients at high risk for cardiogenic shock, could be harmful.[4] The ClOpidogrel and Metoprolol in Myocardial Infarction Trial (COMMIT), published in 2005, showed that early β-blocker therapy for patients with AMI significantly reduced the risk of reinfarction and ventricular fibrillation, but this benefit was counterbalanced by an increased risk of cardiogenic shock among patients with risk factors such as advanced age or evidence of hemodynamic instability.[4] In 2007, the American College of Cardiology and the American Heart Association tempered their broad endorsement of early β-blocker use for patients with AMI, retaining a recommendation

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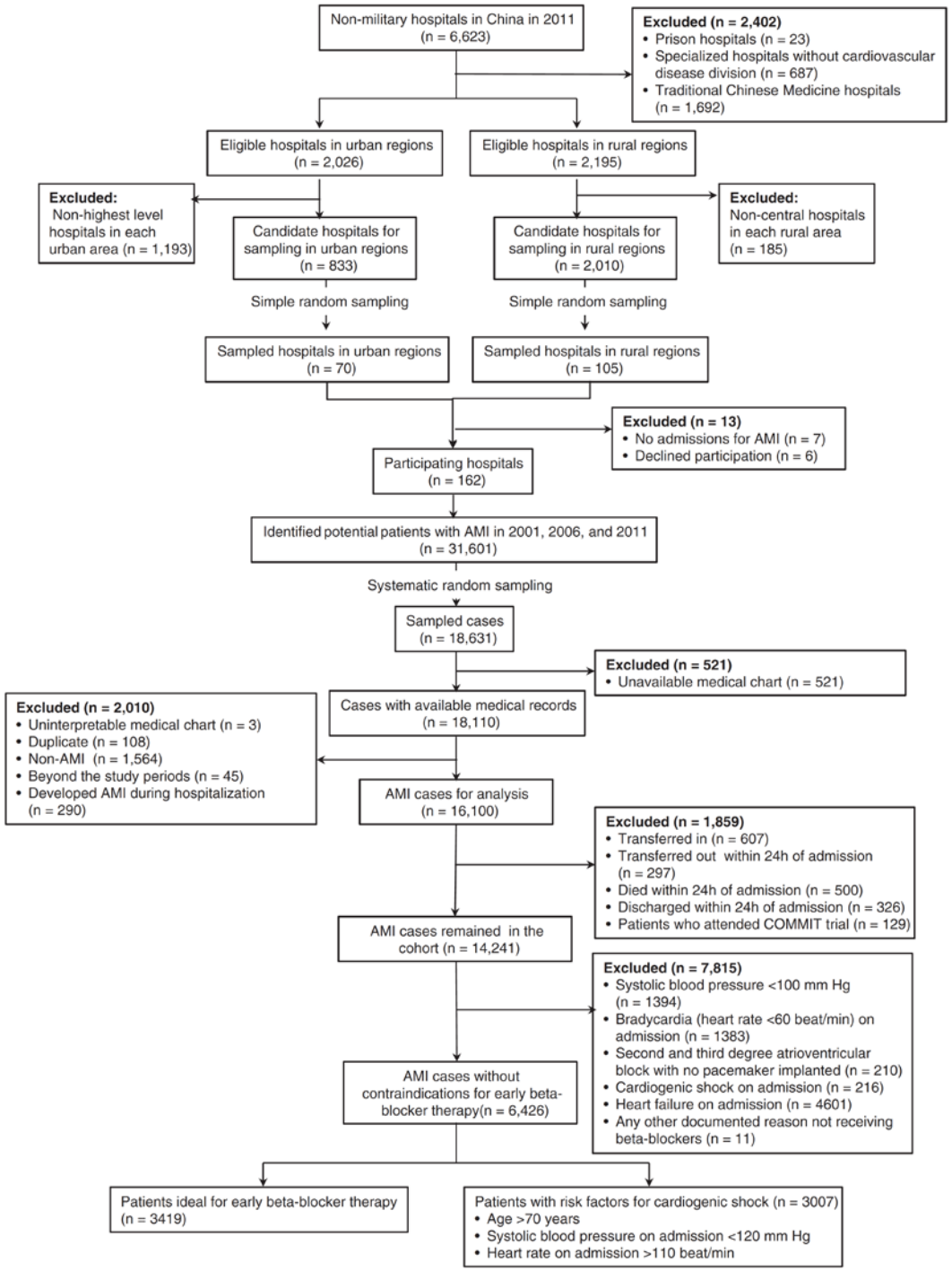

Figure 1. Flowchart of the random sampling and study cohorts.

