

Supplementary Materials

Table S1. Disease diagnostic coding and ATC code for medication

Disease/Comorbidity	ICD-9-CM/ATC
MI	410
STEMI	410.0, 410.1, 410.2, 410.3, 410.4, 410.5, 410.6, 410.8
NSTEMI	410.7, 410.9
HF	428
DM	250
HTN	401–402
Dyslipidemia	272
CVD	430–438
AF	427.31
Cancer	140–239
COPD	491, 492, 494, 496
Asthma	493
Dementia	290–294
Parkinsonism	332
OA	715
RA	714
Rheumatism	729
Bleeding	535.01, 535.11, 535.21, 535.31, 535.41, 535.51, 535.61, 537.83, 562.02, 562.03, 562.12, 562.13, 569.3, 569.85, 578.0, 578.1, 578.9, 430, 431, 432, 432.0, 432.1, 432.9, 767.0, 852–852.5, 853–853.1
CRD	582, 583–583.7, 585, 586, 587, 588
Medications	
ACEI/ARB	C09AA, C09BA, C09BB, C09CA, C09DA, C09DB, C09DX
ARNI	C09DX04
Beta-blocker	C07AA, C07AB, C07AG
Ivabradine	C01EB17
Nitrate	C01DA, C01DX
Aspirin	B01AC06
P2Y ₁₂ inhibitors	B01AC04 (Clopidogrel), B01AC22 (Prasugrel), B01AC24 (Ticagrelor)
Statin	C10AA
PPI	A02BC
Steroid	H02, R03BA
NSAID	M01A, M02A, N02BA
OAC	Warfarin (B01AA03), Rivaroxaban (B01AF01), Apixaban (B01AF02), Dabigatran (B01AE07), Edoxaban (B01AF03)

Abbreviations: ACEI = angiotensin-converting enzyme inhibitor; AF = atrial fibrillation; ARB = angiotensin II receptor blocker; ARNI = angiotensin receptor/neprilysin inhibitor; ATC = anatomical therapeutic chemical; COPD = chronic obstructive pulmonary disease; CRD = chronic renal disease; CVD = cerebrovascular disease; DM = diabetes mellitus; HTN = hypertension; ICD-9-CM = International Classification of Diseases, Ninth Revision, Clinical Modification; MI = myocardial infarction; NSAID = nonsteroidal anti-inflammatory drug; NSTEMI = non-ST-elevation myocardial infarction; OA = osteoarthritis; OAC = oral anticoagulant; PPI = proton pump inhibitor; RA = rheumatoid arthritis; STEMI = ST-elevation myocardial infarction.

Table S2. The rates of CICR and the risk of stent-associated HHF between different NG-DESs categorized by coated drugs.

NG-DESs / Follow-ups	1-year	2-year	3-year	4-year	5-year	Adjusted SHR (95% CI)	<i>p</i>
SES	5.09%	6.98%	8.20%	9.42%	11.3%	Reference	-
EES	3.41%	4.70%	5.53%	6.36%	7.66%	0.66 (0.43 – 1.02)	0.06
BES	3.65%	5.02%	5.91%	6.80%	8.18%	0.71 (0.46 – 1.11)	0.13
ZES	3.93%	5.41%	6.36%	7.31%	8.80%	0.77 (0.51 – 1.16)	0.21

Abbreviation: BES = biolimus-eluting stent; CI = confidence interval; CICR = cumulative incidence competing risk; EES = everolimus-eluting stent; HHF = hospitalization for heart failure; NG-DES = new-generation drug-eluting stent; SES = sirolimus-eluting stent; SHR = subdistribution hazard ratio; ZES = zotarolimus-eluting stent.

