



Current Status of AMI Treatment in Korea

~ Based on KAMIR Registry ~

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Global Registries for AMI

GRACE The **G**lobal **R**egistry of **A**cute **C**oronary **E**vents

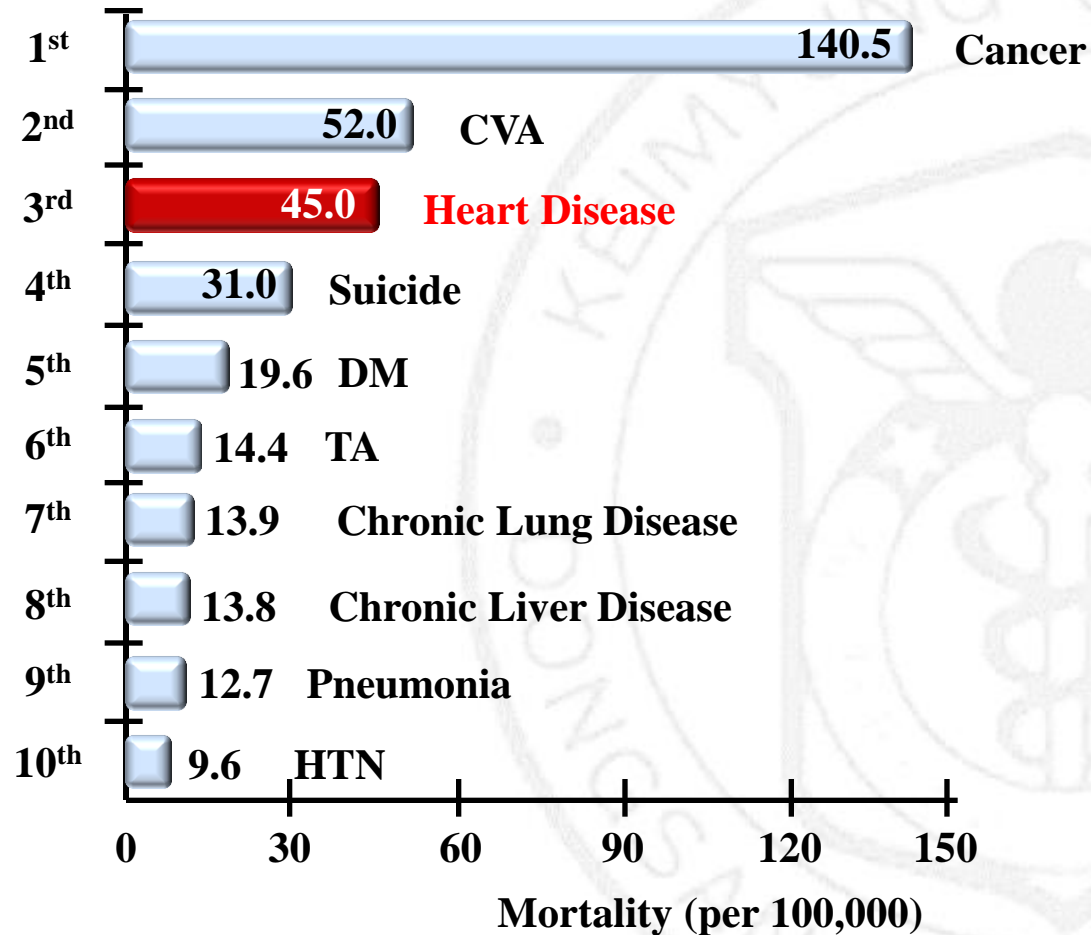
- ✓ From 1999
- ✓ Participated 30 countries, 247 Institutes
- ✓ Over 100,000 ACS Patients have enrolled

OPERA

Observatoire sur la **P**rise en charge hospitalie`re, l'**E**volution a` un an et les ca**R**actéristiques de patients présentant un inf**A**rctus du myocarde avec ou sans onde Q

- ✓ From 2002 to 2003
- ✓ Participated 56 Institutes in France
- ✓ 2,176 AMI patients have enrolled

Cause of Death (2009)



How About in Korea?

