Asian AMI Registry Session
The 17th Joint Meeting of Coronary Revascularization (JCR 2017)
Busan, Korea Dec 8th 2017

Trends of acute myocardial infarction in Korea from the experience of Korea Acute Myocardial Infarction Registry: What are different from Western registries?

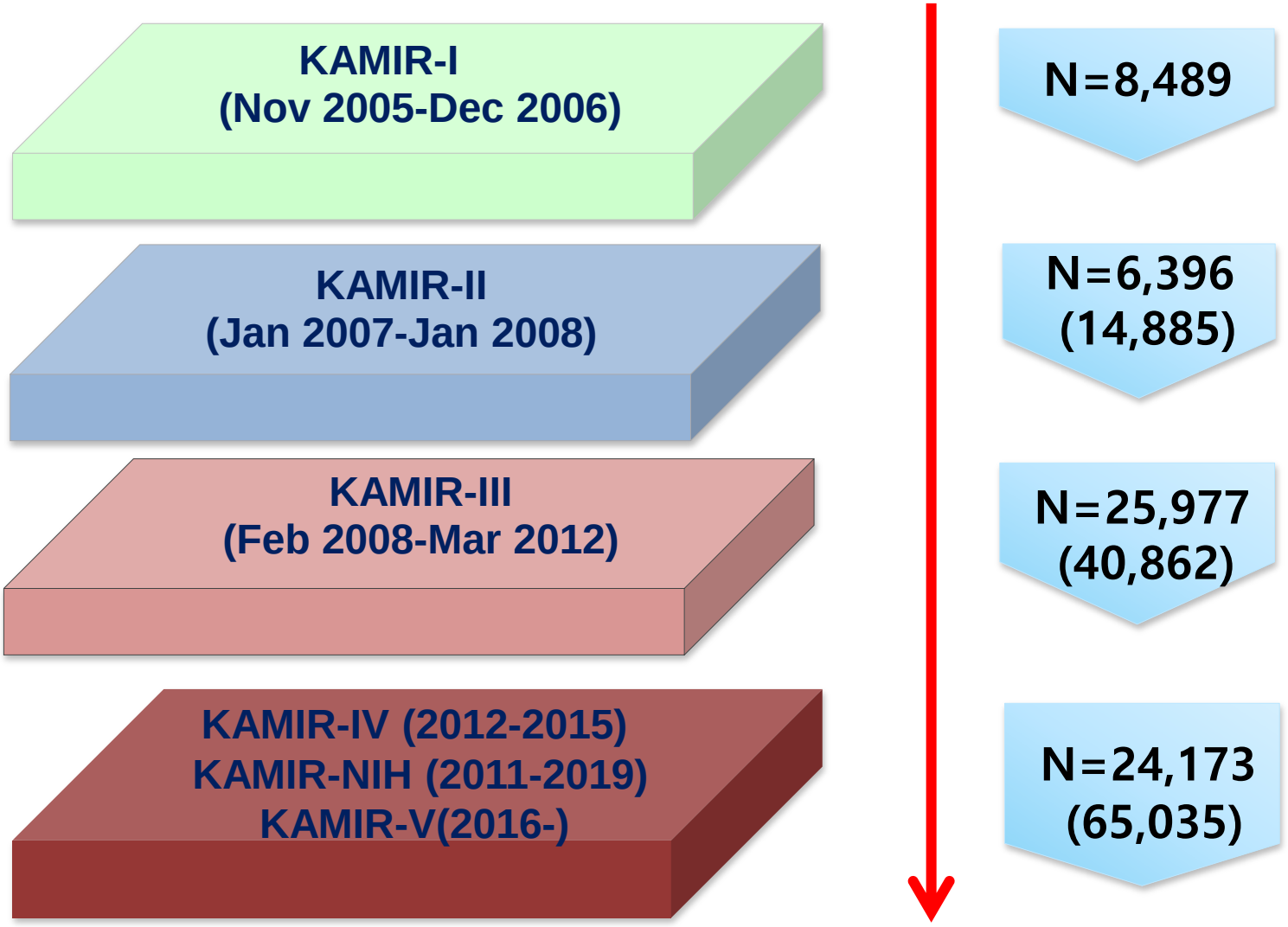
Yongcheol Kim[1], Myung Ho Jeong[1]*,
and other Korea Acute Myocardial Infarction Registry Investigators

[1]Chonnam National University Hospital

Introduction

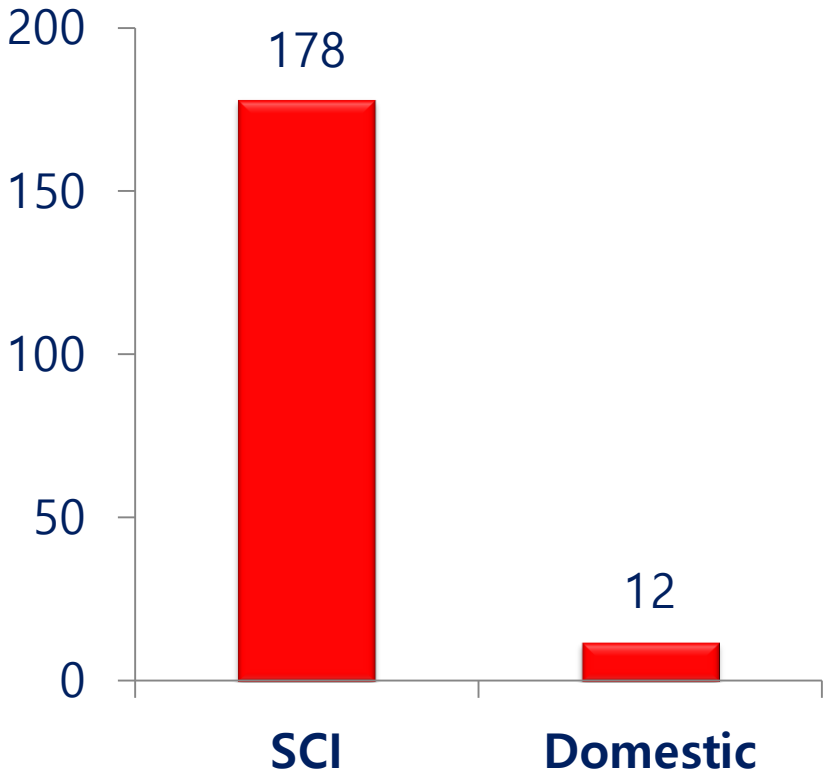
- **Myocardial infarction (MI), one of the main manifestations of coronary artery disease, is a leading cause of mortality in Asia-Pacific region.**
- **The incidence rate of MI decreased in Western countries, but it gradually increased in Asian countries in recent years.**
- **Despite increasing the burden of cardiovascular disease by MI in Asia, a few data are available to reference for management and treatment of MI in real-world practice.**
- **We aimed to assess trends in the characteristics, treatment, and clinical outcomes in patients with AMI including STEMI and NSTEMI, respectively, using the KAMIR data.**

KAMIR Supported by Korean Society of Cardiology and Korea NIH

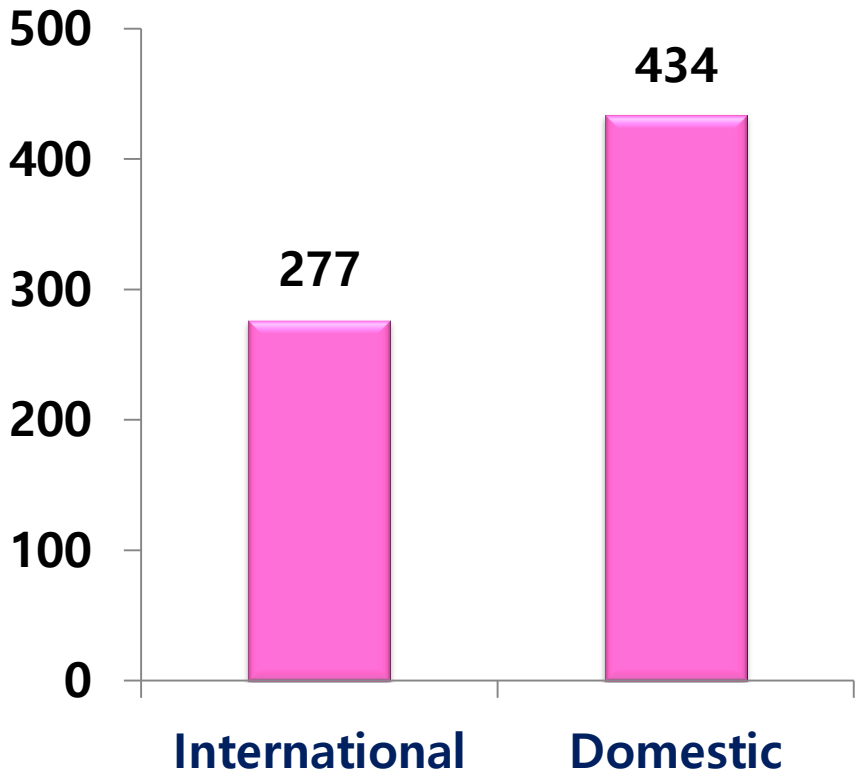


KAMIR Publications and Presentations (2005~2017) The Largest Number of Papers in the World