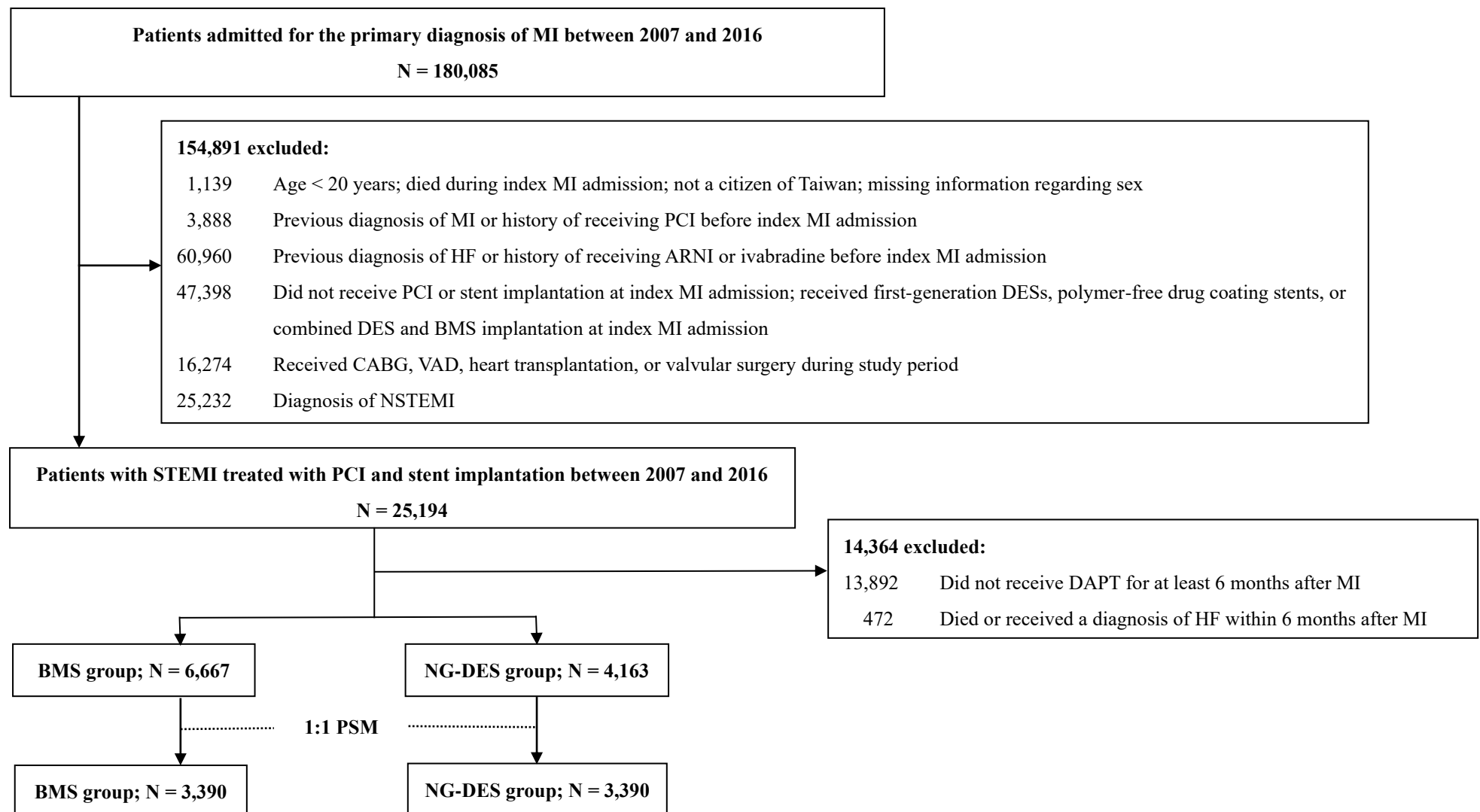


Figure S1. Selection process of patients with STEMI who received DAPT for an undefined duration of longer than 6 months following stent implantation. Abbreviations: ARNI = angiotensin receptor/neprilysin inhibitor; BMS = bare-metal stent; CABG = coronary artery bypass graft; DAPT = dual antiplatelet therapy; DES = drug-eluting stent; HF = heart failure; MI = myocardial infarction; NG-DES = new-generation drug-eluting stent; NSTEMI = non-ST-elevation myocardial infarction; PCI = percutaneous coronary intervention; PSM = propensity score matching; STEMI = ST-elevation myocardial infarction; VAD = ventricular assist device.