Table 1. Characteristics of patients ideal for β-blockers and patients with at least 1 risk factor for shock

Characteristics	Patients ideal for early BB			Patients with at least 1 risk factor for shock		
	No. (%) of patients receiving early BB	No. (%) of patients not receiving early BB	*P*	No. (%) of patients receiving early BB	No. (%) of patients not receiving early BB	*P*
All patients	2161 (63.2)	1258 (36.8)		1638 (54.5)	1369 (45.5)	
Demographic			<.001			.09
Age <60 y	1301 (60.2)	672 (53.4)		427 (26.1)	318 (23.2)	
Age 60-70 y	860 (39.8)	586 (46.6)		254 (15.5)	244 (17.8)	
Age >70 y	–	–		957 (58.4)	807 (58.9)	
Male	1712 (79.2)	961 (76.4)	.05	1126 (68.7)	904 (66.0)	.11
Cardiovascular risk factors						
Prior hypertension	1198 (55.4)	593 (47.1)	<.001	751 (45.8)	561 (41.0)	.007
Prior diabetes	337 (15.6)	198 (15.7)	.91	277 (16.9)	177 (12.9)	.002
Current smoker	960 (44.4)	530 (42.1)	.19	539 (32.9)	407 (29.7)	.06
Medical histories						
Ischemic stroke	157 (7.3)	88 (7.0)	.77	162 (9.9)	136 (9.9)	.97
Chronic lung diseases	23 (1.1)	21 (1.7)	.13	42 (2.6)	58 (4.2)	.01
Myocardial infarction	168 (7.8)	91 (7.2)	.56	188 (11.5)	119 (8.7)	.01
Clinical characteristics at admission						
Chest discomfort	2084 (96.4)	1172 (93.2)	<.001	1545 (94.3)	1203 (87.9)	<.001
HR (beats/min)			<.001			<.001
60-79	1081 (50.0)	773 (61.4)		791 (48.3)	817 (59.7)	
80-99	901 (41.7)	404 (32.1)		617 (37.7)	411 (30.0)	
100-110	179 (8.3)	81 (6.4)		125 (7.6)	82 (6.0)	
>110				105 (6.4)	59 (4.3)	
SBP (mm Hg)			<.001			<.001
100-119				818 (49.9)	765 (55.9)	
120-139	970 (44.9)	642 (51.0)		318 (19.4)	283 (20.7)	
≥140	1191 (55.1)	616 (49.0)		502 (30.6)	321 (23.4)	

Table 1. Continued

Characteristics	Patients ideal for early BB			Patients with at least 1 risk factor for shock		
	No. (%) of patients receiving early BB	No. (%) of patients not receiving early BB	*P*	No. (%) of patients receiving early BB	No. (%) of patients not receiving early BB	*P*
MI type			.15			.009
STEMI	1868 (86.4)	1109 (88.2)		1437 (87.7)	1156 (84.4)	
NSTEMI	293 (13.6)	149 (11.8)		201 (12.3)	213 (15.6)	
Hospital characteristics						
Teaching hospital	1775 (82.1)	958 (76.2)	<.001	1292 (78.9)	1066 (77.9)	.50
PCI-capable hospital	1410 (65.2)	725 (57.6)	<.001	1023 (62.5)	832 (60.8)	.35
Economic-geographic region			.13			.13
Eastern	1267 (58.6)	775 (61.6)		937 (57.2)	816 (59.6)	
Central	447 (20.7)	256 (20.3)		354 (21.6)	255 (18.6)	
Western	447 (20.7)	227 (18.0)		347 (21.2)	298 (21.8)	
Rural/Urban			.03			.81
Rural	802 (37.1)	513 (40.8)		650 (39.7)	549 (40.1)	
Urban	1359 (62.9)	745 (59.2)		988 (60.3)	820 (59.9)	
Year			<.001			<.001
2001	288 (13.3)	253 (20.1)		154 (9.4)	215 (15.7)	
2006	634 (29.3)	304 (24.2)		520 (31.7)	343 (25.1)	
2011	1239 (57.3)	701 (55.7)		964 (58.9)	811 (59.2)	

Abbreviations: BB, β-blocker; STEMI, ST-elevation myocardial infarction; NSTEMI, non–ST-elevation myocardial infarction.