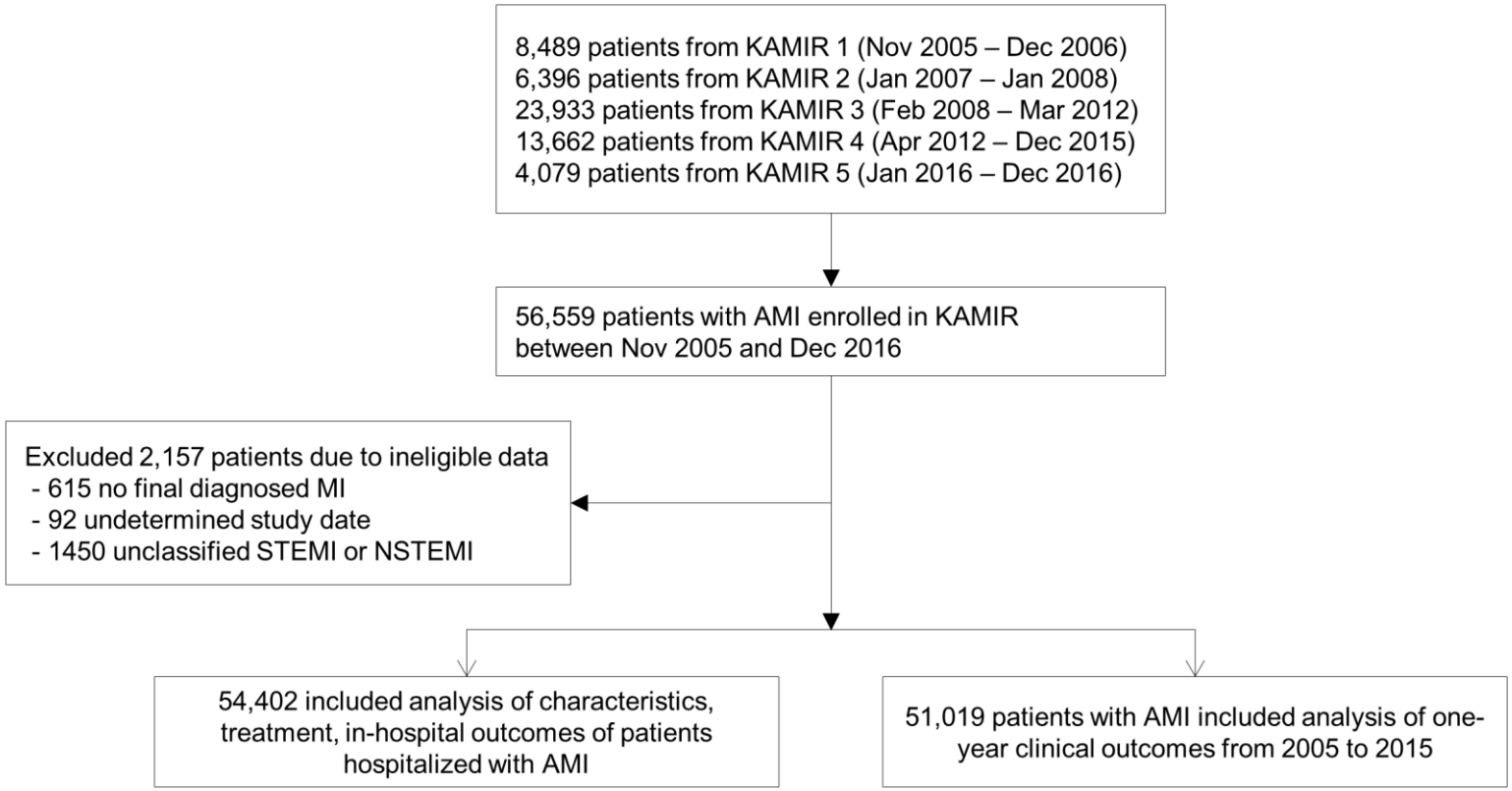
Published Papers



Presentations



Study Flowchart



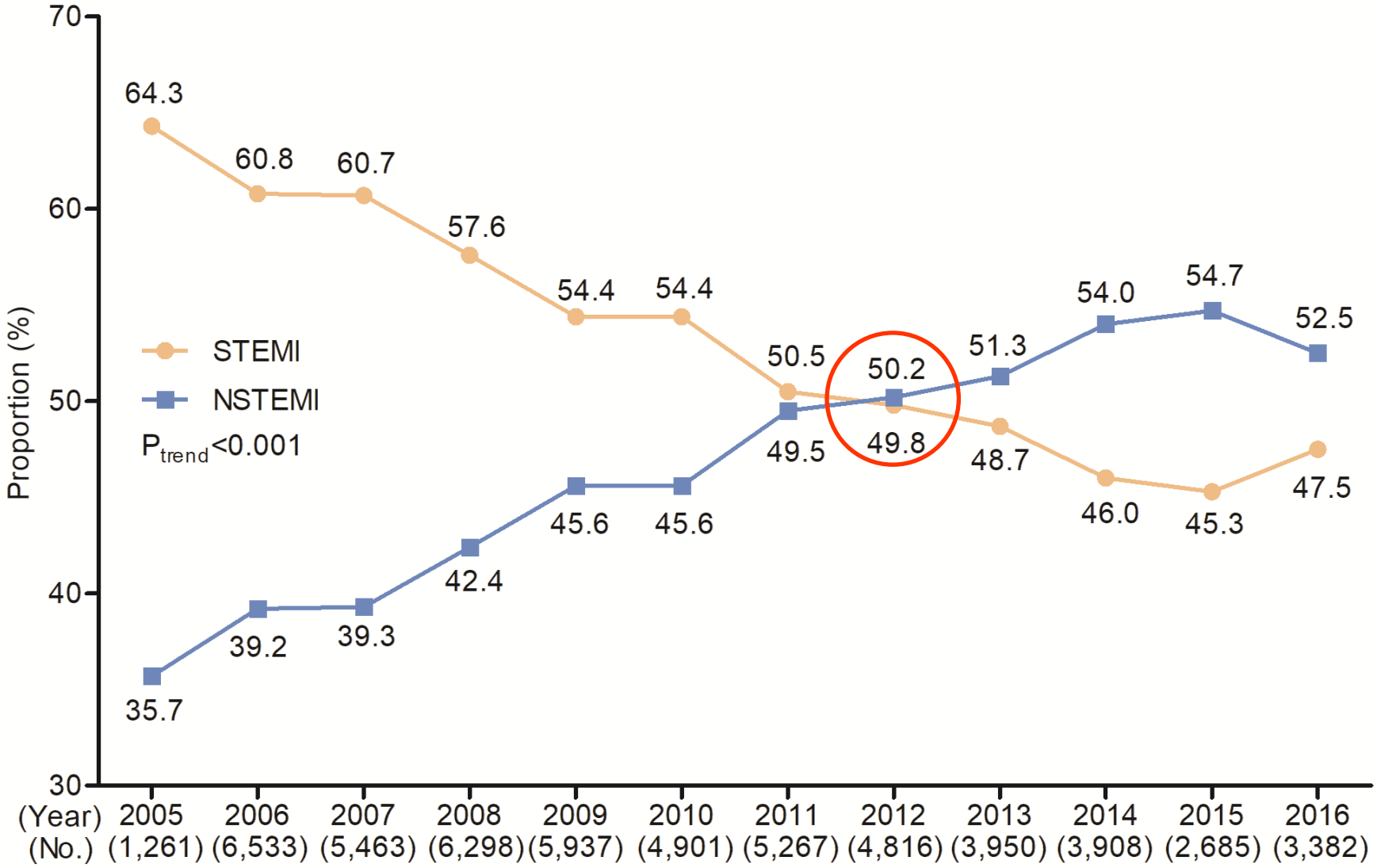
Submitted to Circulation

Demographics, clinical characteristics patients with AMI between 2005 and 2016

Variables	AMI (n=54,402)	STEMI (n=29,222)	NSTEMI (n=25,180)	P Value
Demographic		53.7%	46.3%	
Age, mean (SD), y	63.5 (12.8)	62.4 (13.0)	64.8 (12.4)	<0.001
Male sex	39,107 (71.9)	21,975 (75.2)	17,132 (68.0)	<0.001
BMI, mean (SD), kg/m^2	24·0 (3.3)	24.0 (3.3)	23.9 (3.1)	0.012
Cardiovascular risk factors				
Hypertension	26,995 (55.7)	13,419 (51.2)	13,576 (60.8)	<0.001
Diabetes mellitus	15,195 (31.4)	7,304 (28.0)	7,891 (35.4)	<0.001
Dyslipidemia	6,011 (12.4)	2,847 (10.9)	3,164 (14.2)	<0.001
Current smoking	21,730 (41.0)	13,229 (46.2)	8,501 (34.9)	<0.001
Family history of IHD	3,912 (7.4)	2,070 (7.2)	1,842 (7.5)	0.18
Medical history				
Angina	4,007 (8.3)	1,460 (5.6)	2,547 (11.4)	<0.001
MI	4,069 (8.4)	1,702 (6.5)	2,367 (10.6)	<0.001
PCI	4,003 (8.2)	1,608 (6.1)	2,395 (10.6)	<0.001
CABG	412 (0.8)	110 (0.4)	302 (1.3)	<0.001
CVA	3,407 (6.9)	1,499 (5.7)	1,908 (8.4)	<0.001
Killip classification III, IV	7,082 (13.9)	4,147 (15.0)	2,935 (12.5)	<.001
LVEF, %	52.0 (11.9)	50.6 (11.5)	53.5 (12.3)	<.001

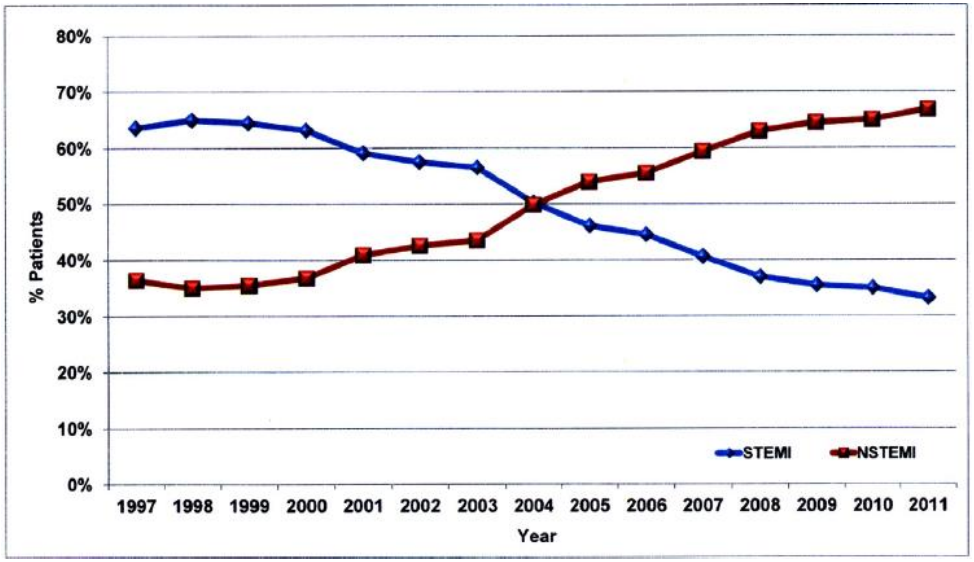
Submitted to Circulation

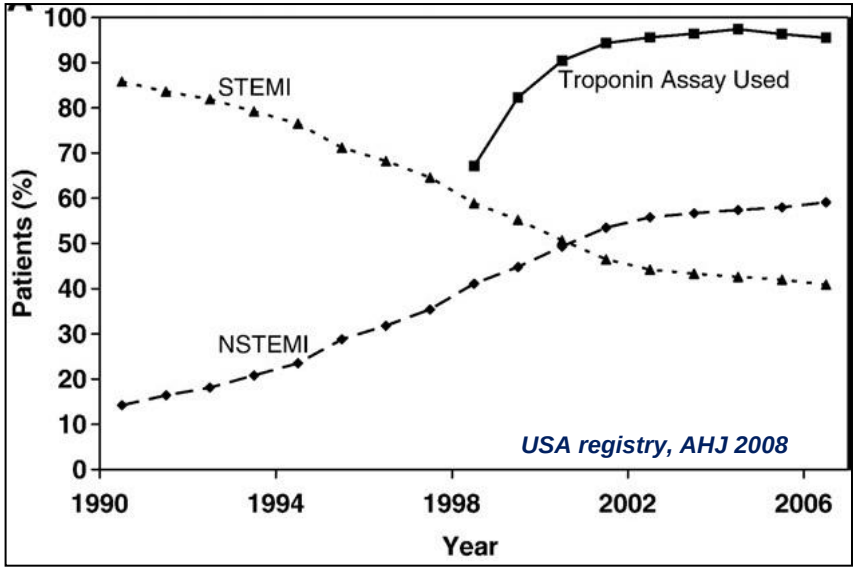
Annual incidence rates of STEMI and NSTEMI from 2008 to 2016