Table S3. Baseline characteristics of patients with STEMI who received DAPT for an undefined duration of longer than 6 months following stent implantation.

	Before PSM					After PSM				
	NG-DES		BMS		SMD*	NG-DES		BMS		SMD*
	n	(%)	n	(%)		n	(%)	n	(%)	
N (%)	4,163		6,667			3,390		3,390		
Age, mean (SD)	58.1 (11.8)		58.6 (12.6)			58.1 (11.5)		58.1 (11.5)		
Age group, n (%)										
20–44	518	(12.4)	845	(12.7)	0.007	404	(11.9)	407	(12.0)	0.003
45–64	2,491	(59.8)	3,807	(57.1)	0.056	2,051	(60.5)	2,037	(60.1)	0.008
65–74	739	(17.8)	1,149	(17.2)	0.014	618	(18.2)	634	(18.7)	0.012
≥75	415	(10.0)	866	(13.0)	0.095	317	(9.4)	312	(9.2)	0.005
Male (%)	3,651	(87.7)	5,766	(86.5)	0.036	3,039	(89.6)	3,039	(89.6)	<0.001
Clinical data of index PCI										
Diagnostic year										
2007–2010	446	(10.7)	2,291	(34.4)	0.590	428	(12.6)	428	(12.6)	<0.001
2011–2013	1,345	(32.3)	2,294	(34.4)	0.045	1,236	(36.5)	1,236	(36.5)	<0.001
2014–2016	2,372	(57.0)	2,082	(31.2)	0.537	1,726	(50.9)	1,726	(50.9)	<0.001
Multivessel PCI	454	(10.9)	579	(8.7)	0.075	318	(9.4)	258	(7.6)	0.064
Number of stents, mean (SD)	1.23 (0.54)		1.29 (0.58)			1.24 (0.54)		1.25 (0.54)		
IABP use, yes, n (%)	190	(4.6)	561	(8.4)	0.157	169	(5.0)	163	(4.8)	0.008
Comorbidity										
DM	1,153	(27.7)	1,988	(29.8)	0.047	947	(27.9)	974	(28.7)	0.018
HTN	2,197	(52.8)	3,444	(51.7)	0.034	1,758	(51.9)	1,737	(51.2)	0.012
Dyslipidemia	2,241	(53.8)	3,268	(49.0)	0.096	1,810	(53.4)	1,776	(52.4)	0.020
CVD	164	(3.9)	373	(5.6)	0.078	139	(4.1)	140	(4.1)	0.001
AF	116	(2.8)	200	(3.0)	0.013	92	(2.7)	91	(2.7)	0.002
COPD/Asthma	156	(3.7)	297	(4.5)	0.036	132	(3.9)	128	(3.8)	0.006
Dementia/Parkinsonism	37	(0.9)	86	(1.3)	0.039	30	(0.9)	34	(1.0)	0.012
OA/RA/Rheumatism	370	(8.9)	674	(10.1)	0.042	309	(9.1)	316	(9.3)	0.007
CHA ₂ DS ₂ -VASc score										
≥2	3,037	(73.0)	4,952	(74.3)	0.030	2,436	(71.9)	2,468	(72.8)	0.021
0–1	1,126	(27.0)	1,715	(25.7)	0.030	954	(28.1)	922	(27.2)	0.021
Medication use										
ACEI/ARB	3,390	(81.4)	5,402	(81.0)	0.010	2,760	(81.4)	2,755	(81.3)	0.004
Beta-blockers	3,270	(78.5)	4,827	(72.4)	0.143	2,609	(77.0)	2,605	(76.8)	0.003
Nitrates	3,826	(91.9)	6,104	(91.6)	0.013	3,112	(91.8)	3,078	(90.8)	0.036
Aspirin	4,163	(100.0)	6,667	(100.0)	<0.001	3,390	(100.0)	3,390	(100.0)	<0.001
P2Y ₁₂ inhibitors	4,163	(100.0)	6,667	(100.0)	<0.001	3,390	(100.0)	3,390	(100.0)	<0.001
Statins	3,664	(88.0)	5,289	(79.3)	0.237	2,951	(87.1)	2,969	(87.6)	0.016
PPIs	404	(9.7)	706	(10.6)	0.029	315	(9.3)	331	(9.8)	0.016
Steroids	345	(8.3)	736	(11.0)	0.093	296	(8.7)	300	(8.8)	0.004
NSAIDs	1,124	(27.0)	2,314	(34.7)	0.167	987	(29.1)	911	(26.9)	0.050
ORBIT score										
≥3	62	(1.5)	178	(2.7)	0.083	49	(1.4)	50	(1.5)	0.002
0–2	4,101	(98.5)	6,489	(97.3)	0.083	3,341	(98.6)	3,340	(98.5)	0.002
ARC criteria of bleeding risk										
Major criteria										
Malignancy	112	(2.7)	129	(1.9)	0.050	66	(1.9)	70	(2.1)	0.008
Long-term use of anticoagulants	42	(1.0)	100	(1.5)	0.044	34	(1.0)	35	(1.0)	0.003
End-stage CKD	10	(0.2)	11	(0.2)	0.017	8	(0.2)	4	(0.1)	0.028
ICH	18	(0.4)	43	(0.6)	0.029	17	(0.5)	19	(0.6)	0.008
Minor criteria										
Age ≥75	415	(10.0)	866	(13.0)	0.095	317	(9.4)	312	(9.2)	0.005
Ischemic stroke	82	(2.0)	201	(3.0)	0.067	67	(2.0)	68	(2.0)	0.002