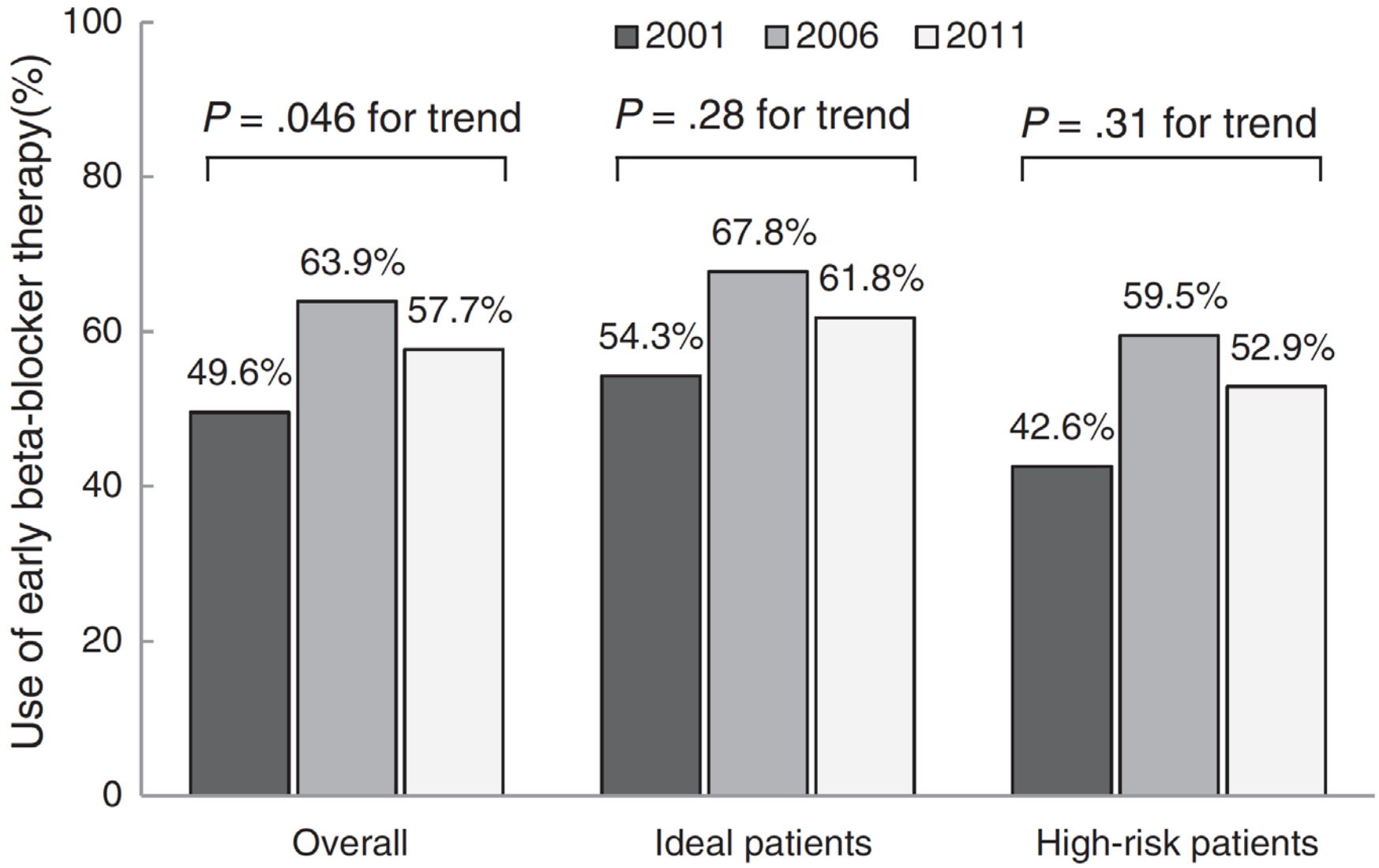

Figure 2. Temporal trends in early β-blocker use (weighted) in overall patients with AMI (n = 6426), ideal patients (n = 3419), and high-risk patients (n = 3007), 2001 to 2011.