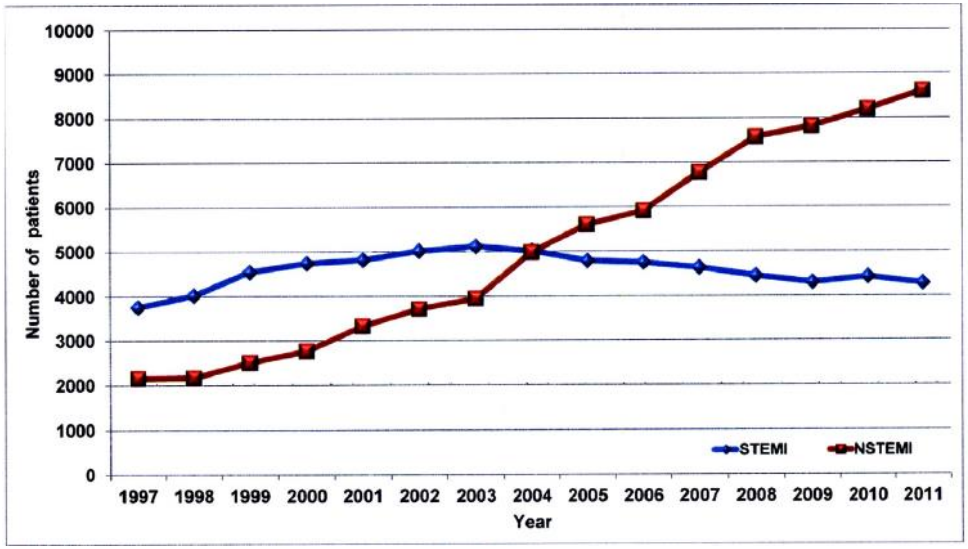


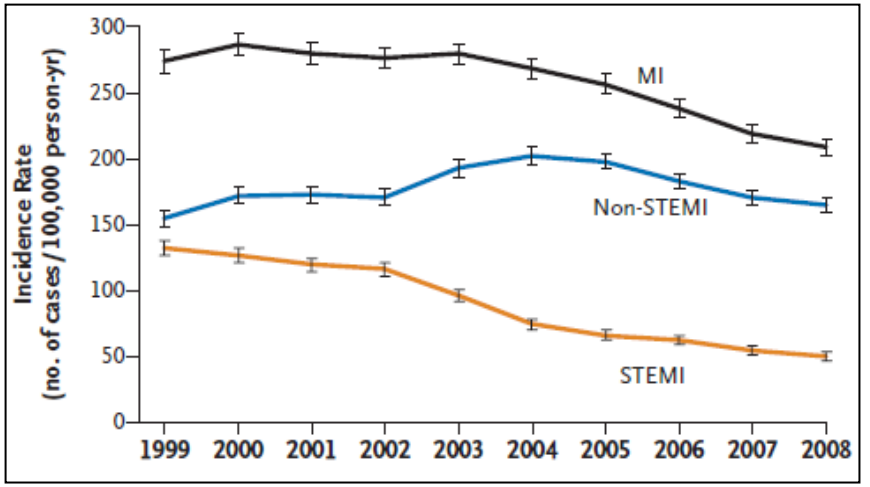
Submitted to Circulation

Annual incidence rates of STEMI and NSTEMI In other countries









Taiwan registry, IJC 2016;209: 103-113

USA registry, NEJM2016;209: 103-113

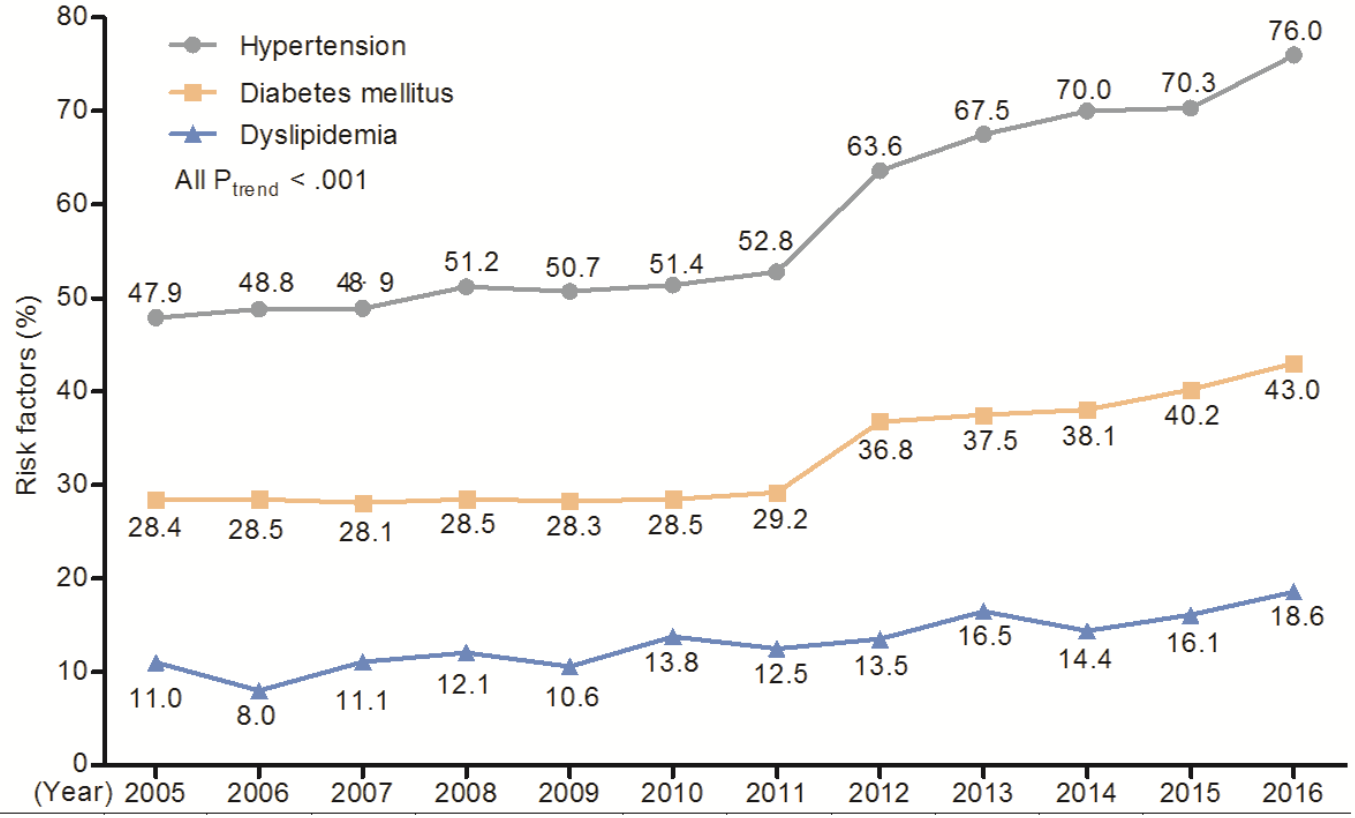
Demographics, clinical characteristics patients with AMI between 2005 and 2016

Variables	AMI (n=54,402)	STEMI (n=29,222)	NSTEMI (n=25,180)	P Value
Demographic		53.7%	46.3%	
Age, mean (SD), y	63.5 (12.8)	62.4 (13.0)	64.8 (12.4)	<0.001
Male sex	39,107 (71.9)	21,975 (75.2)	17,132 (68.0)	<0.001
BMI, mean (SD), kg/m^2	24·0 (3.3)	24.0 (3.3)	23.9 (3.1)	0.012
Cardiovascular risk factors				
Hypertension	26,995 (55.7)	13,419 (51.2)	13,576 (60.8)	<0.001
Diabetes mellitus	15,195 (31.4)	7,304 (28.0)	7,891 (35.4)	<0.001
Dyslipidemia	6,011 (12.4)	2,847 (10.9)	3,164 (14.2)	<0.001
Current smoking	21,730 (41.0)	13,229 (46.2)	8,501 (34.9)	<0.001
Family history of IHD	3,912 (7.4)	2,070 (7.2)	1,842 (7.5)	0.18
Medical history				
Angina	4,007 (8.3)	1,460 (5.6)	2,547 (11.4)	<0.001
MI	4,069 (8.4)	1,702 (6.5)	2,367 (10.6)	<0.001
PCI	4,003 (8.2)	1,608 (6.1)	2,395 (10.6)	<0.001
CABG	412 (0.8)	110 (0.4)	302 (1.3)	<0.001
CVA	3,407 (6.9)	1,499 (5.7)	1,908 (8.4)	<0.001
Killip classification III, IV	7,082 (13.9)	4,147 (15.0)	2,935 (12.5)	<.001
LVEF, %	52.0 (11.9)	50.6 (11.5)	53.5 (12.3)	<.001

Submitted to Circulation

Temporal trends in cardiovascular risk factors from 2005 to 2016

AMI



Hypertension												
No. (26,995)	592	3,144	2,632	3,161	2,952	2,410	2,562	2,458	2,008	2,008	1,369	1,699
Total no. (48,505)	1,236	6,449	5,384	6,172	5,827	4,688	4,856	3,864	2,977	2,869	1,948	2,235
Diabetes Mellitus												
No. (15,195)	351	1,833	1,514	1,759	1,650	1,331	1,415	1,408	1,095	1,093	784	962
Total no. (48,399)	1,237	6,440	5,386	6,175	5,828	4,678	4,850	3,830	2,922	2,869	1,948	2,236
Dyslipidemia												
No. (6,011)	136	515	596	751	618	650	605	517	480	414	314	415
Total no. (48,411)	1,237	6,426	5,374	6,190	5,836	4,694	4,857	3,830	2,913	2,869	1,948	2,237

Submitted to Circulation

Temporal trends in cardiovascular risk factors in French registry from 2005 to 2016

STEMI	USIK 1995* (n=1536)	USIC 2000* (n=1844)	FAST-MI 2005 (n=1611)	FAST-MI 2010 (n=1716)	FAST-MI 2015 (n=1872)	*P* Value
Risk factors, n (%)						
Hypertension	673 (44)	804 (44)	792 (49)	806 (47)	835 (45)	0.006
Hypercholesterolemia	534 (35.5)	719 (39.5)	699 (43)	675 (39)	678 (36)	<0.001
Diabetes mellitus	242 (16)	364 (20)	302 (19)	283 (16.5)	308 (16.5)	0.01
Current smoking	491 (32)	651 (35)	600 (37)	701 (41)	789 (42)	<0.001
Obesity (BMI ≥30)	208 (14)	269 (16)	299 (21)	324 (20)	349 (19.5)	<0.001

KAMIR (AMI)	2005	2010	2015
Dyslipidemia	**11.0%**	**13.8%**	**16.1%**

NSTEMI	USIK 1995* (n=616)	USIC 2000* (n=476)	FAST-MI 2005 (n=1448)	FAST-MI 2010 (n=1363)	FAST-MI 2015 (n=1941)	*P* for Trend
Risk factors, n (%)						
Hypertension	303 (50)	272 (57)	962 (66)	847 (62)	1220 (63)	<0.001
Hypercholesterolemia	221 (37)	225 (48)	749 (52)	653 (48)	979 (54)	<0.001
Diabetes mellitus	122 (20)	123 (26)	422 (29)	370 (27)	522 (27)	0.001
Current smoking	157 (26)	103 (22)	322 (22)	334 (24.5)	566 (29)	0.75
Obesity (BMI ≥30)	77 (13)	93 (22.5)	268 (21)	306 (24)	468 (25)	<0.001