Bleeding events requiring hospitalization or transfusion	33	(0.8)	107	(1.6)	0.075	28	(0.8)	41	(1.2)	0.038
DAPT at discharge of index MI										
Aspirin	4,163	(100.0)	6,667	(100.0)	<0.001	3,390	(100.0)	3,390	(100.0)	<0.001
P2Y ₁₂ inhibitors	4,163	(100.0)	6,667	(100.0)	<0.001	3,390	(100.0)	3,390	(100.0)	<0.001

Abbreviations: ACEI = angiotensin-converting enzyme inhibitor; ARB = angiotensin II receptor blocker; ARC = Academic Research Consortium; AF = atrial fibrillation; BMS = bare-metal stent; CHA₂DS₂-VASc score = congestive heart failure, hypertension, age ≥ 75 years, diabetes, stroke/transient ischemic attack, vascular disease, age 65 to 74 years, female sex; CKD = chronic kidney disease; COPD = chronic obstructive pulmonary disease; CVD = cerebrovascular disease; DES = drug-eluting stent; DM = diabetes mellitus; HTN = hypertension; IABP = intra-aortic balloon pump; ICH = intracranial hemorrhage; NG-DES = newer-generation drug-eluting stent; NSAIDs = nonsteroidal anti-inflammatory drugs; OA = osteoarthritis; OACs = oral anticoagulants; ORBIT score = age ≥ 75 years, bleeding history, chronic kidney disease, treatment with antiplatelet; PCI = percutaneous coronary intervention; PPIs = proton pump inhibitors; PSM = propensity score matching; RA = rheumatoid arthritis; SD = standard deviation; SMD = standardized mean difference; STEMI = ST-elevation myocardial infarction;

*SMD = difference in means or proportions divided by standard error and imbalance defined as an absolute value greater than 0.1.