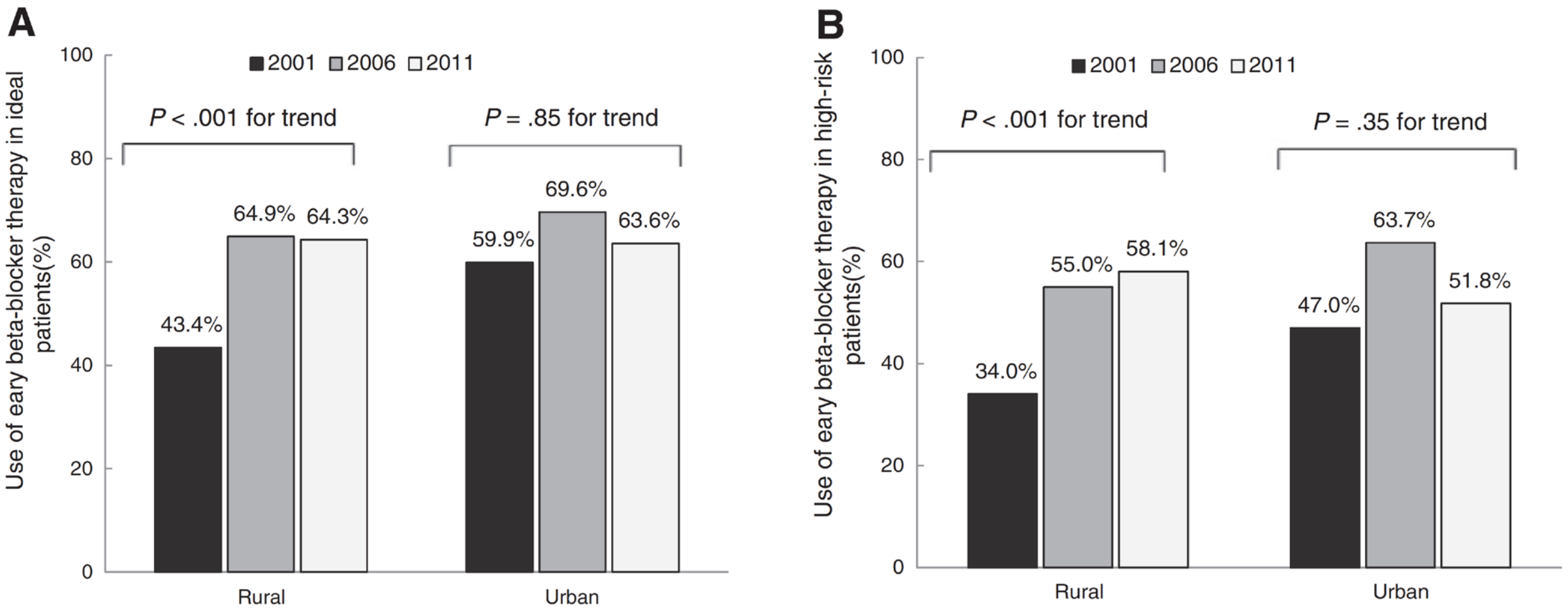

Figure 3. Temporal trends in early β-blocker use (unweighted) in ideal patients (A) and high-risk patients (B) in strata of rural and urban hospitals, 2001 to 2011.