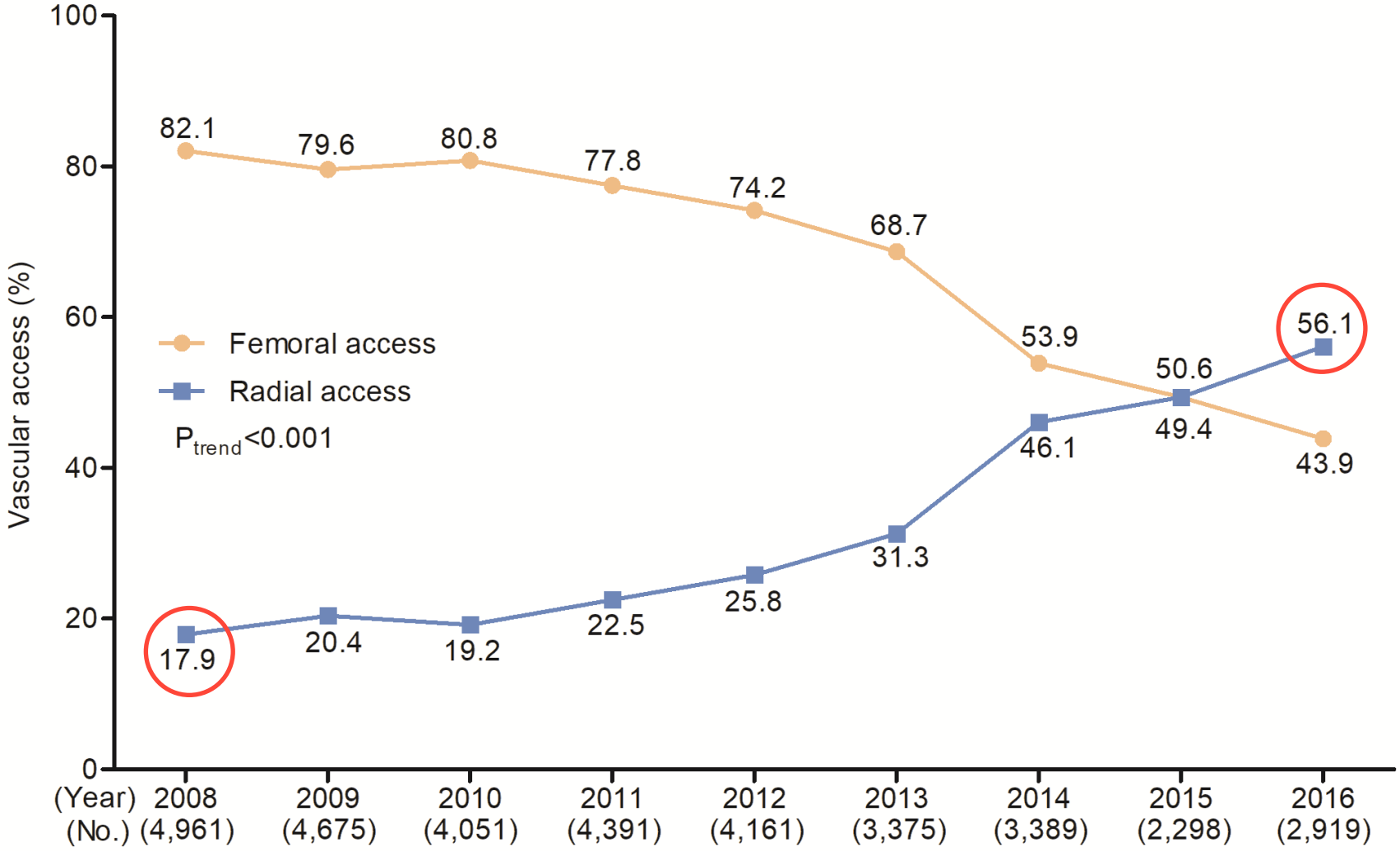
French registry, Circulation 2017;136: 00-00

Coronary angiographic and procedural characteristics patients with AMI between 2005 and 2016

Variables	AMI (n=54,402)	STEMI (n=29,222)	NSTEMI (n=25,180)	P Value
Trans-radial access	10,100 (29.5)	4,356 (22.8)	5,744 (38.0)	<0.001
Image-guided PCI	7,394 (21.4)	3,768 (20.7)	3,626 (22.1)	0.001
Primary PCI for STEMI	-	24,296 (87.8)	-	
Performed PCI	46,941 (87.3)	27,217 (93.6)	19,724 (80.0)	<0.001
Successful PCI	44,616 (97.6)	25,851 (97.3)	18,765 (97.9)	<0.001
Infarct-related artery				<0.001
Left anterior descending	22,263 (47.1)	13,848 (51.2)	8,415 (41.7)	
Left circumflex	8,044 (17.0)	2,623 (9.7)	5,421 (26.9)	
Right coronary	15,834 (33.5)	10,144 (37.5)	5,690 (28.2)	
Left main	1,099 (2.3)	452 (1.7)	647 (3.2)	
Involved vessel type				<0.001
Single vessel	21,667 (46.0)	13,519 (50.1)	8,148 (40.5)	
Left main or multivessel	25,457 (54.0)	13,470 (49.9)	11,987 (59.5)	
ACC/AHA B2/C lesion	35,000 (80.6)	20,213 (81.4)	14,787 (79.4)	<0.001
Stenting for target lesion	42,027 (90.3)	24,651 (91.7)	17,376 (88.3)	<0.001
Drug-eluting stent	38,772 (94.0)	22,592 (93.5)	16,180 (94.8)	
Bare-metal stent	2,367 (6.0)	1,527 (6.5)	840 (5.2)	

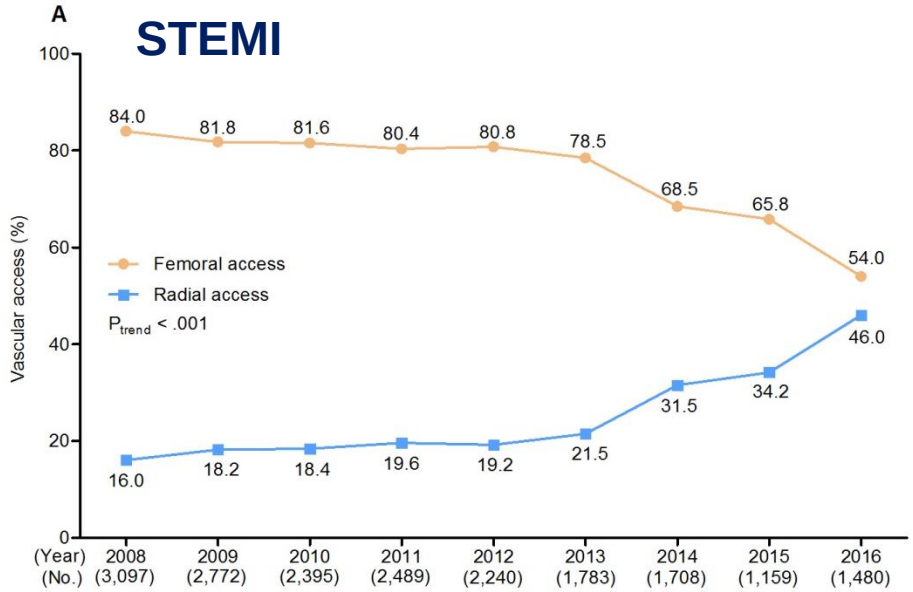
Submitted to Circulation

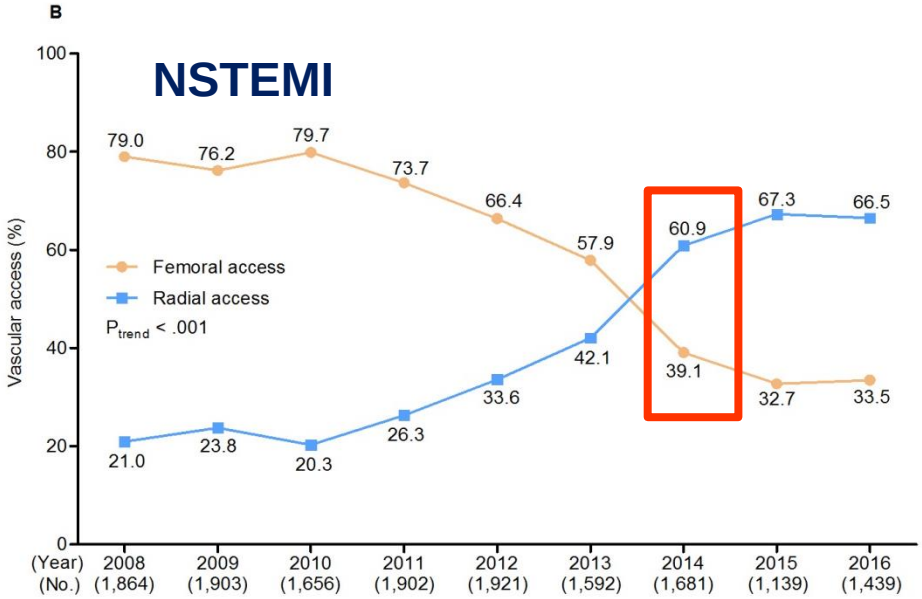
Changing trend in vascular access in patients with AMI between 2005 and 2016



Submitted to Circulation

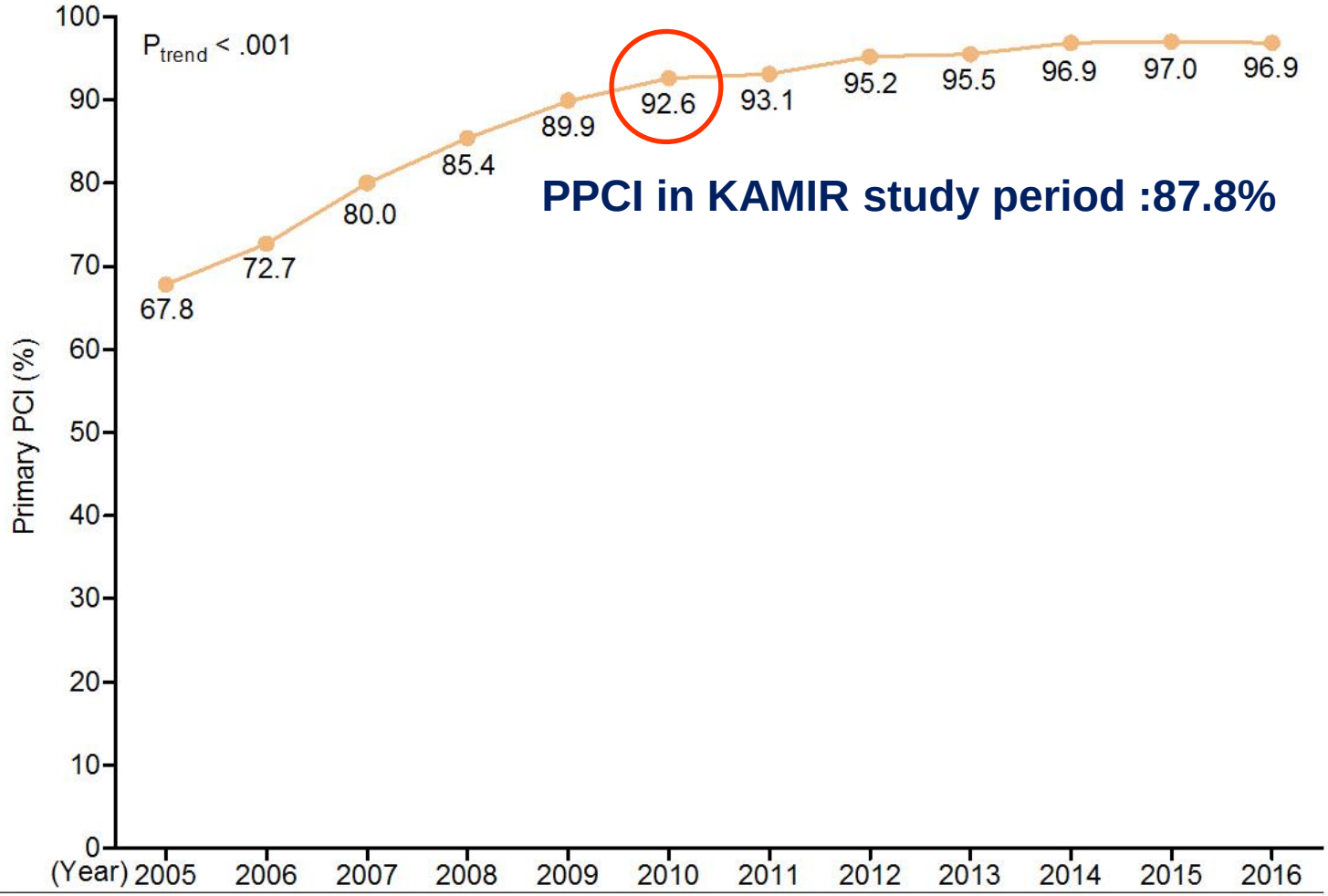
The comparison of trends in vascular access in patients with STEMI and NSTEMI