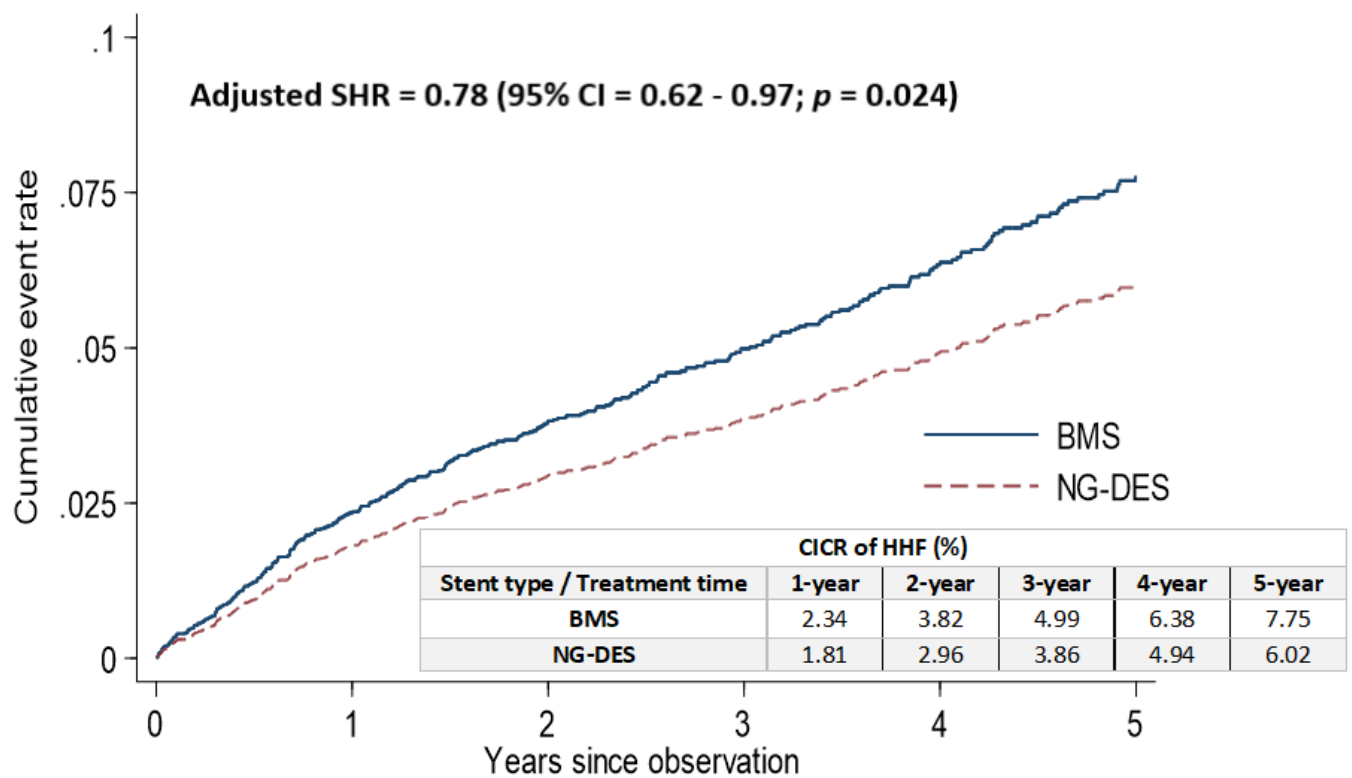


Figure S2. Cumulative incidence of HHF for competing risk among patients with STEMI who received DAPT for an undefined duration of longer than 6 months following stent implantation.

Abbreviations: BMS = bare-metal stent; CI = confidence interval; CICR = cumulative incidence for competing risk; DAPT = dual antiplatelet therapy; HHF = hospitalization for heart failure; NG-DES = new-generation drug-eluting stent; STEMI = ST-elevation myocardial infarction; SHR = subdistribution hazard ratio.