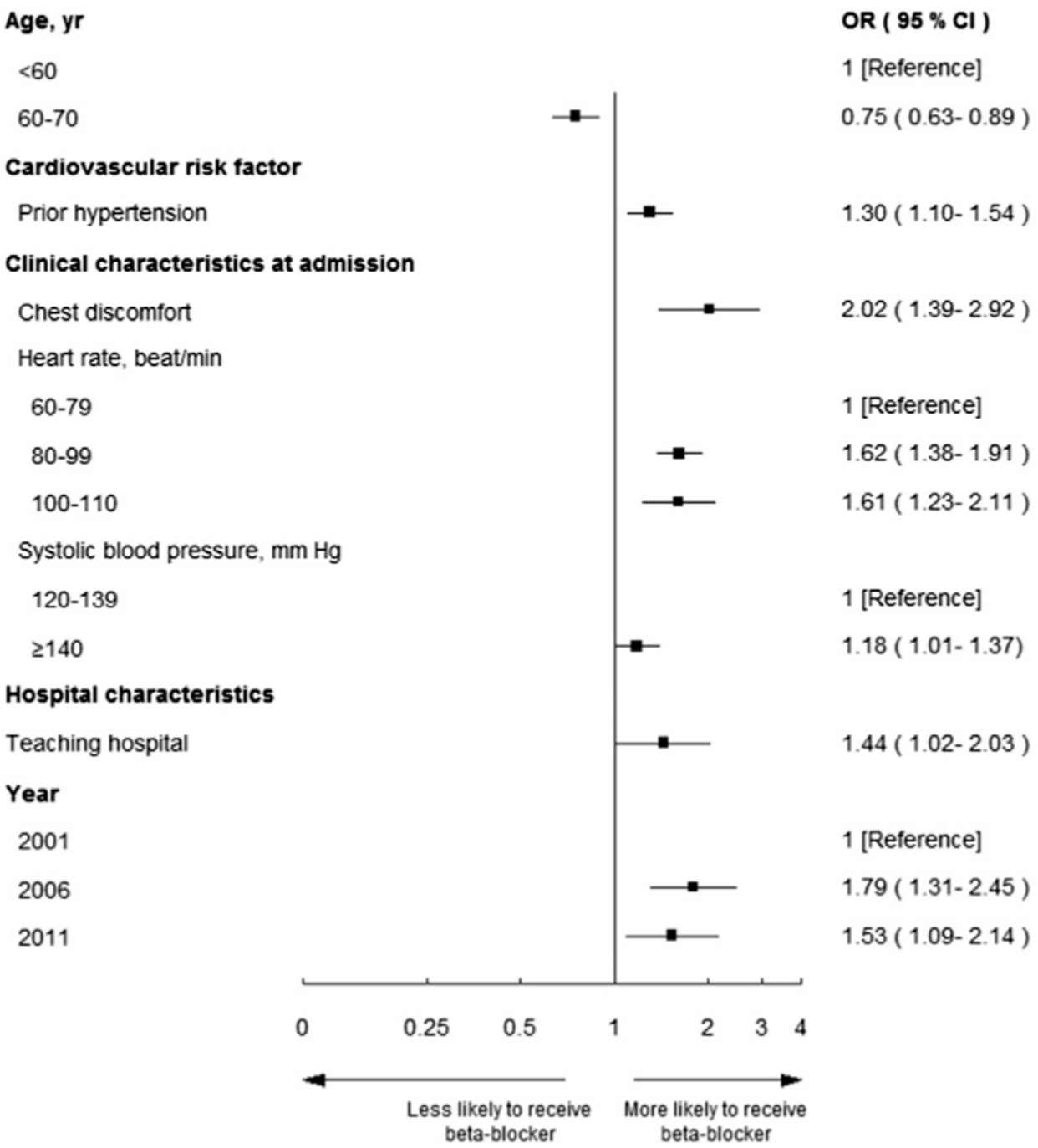

Figure 4. Factors associated with early β-blocker use in the ideal cohort (n = 3,419). Variables having a significant association with early β-blocker use are shown along the vertical axis. The strength of effect is shown along the horizontal axis, with the vertical line demarking an OR of 1 (i.e., no association); estimates to the right (i.e., N1) are associated with greater likelihood of early β-blocker use, whereas those to the left (i.e., b1) indicate association with reduced likelihood of early β-blocker use. Each square represents the point estimate of the effect of that variable in the model, whereas the line shows the 95% CI.