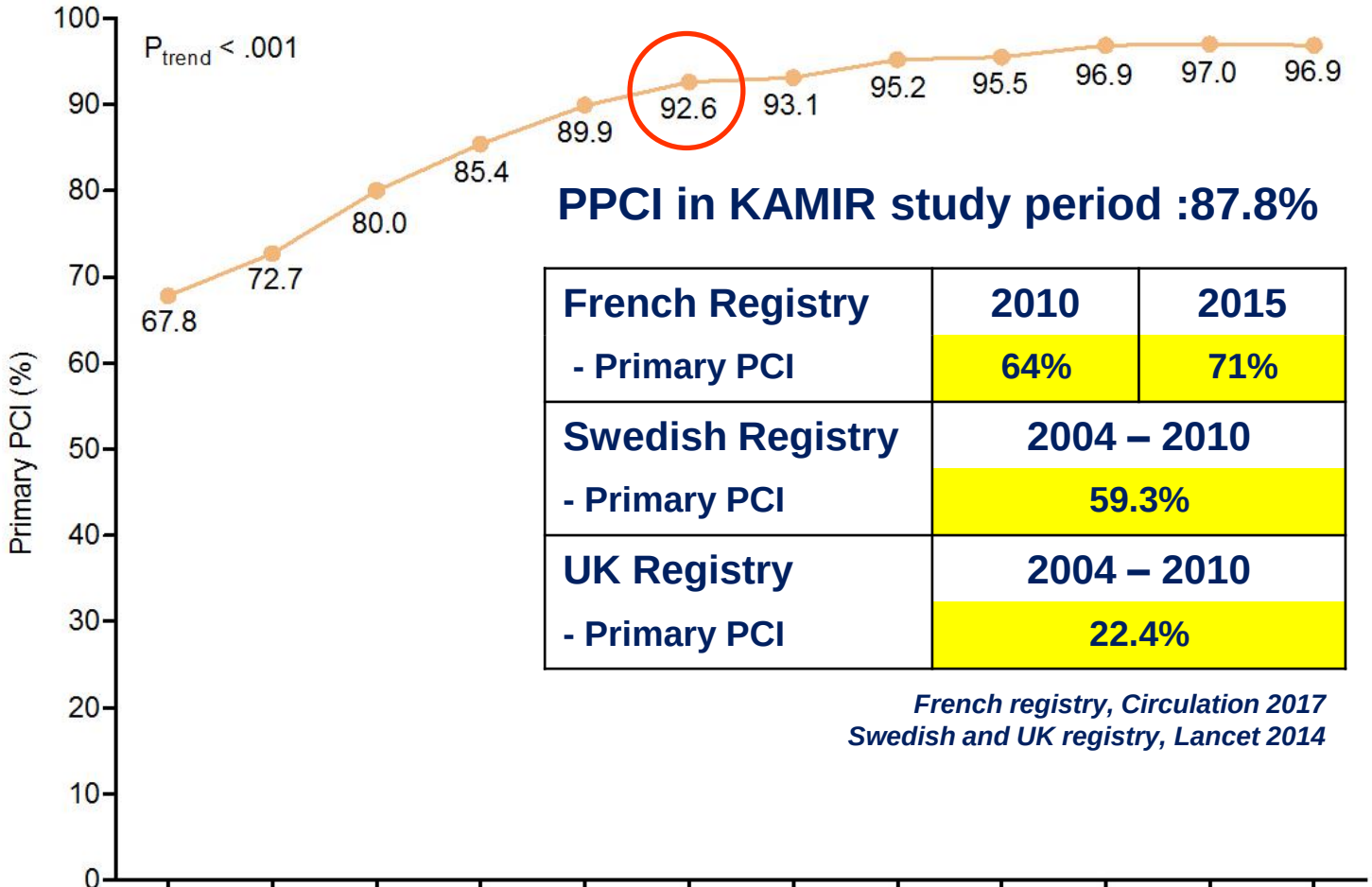
Submitted to Circulation

Annual primary PCI rate in patients with STEMI from 2005 to 2016



(Year)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
PPCI in STEMI												
No. (24,296)	515	2,751	2,545	2,801	2,616	2,289	2,332	2,223	1,390	1,741	1,018	2,075
Total no. (27,669)	760	3,785	3,180	3,279	2,909	2,472	2,505	2,335	1,456	1,797	1,050	2,141

Annual primary PCI rate in patients with STEMI from 2005 to 2016



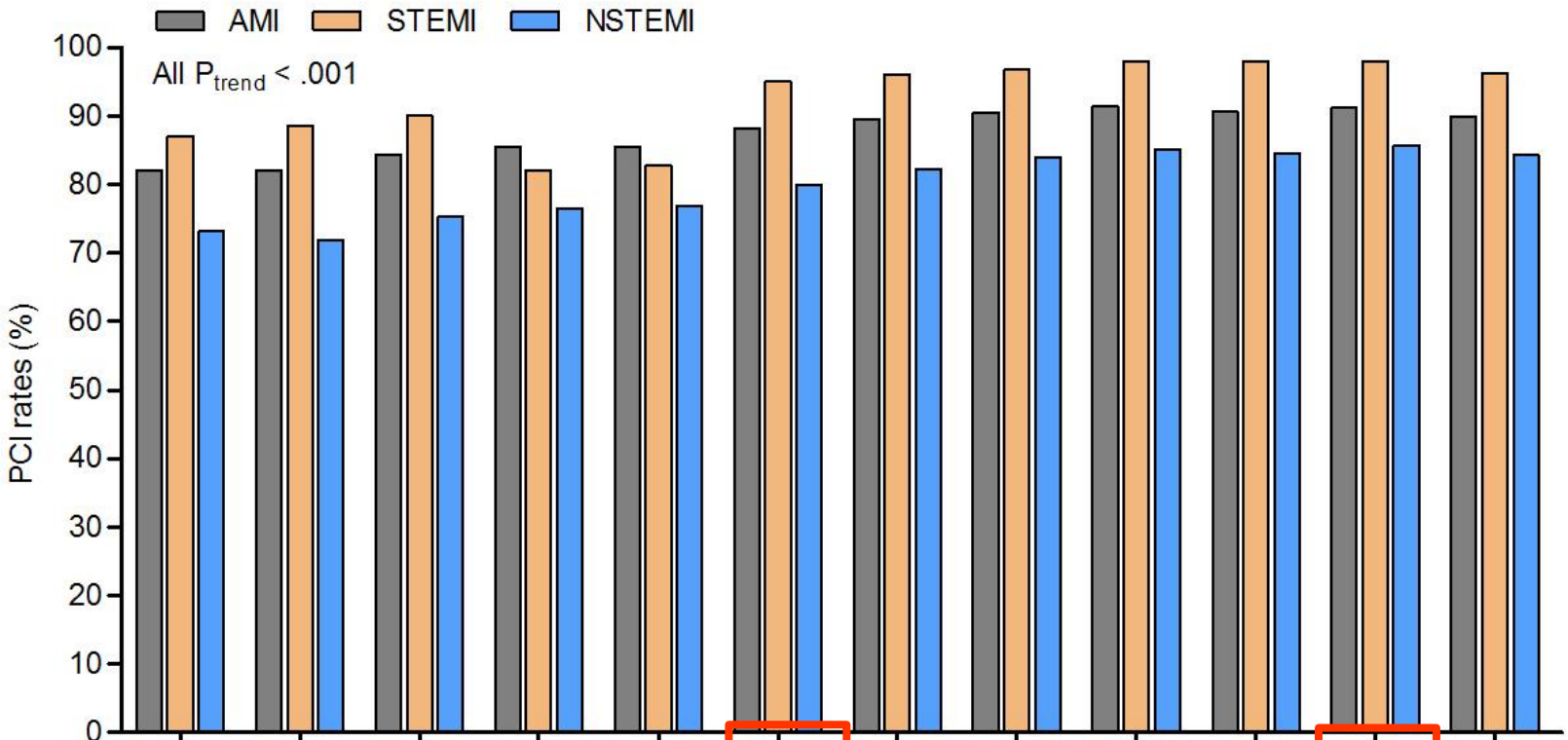
PPCI in KAMIR study period :87.8%

French Registry	**2010**	**2015**
- Primary PCI	**64%**	**71%**
Swedish Registry	**2004 – 2010**	
- Primary PCI	**59.3%**	
UK Registry	**2004 – 2010**	
- Primary PCI	**22.4%**	

French registry, Circulation 2017
Swedish and UK registry, Lancet 2014

(Year)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
PPCI in STEMI												
No. (24,296)	515	2,751	2,545	2,801	2,616	2,289	2,332	2,223	1,390	1,741	1,018	2,075
Total no. (27,669)	760	3,785	3,180	3,279	2,909	2,472	2,505	2,335	1,456	1,797	1,050	2,141

Annual PCI rates in patients with AMI and both STEMI and NSTEMI from 2005 to 2016



(Year)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
AMI, %	82.0	82.1	84.3	85.5	85.6	88.3	89.5	90.4	91.4	90.7	91.3	90.0
STEMI, %	87.0	88.6	90.1	92.1	92.8	95.0	96.1	96.7	98.0	97.9	97.9	96.2
NSTEMI, %	73.1	71.9	75.3	76.6	76.9	79.9	82.2	84.1	85.1	84.5	85.7	84.3

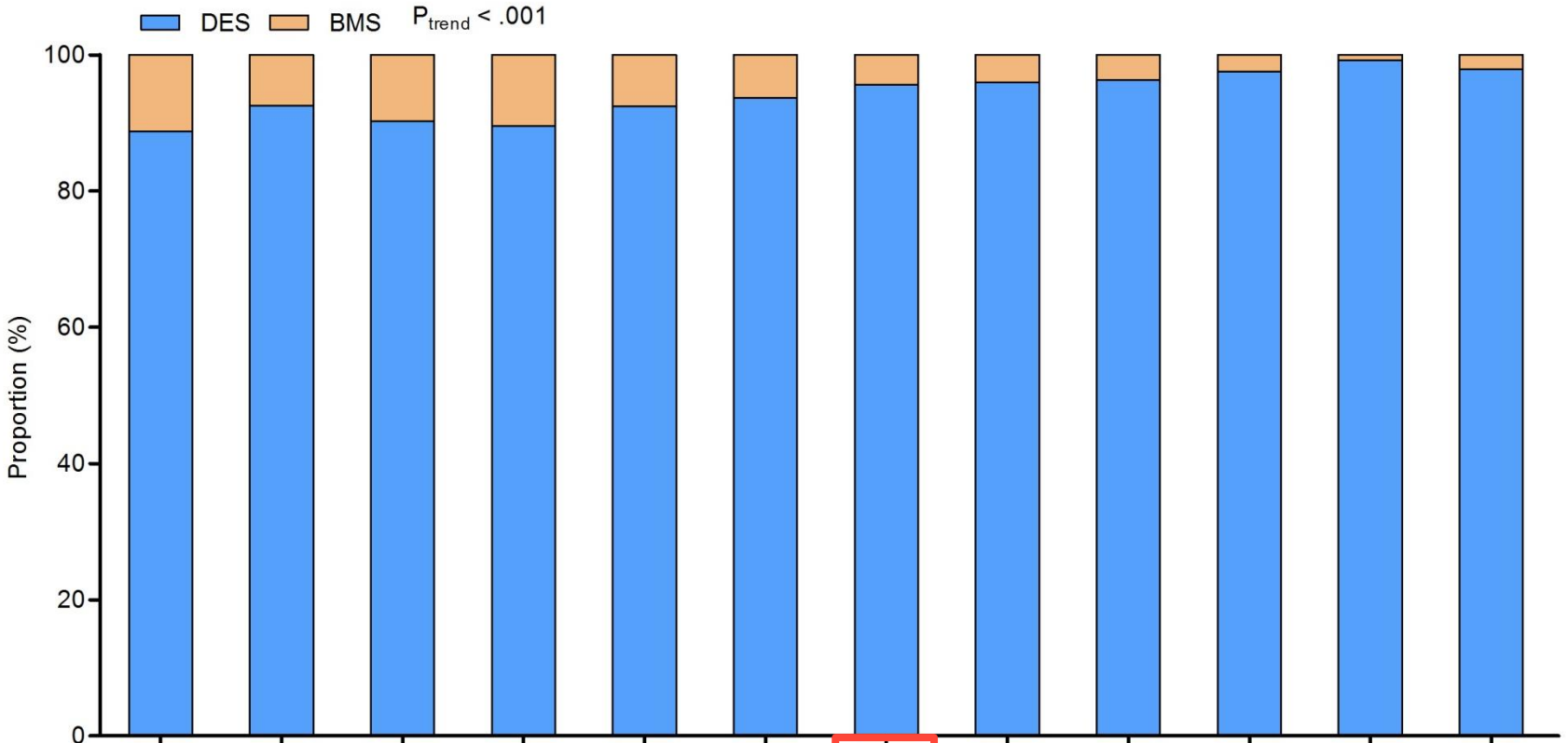
PCI rates in French registy	2010	2015
AMI, %	77.0%	78.0%
STEMI, %	86.0%	90.0%
NSTEMI, %	66.0%	60.0%