KAMIR

Korea Acute Myocardial Infarction Registry

- ✓ From Nov. 2005
- ✓ Participated 55 Institutes in Korea
- ✓ Over 30,000 patients have enrolled



KAMIR

Korea Acute Myocardial Infarction Registry

Principal Investigator: Jeong MH

Sub-investigators: Kim YJ, Kim CJ, Cho MC, Ahn YK

Co-investigators: 55 primary PCI centers

Ko YP, Koo BG, Gwon HC, Kim KS, Kim DI, Kim MH, Kim BO, Kim SW, Kim SJ, Kim YJ, Kim JK, Kim CJ, Kim TI, Rha SW, Rhew JY, Park GS, Park SW, Park SH, Bae JH, Seong IW, Seung KB, Ahn YK, Ahn TH, Yang JY, Oh SK, Yoon Jh, Lee HS, Lee MY, Lee SH, Lee SW, Rhim JY, Jeong KT, Jeong MH, Chung WS, Jeong HJ, Cho MC, Cho JH, Cho JM, Joo SJ, Jin DG, Jin SW, Chae SC, Chae IH, Chae JK, Choi DH, Tahk SJ, Han KR, Hur SH, Hwang JY

Steering Committee:

Park SJ, Jang YS, Seung KB, Chung WS, Cho JG, Kim YJ, Kim CJ, Cho MC, Yoon JH, Chae IH, Jeong MH

Three Phases of KAMIR Study

KAMIR-I
(Nov 2005-Dec 2006)