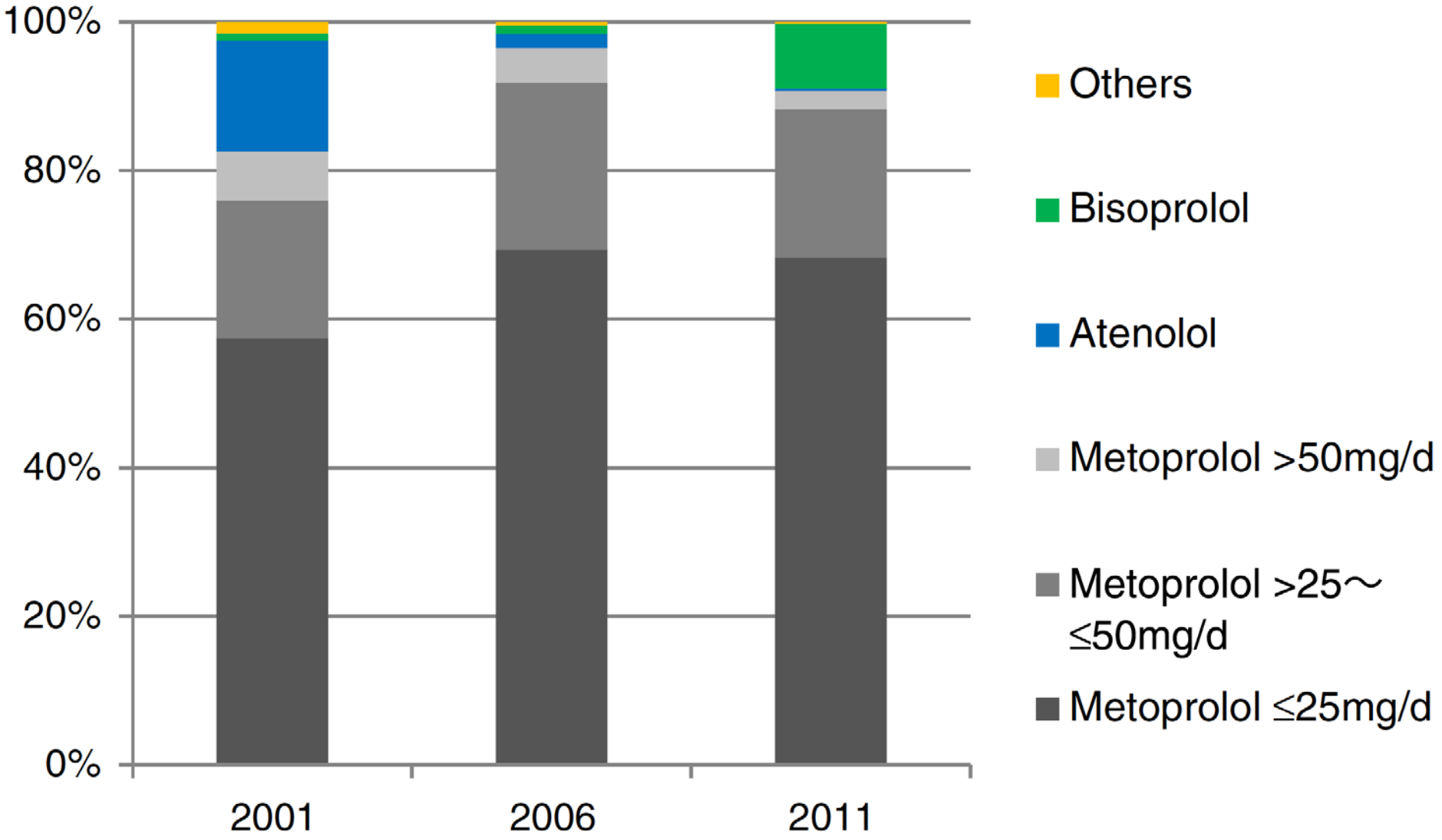

Figure 5. Type and dosage of oral β-blockers. Dosage distribution of metoprolol in each year is shown as the cumulative oral dose administered within the first 24 hours of admission. The numbers of patients using atenolol, bisoprolol, or other β-blockers was small, and thus, only the proportions of total use are shown. Others included propranolol, carvedilol, and arotinolol.

Conclusions

- Our study found that over the last decade in China, β-blocker therapy within the first 24 hours of admission for AMI was significantly underused and under dosed among ideal patients and commonly used in patients at high risk for cardiogenic shock.
- Our findings highlight the need for better translation of complex evidence into clinical practice and the need to improve care for patients with AMI.