Coronary angiographic and procedural characteristics patients with AMI between 2005 and 2016

Variables	AMI (n=54,402)	STEMI (n=29,222)	NSTEMI (n=25,180)	P Value
Trans-radial access	10,100 (29.5)	4,356 (22.8)	5,744 (38.0)	<0.001
Image-guided PCI	7,394 (21.4)	3,768 (20.7)	3,626 (22.1)	0.001
Primary PCI for STEMI	-	24,296 (87.8)	-	
Performed PCI	46,941 (87.3)	27,217 (93.6)	19,724 (80.0)	<0.001
Successful PCI	44,616 (97.6)	25,851 (97.3)	18,765 (97.9)	<0.001
Infarct-related artery				<0.001
Left anterior descending	22,263 (47.1)	13,848 (51.2)	8,415 (41.7)	
Left circumflex	8,044 (17.0)	2,623 (9.7)	5,421 (26.9)	
Right coronary	15,834 (33.5)	10,144 (37.5)	5,690 (28.2)	
Left main	1,099 (2.3)	452 (1.7)	647 (3.2)	
Involved vessel type				<0.001
Single vessel	21,667 (46.0)	13,519 (50.1)	8,148 (40.5)	
Left main or multivessel	25,457 (54.0)	13,470 (49.9)	11,987 (59.5)	
ACC/AHA B2/C lesion	35,000 (80.6)	20,213 (81.4)	14,787 (79.4)	<0.001
Stenting for target lesion	42,027 (90.3)	24,651 (91.7)	17,376 (88.3)	<0.001
Drug-eluting stent	38,772 (94.0)	22,592 (93.5)	16,180 (94.8)	
Bare-metal stent	2,367 (6.0)	1,527 (6.5)	840 (5.2)	

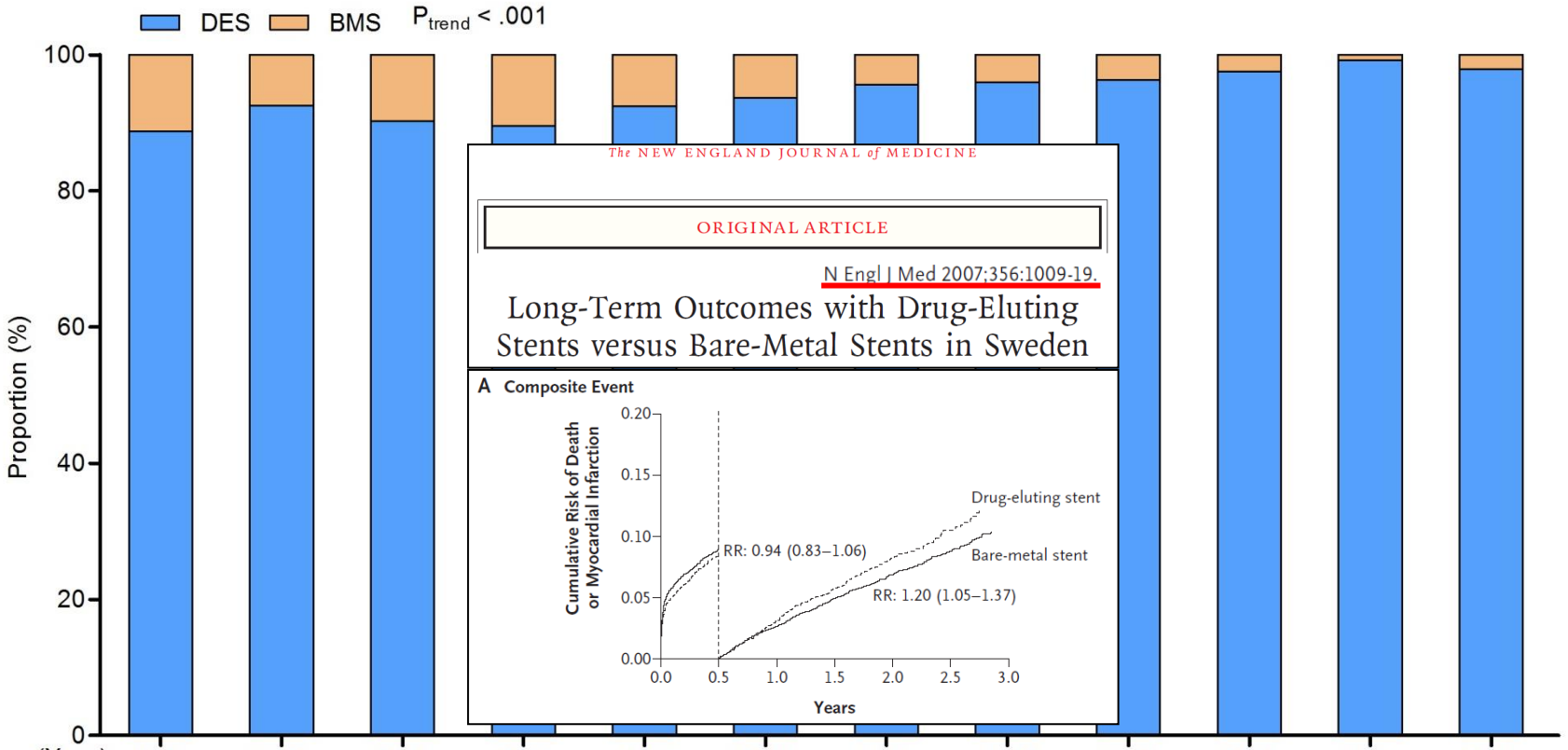
Submitted to Circulation

The proportion of DES and BMS implantation in patient with STEMI from 2005 to 2016



(Year)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
DES, %	88.8	92.5	90.3	89.6	92.4	93.7	95.6	95.9	96.3	97.5	99.2	97.9
No. (22,592)	587	2,966	2,429	2,636	2,286	1,963	2,057	1,973	1,626	1,595	1,101	1,373
BMS, %	11.2	7.5	9.7	10.4	7.6	6.3	4.4	4.1	3.7	2.5	0.8	2.1
No. (1,527)	74	242	261	307	188	132	95	85	63	41	9	30
Total no. (24,119)	661	3,208	2,690	2,943	2,474	2,095	2,152	2,058	1,689	1,636	1,110	1,403

The proportion of DES and BMS implantation in patient with STEMI from 2005 to 2016



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

N Engl J Med 2007;356:1009-19.

Long-Term Outcomes with Drug-Eluting Stents versus Bare-Metal Stents in Sweden

A Composite Event

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
DES, %	88.8	92.5	90.3	89.6	92.4	93.7	95.6	95.9	96.3	97.5	99.2	97.9
No. (22,592)	587	2,966	2,429	2,636	2,286	1,963	2,057	1,973	1,626	1,595	1,101	1,373
BMS, %	11.2	7.5	9.7	10.4	7.6	6.3	4.4	4.1	3.7	2.5	0.8	2.1
No. (1,527)	74	242	261	307	188	132	95	85	63	41	9	30
Total no. (24,119)	661	3,208	2,690	2,943	2,474	2,095	2,152	2,058	1,689	1,636	1,110	1,403

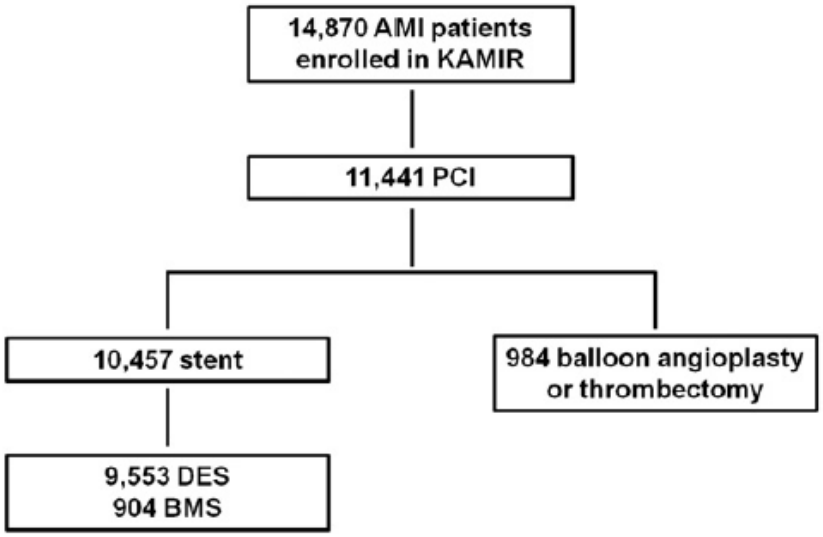
The efficacy and safety of DES in patients with AMI : Results from KAMIR

Editorial

The efficacy and safety of drug-eluting stents in patients with acute myocardial infarction: Results from Korea Acute Myocardial Infarction (KAMIR)

Young Joon Hong, Myung Ho Jeong *, Youngkeun Ahn, Jung Chaee Kang

Korea Cardiovascular Stent Research Institute, Heart Center of Chonnam National University Hospital, Gwangju, Republic of Korea



Nov 2005 – Jan 2008

5. Conclusions

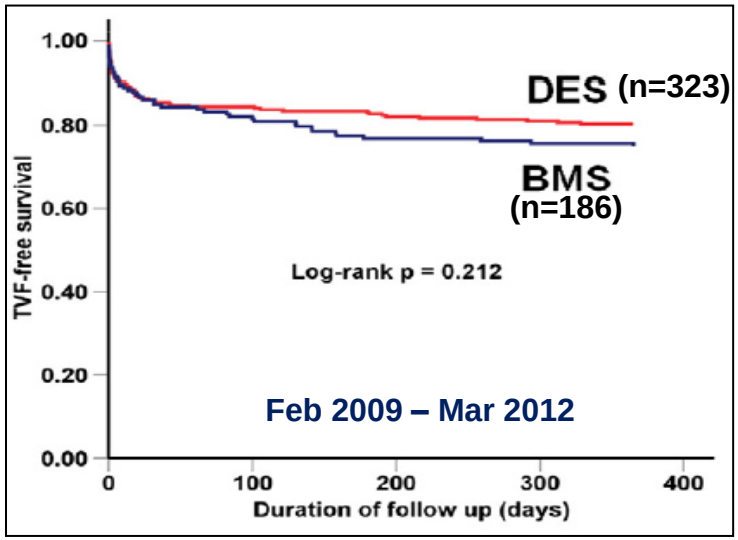
According to the KAMIR data, DES penetration rate is more than 90%. As compared with BMS, the event rates are lower after DES implantation in patients with AMI. There were no significant differences in the incidences of overall MACE according to the DES types except for the lower need for repeat revascularization in SES compared with PES or ZES. According to KAMIR data, DES can be used safely and effectively to treat AMI patients by reducing the need for repeat revascularizations and by not increasing the risks of mortality, MI, and stent thrombosis.