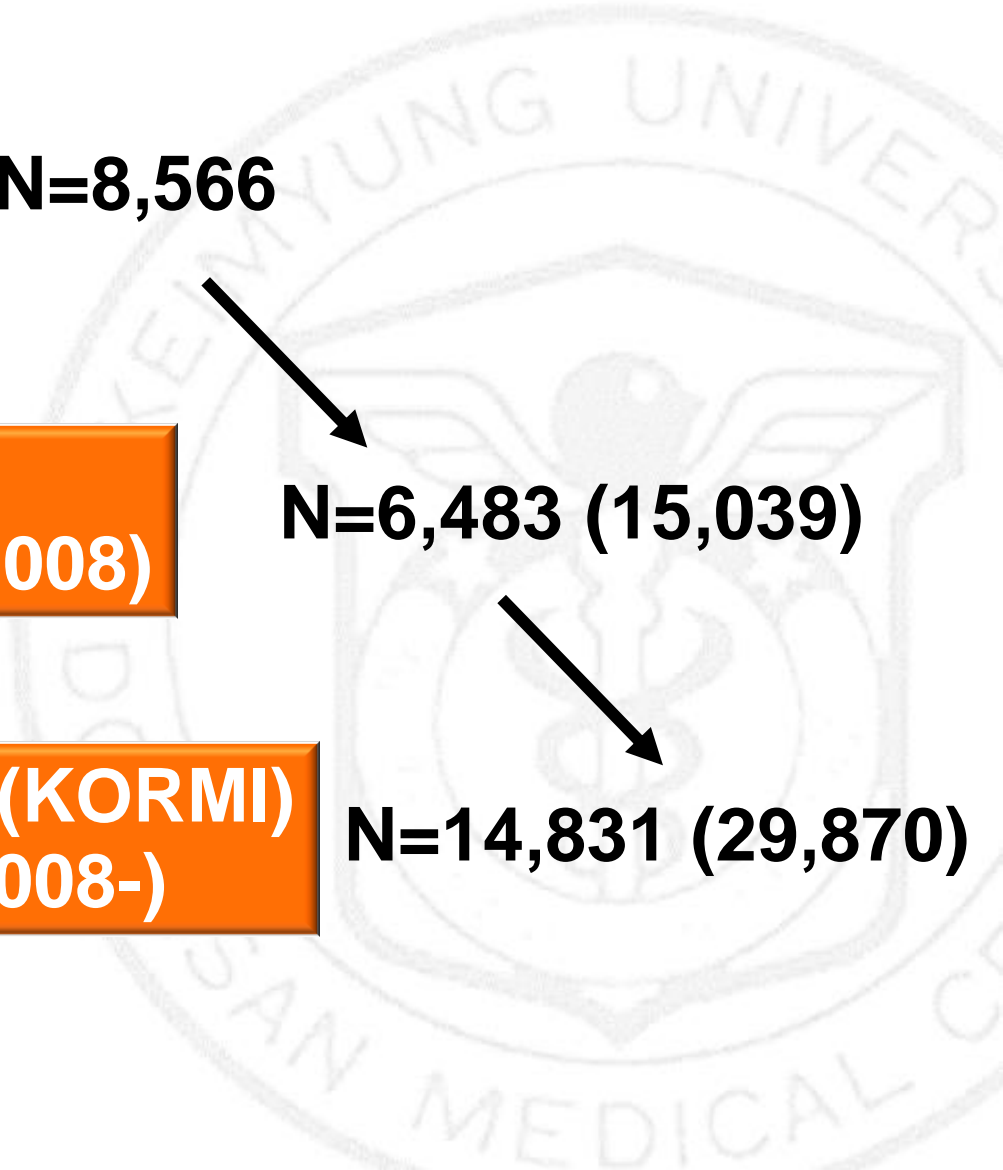
N=8,566

KAMIR-II
(Jan 2007-Jan 2008)

N=6,483 (15,039)

KAMIR-III (KORMI)
(Feb 2008-)

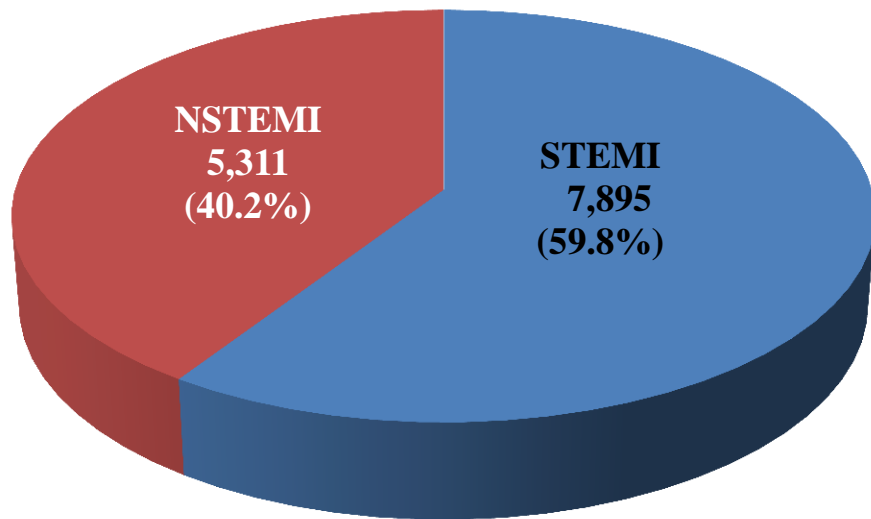
N=14,831 (29,870)