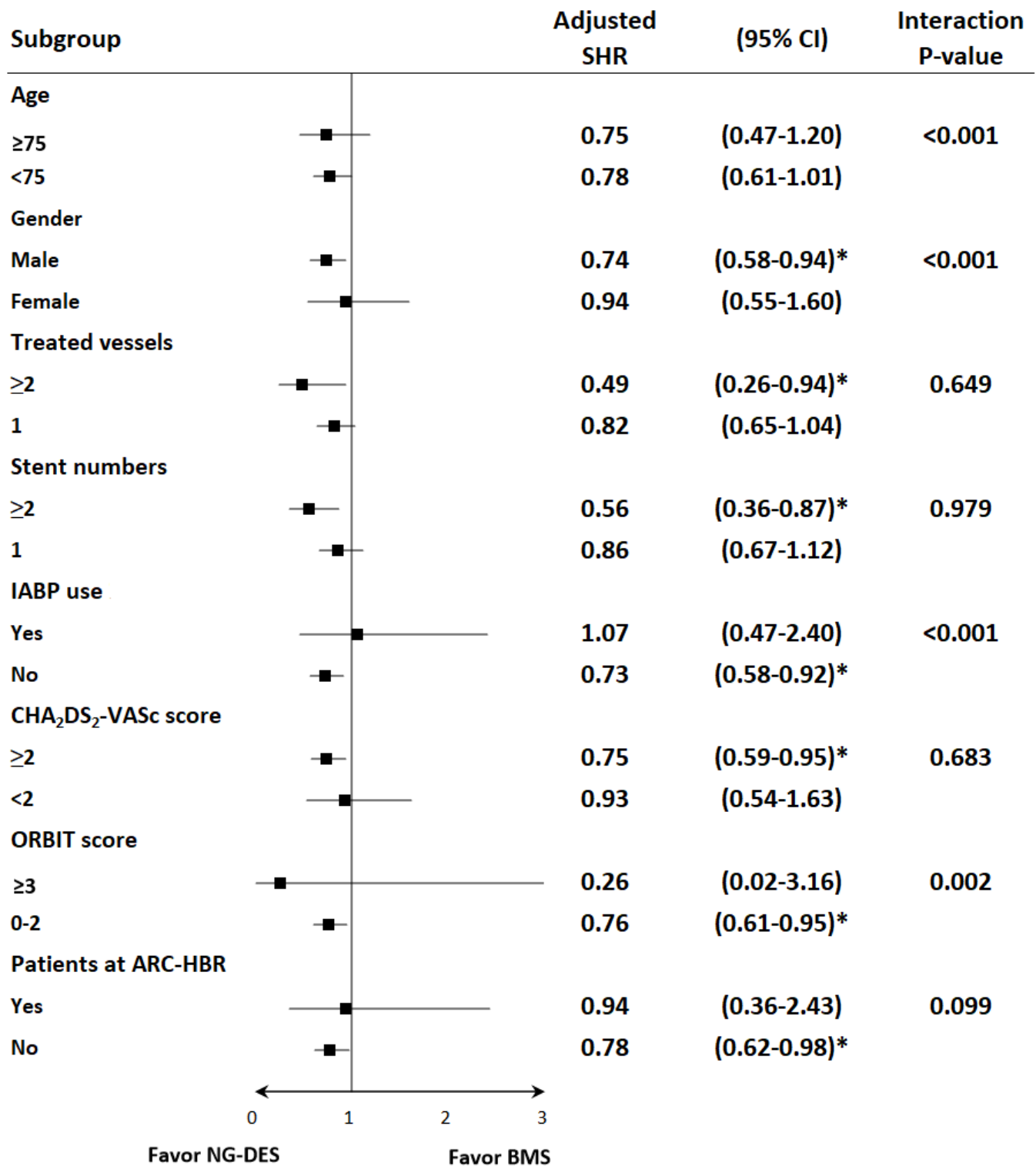


Figure S3. Subgroup analysis of the risk of HHF among patients with STEMI who received DAPT for an undefined duration of longer than 6 months following stent implantation. Abbreviations: BMS = bare-metal stent; CHA₂DS₂-VASc score = congestive heart failure, hypertension, age ≥ 75 years, diabetes, stroke/transient ischemic attack, vascular disease, age 65 to 74 years, female sex; CI = confidence interval; HHF = hospitalization for heart failure; IABP = intra-aortic balloon pump; NG-DES = new-generation drug-eluting stent; STEMI = ST-elevation myocardial infarction; ORBIT score = age ≥ 75 years, bleeding history, chronic kidney disease, treatment with antiplatelet; PCI = percutaneous coronary intervention; SHR = subdistribution hazard ratio.

* $p < 0.05$

Table S4. The rates of CICR and the risk of repeat PCI in patients with STEMI receiving NG-DESs compared with those patients with STEMI receiving BMSs.

Stent types	5-year CICR	Adjusted SHR (95% CI)	<i>p</i>
BMS	39.7%	Reference	-
NG-DES	34.9%	0.85 (0.80 – 0.90)	<0.001

Abbreviation: BMS = bare-metal stent; CI = confidence interval; CICR = cumulative incidence competing risk; NG-DES = new-generation drug-eluting stent; PCI = percutaneous coronary intervention; SHR = subdistribution hazard ratio; STEMI = ST-elevation myocardial infarction

Table S5. The rates of CICR and the risk of recurrent MI in patients with STEMI receiving NG-DESs compared with those patients with STEMI receiving BMSs.

Stent types	5-year CICR	Adjusted SHR (95% CI)	<i>p</i>
BMS	12.2%	Reference	-
NG-DES	10.0%	0.80 (0.72 – 0.90)	<0.001