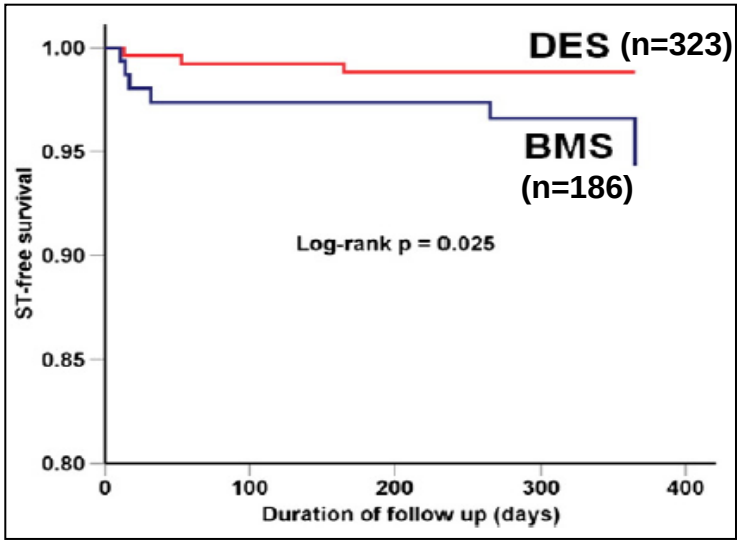
Int J Cardiol. 2013;163(1):1-4

Letter to the Editor

Comparison of second-generation drug-eluting versus bare-metal stents in octogenarian patients with ST-segment elevation myocardial infarction

Zhe Hao Piao [a,b], Myung Ho Jeong [a,*], Ying Li [b], Min Chul Kim [a], Kyung Hoon Cho [a], Keun-Ho Park [a], Doo Sun Sim [a], Kye Hun Kim [a], Young Joon Hong [a], Hyung Wook Park [a], Ju Han Kim [a], Youngkeun Ahn [a], Jeong Gwan Cho [a], Jong Chun Park [a], Young Jo Kim [c], Myeong Chan Cho [d], Chong Jin Kim [e], Hyo Soo Kim [f], Other Korea Acute Myocardial Infarction Registry (KAMIR) Investigators





Clinical outcomes at 12-months.

Variable	DES (n = 323)	BMS (n = 186)	Adjusted HR (95% CI)
TVF	65 (20.1)	48 (25.8)	0.68 (0.39–1.18)
Cardiac death/MI	57 (17.6)	42 (22.6)	0.73 (0.36–1.49)
TVR	8 (2.5)	6 (3.2)	0.93 (0.23–3.80)
ST	3 (0.9)	7 (3.8)	0.19 (0.04–0.93)*

Int J Cardiol. 2014;177(3):1081-1084

TOTAL Trial
(STEMI pts. In 20 Western hospitals between 2010 and 2014)

Short communication

Bare metal versus drug eluting stents for ST-segment elevation myocardial infarction in the TOTAL trial

3.1. Patients and procedure characteristics

A total of 10,732 patients were enrolled in the TOTAL trial from August 2010 through July 2014. Of those, 10,063 underwent PCI for the index STEMI. We excluded patients for whom there were incomplete data regarding stent types or received both BMS and DES, leaving 5090 patients who received BMS and 4333 patients who received DES. There were 4626 patients in the propensity-matched cohort (2313 in each group), among whom there were no significant differences in any of the baseline or procedural characteristics or anti-platelet therapy used during the course of the study. Selected characteristics are shown in the Table 1.

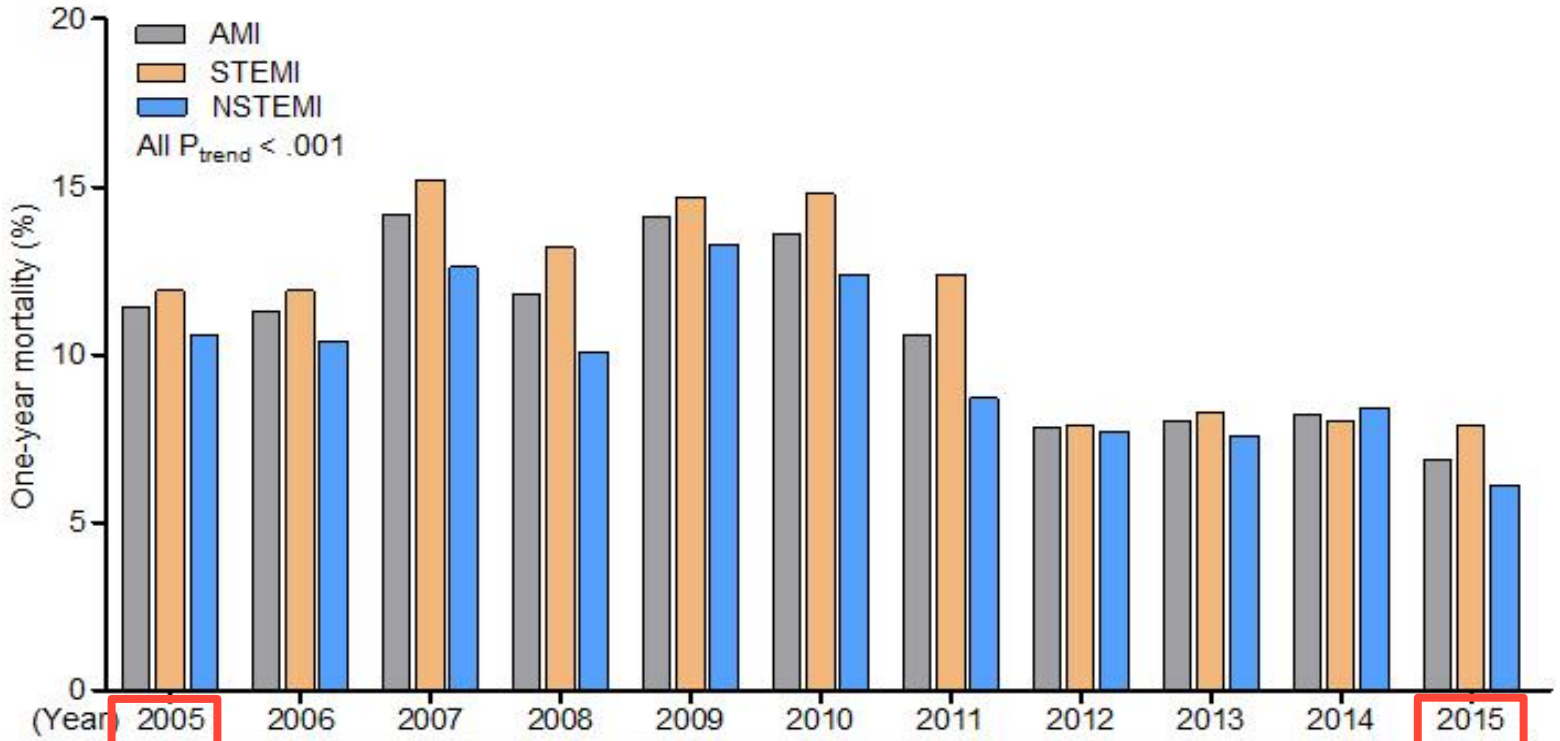
DES implantation was 52% in the TOTAL trial, which was enrolled in 20 Western hospitals between 2010 and 2014.

Int J Cardiol. 2017;248:120-123

One-year cumulative clinical outcomes from 2005 to 2015

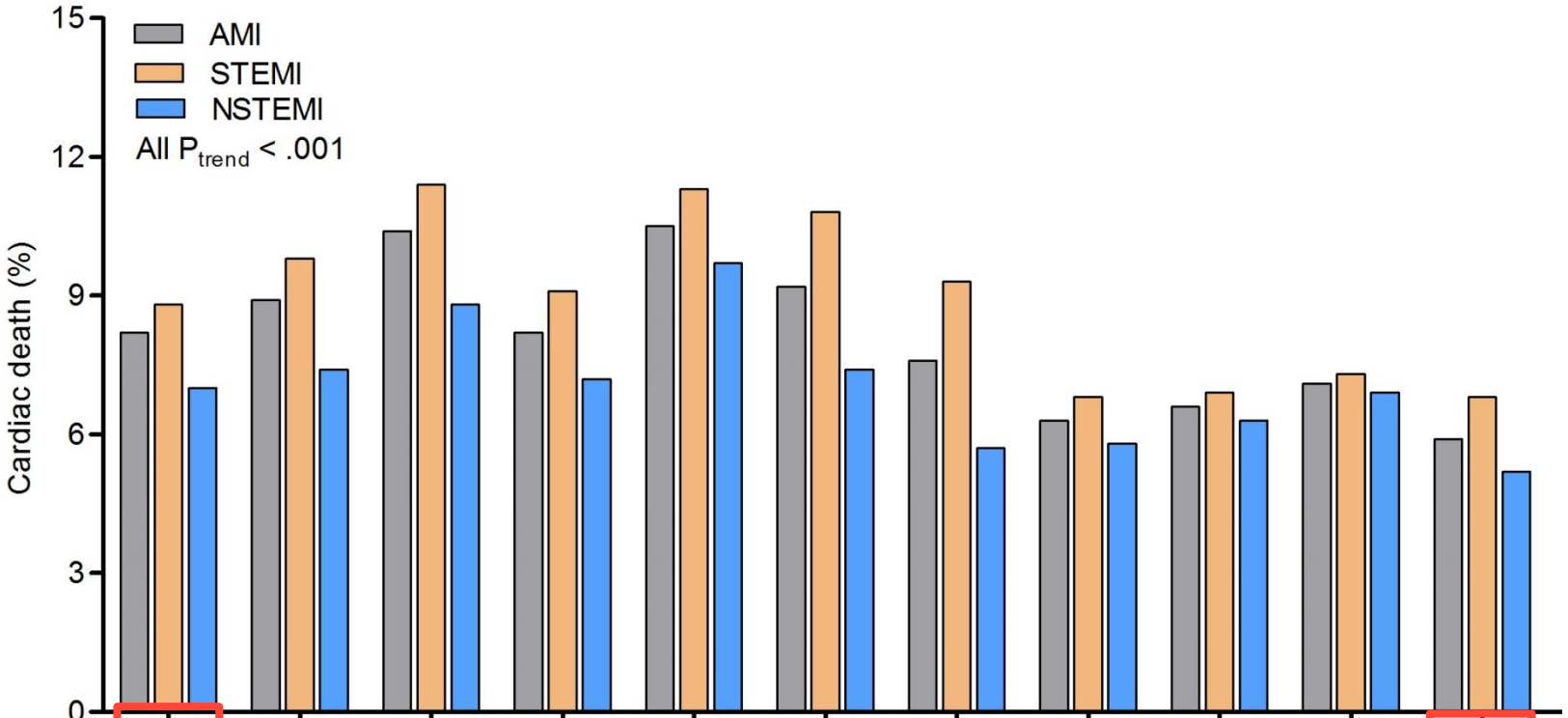
Variables	AMI (n=51,019)	STEMI (n=29,222)	NSTEMI (n=25,180)	P Value
One-year follow-up				
All-cause death	3,630 (10.6)	2,099 (11.5)	1,531 (9.5)	<0.001
Cardiac death	2,758 (8.0)	1,639 (9.0)	1,119 (7.0)	<0.001
Non-cardiac death	872 (2.6)	460 (2.5)	412 (2.6)	0.53
Myocardial infarction	590 (1.7)	243 (1.3)	347 (2.2)	<0.001
STEMI	197 (33.4)	140 (57.6)	57 (16.4)	<0.001
NSTEMI	393 (66.6)	103 (42.4)	290 (83.6)	<0.001
Repeat PCI	1,880 (5.5)	1,031 (5.6)	849 (5.3)	0.18
CABG	129 (0.4)	54 (0.3)	75 (0.5)	0.010
Definite stent thrombosis	147 (0.5)	86 (0.6)	61 (0.4)	0.097
Type of definite stent thrombosis				0.051
Acute	14 (9.5)	8 (9.3)	6 (9.8)	0.91
Subacute	59 (40.1)	42 (48.8)	17 (27.9)	0.011
Late	55 (40.5)	25 (29.1)	30 (49.2)	0.013
Very late	19 (12.9)	11 (12.8)	8 (13.1)	0.95