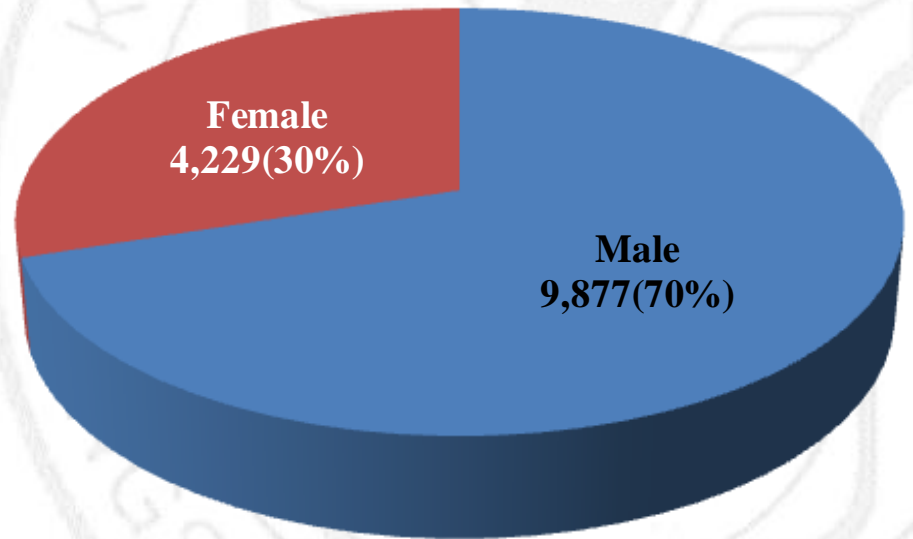
Patient Characteristics

Data from 13,133 Patients in KAMIR Registry

NSTEMI vs. STEMI



Female vs. Male



In-hospital & 1-month MACE

STEMI > NSTEMI

(%)	STEMI (N= 7,890)	NSTEMI (N= 5,103)	<i>p</i> value
In-hospital death	504 (6.4)	199 (3.8)	<0.001
1-month MACE			
Cardiac death	571 (8.5)	255 (5.7)	<0.001
Non-cardiac death	27 (0.4)	19 (0.4)	0.501
Myocardial infarction	30 (0.4)	33 (0.7)	0.821
Re-PCI	62 (1.0)	37 (0.9)	0.324
Target Vessel Revascularization	18 (0.2)	14 (0.2)	0.648
Non-TVR	41 (0.5)	22 (0.4)	0.303
Target Lesion Revascularization	16 (0.2)	10 (0.2)	0.973
CABG	16 (0.2)	20 (0.4)	0.254
Composite	705 (10.4)	364 (8.2)	0.003