Abbreviation: BMS = bare-metal stent; CI = confidence interval; CICR = cumulative incidence competing risk; MI = myocardial infarction; NG-DES = newer-generation drug-eluting stent; SHR = subdistribution hazard ratio; STEMI = ST-elevation myocardial infarction.

Table S6. Baseline characteristics of patients with STEMI who were at ARC-HBR and non-ARC-HBR after PSM.

	ARC-HBR* N= 781	Non-ARC-HBR N = 12,881	<i>p</i>
Age, mean±SD	68.6 ± 12.6	58.7 ± 12.1	<0.001
Male, n (%)	622 (79.6)	11,356 (88.2)	<0.001
Use of NG-DES, n (%)	387 (49.6)	6,444 (50.0)	0.79
Major ARC criteria of bleeding risk			
- Malignancy	353 (45.2)	0	-
- Long-term use of anticoagulants	195 (25.0)	0	-
- End-stage CKD	34 (4.4)	0	-
- ICH	72 (9.2)	0	-
Minor ARC criteria of bleeding risk			
- Age ≥75	303 (38.8)	1,473 (11.4)	<0.001
- Ischemic stroke	154 (19.7)	245 (1.9)	<0.001
- Bleeding events requiring hospitalization or transfusion	69 (8.8)	122 (0.9)	<0.001
DAPT adherence, n (%)			
- At discharge	768 (98.3)	12,759 (99.1)	0.071
- 1 month after discharge	564 (72.2)	11,487 (89.2)	<0.001
- 3 months after discharge	463 (59.3)	9,155 (71.1)	<0.001
- 6 months after discharge	347 (44.4)	6,760 (52.5)	<0.001
- 12 months after discharge	159 (20.4)	2,973 (23.1)	0.075

Abbreviations: ARC = Academic Research Consortium; CKD = chronic kidney disease; DAPT = dual antiplatelet therapy; DES = drug-eluting stent; HBR = high bleeding risk; ICH = intracranial hemorrhage; NG-DES = new-generation drug-eluting stent; PSM = propensity score matching; SD = standard deviation; STEMI = ST-elevation myocardial infarction.

*Patients were defined to be at ARC-HBR if at least 1 clinical major or 2 minor ARC criteria of bleeding risk are met.