Changing trend in one-year mortality between 2005 and 2015



(Year)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
AMI, %	11.4	11.3	14.2	11.8	14.1	13.6	10.6	7.8	8.0	8.	6.9
Event no. (3,573)	105	507	456	470	414	319	285	310	288	302	174
Total no. (34,337)	918	4,474	3,211	3,968	2,945	2,338	2,694	3,978	3,615	3,686	2,510
STEMI, %	11.9	11.9	15.2	13.2	14.7	14.8	12.4	7.9	8.3	8.0	7.9
Event no. (2,081)	70	326	296	298	227	180	172	155	148	137	90
Total no. (18,271)	589	2,732	1,945	2,263	1,539	1,218	1,392	1.959	1,780	1,718	1,136
NSTEMI, %	10.6	10.4	12.6	10.1	13.3	12.4	8.7	7.7	7.6	8.4	6.1
Event no. (2,589)	35	181	160	172	187	139	113	155	140	165	84
Total no. (16,066)	329	1,742	1,266	1,705	1,406	1,120	1,302	2,019	1,835	1,968	1,374

Changing trend in cardiac death rate for patients with AMI, STEMI, and NSTEMI between 2005 and 2015



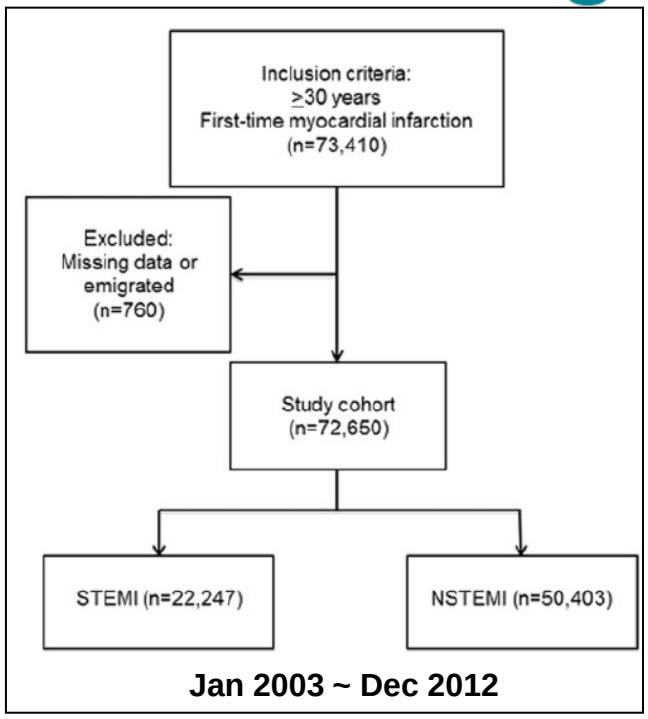
(Year)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
AMI, %	8.2	8.9	10.4	8.2	10.5	9.2	7.6	6.3	6.6	7.1	5.9
Event no. (2,758)	75	396	334	327	310	215	204	251	238	260	148
Total no. (34,337)	918	4,474	3,211	3,968	2,945	2,338	2,694	3,978	3,615	3,686	2,510
STEMI, %	8.8	9.8	11.4	9.1	11.3	10.8	9.3	6.8	6.9	7.3	6.8
Event no. (1,639)	52	267	222	205	174	132	130	133	122	125	77
Total no. (18,271)	589	2,732	1,945	2,263	1,539	1,218	1,392	1,959	1,780	1,718	1,136
NSTEMI, %	7.0	7.4	8.8	7.2	9.7	7.4	5.7	5.8	6.3	6.9	5.2
Event no. (1,119)	23	129	112	122	136	83	74	118	116	135	71
Total no. (16,066)	329	1,742	1,266	1,705	1,406	1,120	1,302	2,019	1,835	1,968	1,374

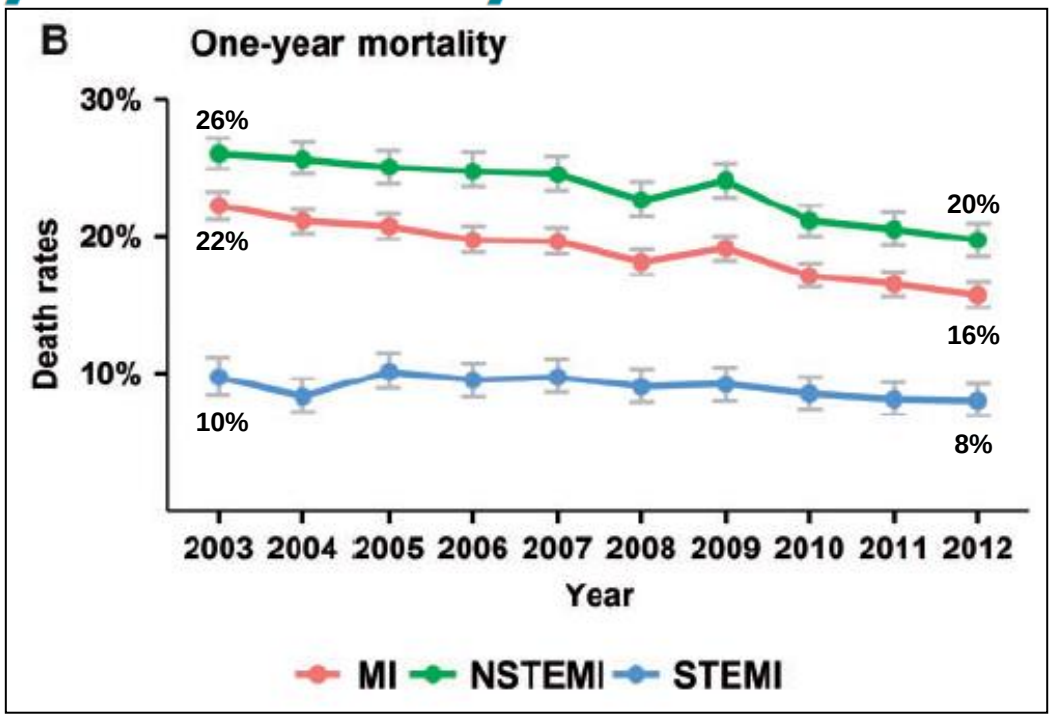
European Heart Journal - Cardiovascular Pharmacotherapy
doi:10.1093/ehjcvp/pvx016

ORIGINAL ARTICLE
Prevention and epidemiology

The Danish National Patient Registry

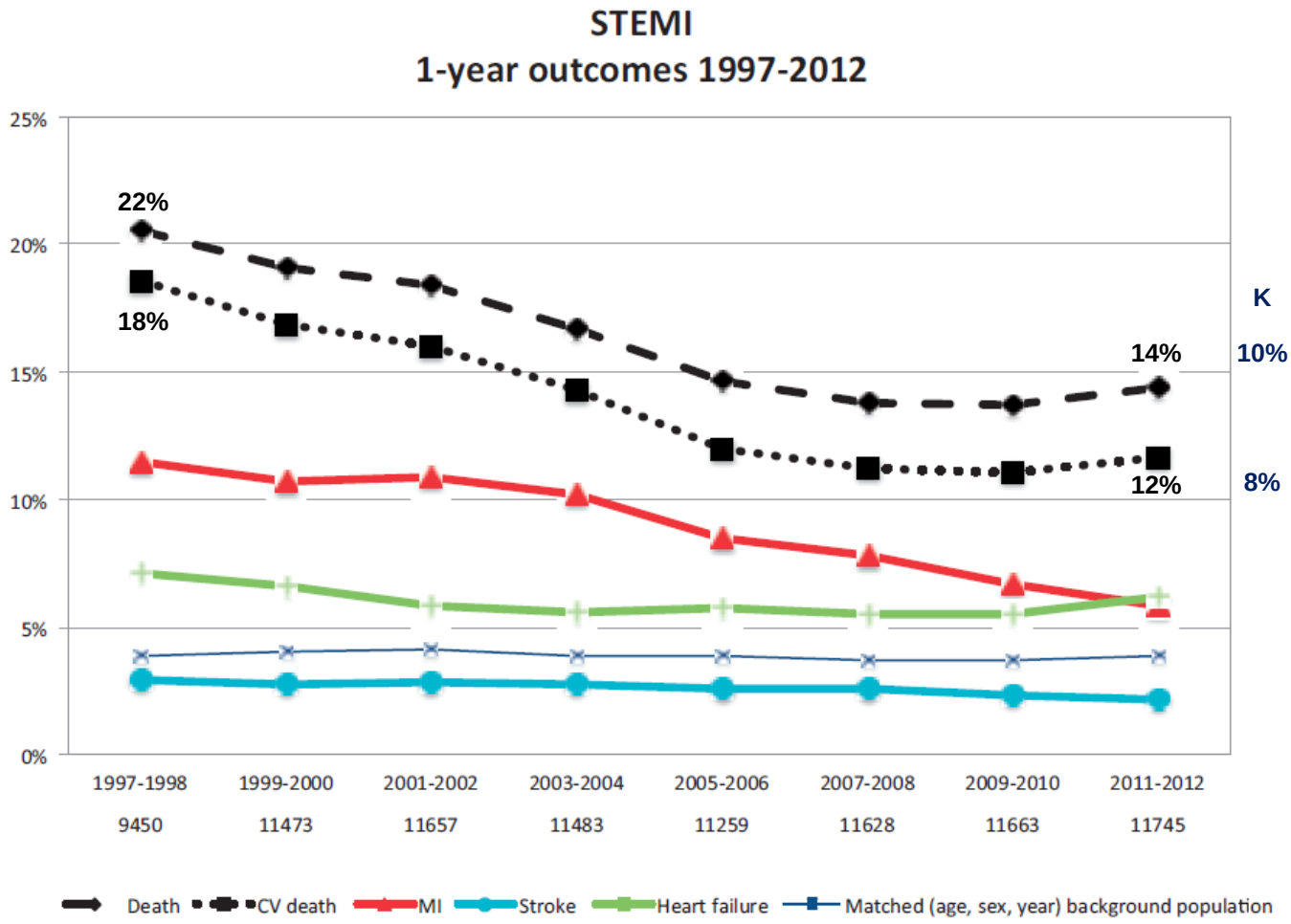
Temporal trends in acute myocardial infarction presentation and association with use of cardioprotective drugs: a nationwide registry-based study





European Heart Journal (2017) **0**, 1–10
doi:10.1093/eurheartj/ehx515

Improved outcomes in patients with ST-elevation myocardial infarction during the last 20 year are related to implementation of evidence-based treatments: experiences from the SWEDEHEART registry 1995-2004



Conclusions

- **The proportion of STEMI decreased and radial access increased as shown in Western registries**

- **The prevalence of risk factors including hypertension, DM, and dyslipidemia increased, but dyslipidemia was relatively lower compared with which in other Western registries.**

- **Regarding interventional strategies, our study evidently showed the difference from Western studies.**

- **PCI was highly performed for all patients AMI with and without ST-elevation.**

Conclusions

- **The rate of primary PCI was over 90% since 2010.**
- **Moreover, the use of DES implantation in patients with STEMI was notably higher, over 90% since 2006, than in Western registries.**
- **One-year mortality improved and was relatively lower than which in Western registries.**
- **Therefore, Guidelines for Asian patients with AMI should be needed due to the differences in between Asia and Western patients with AMI.**

Thank you for your attention

GICS 2018

16th Gwangju International Interventional Cardiology Symposium

June 7 ~ 9, 2018

Place: Kimdaejung Convention Center in Gwangju, Korea

Course Directors

Myung Ho Jeong, MD / Youngkeun Ahn, MD

Ju Han Kim, MD / Young-Joon Hong, MD