12-month MACE

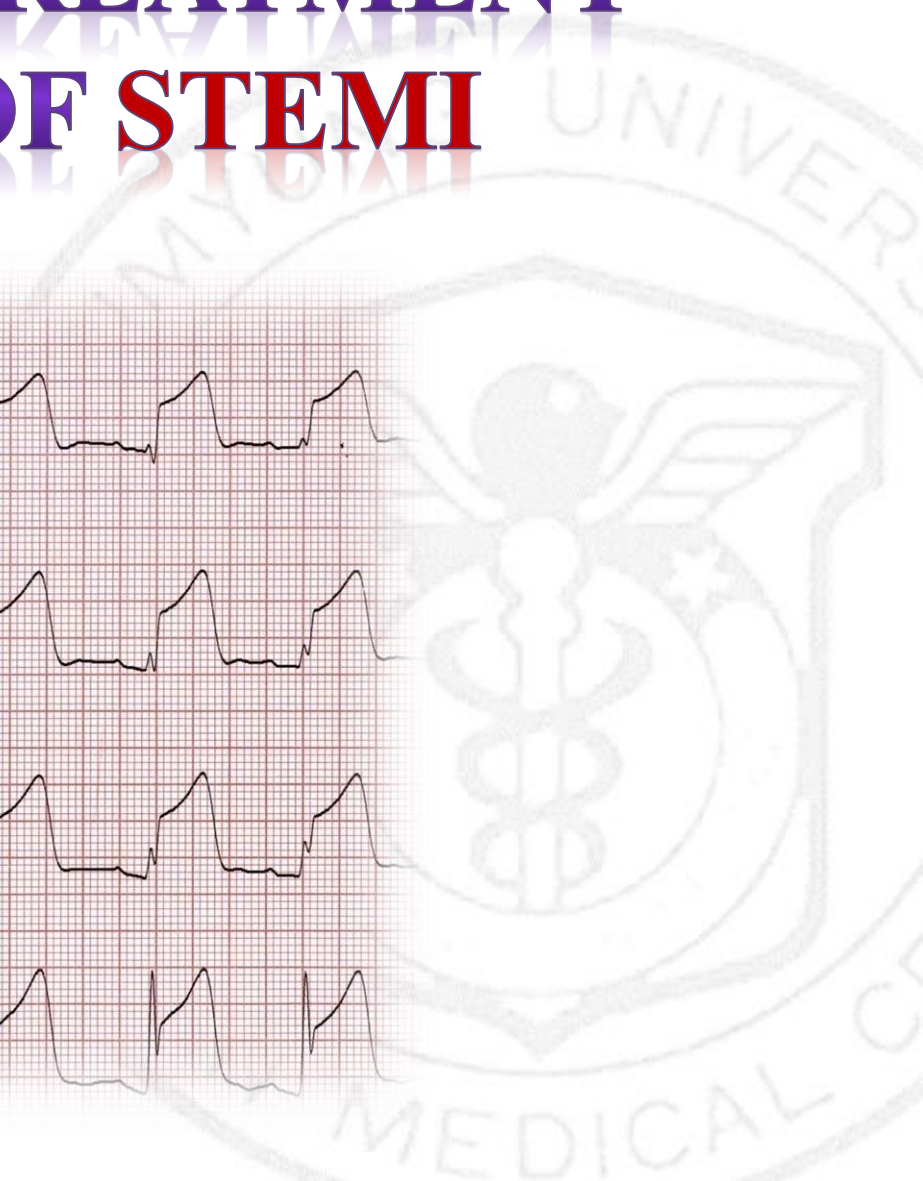
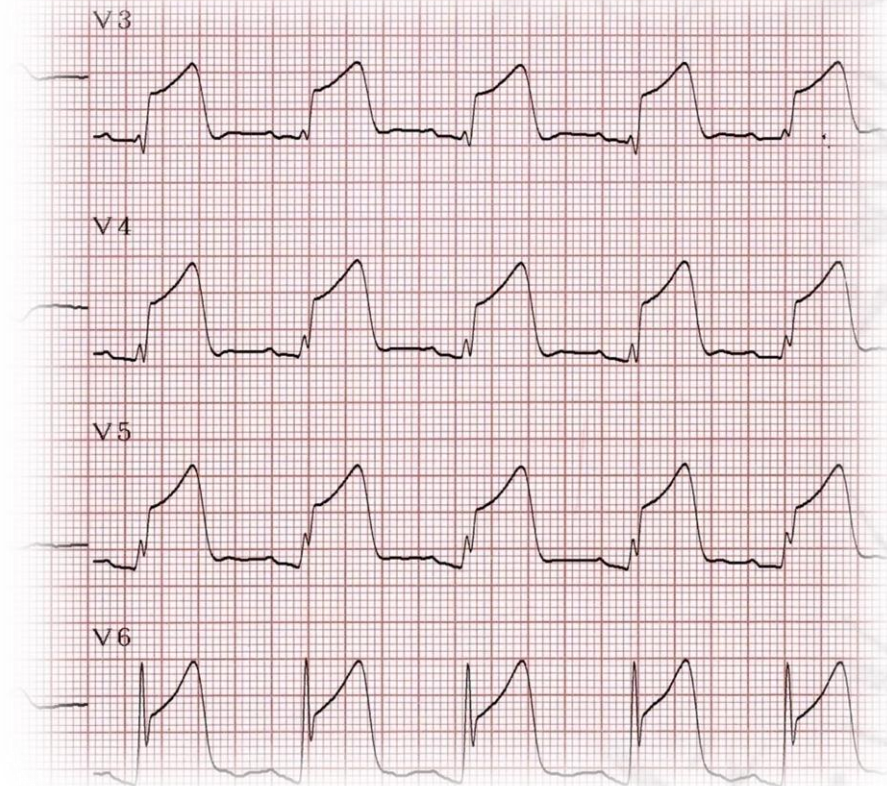
STEMI = NSTEMI

	STEMI (N= 5,110)		NSTEMI (N= 3,315)		<i>p</i> value
12-month MACE (%)					
Cardiac death	630	(12.3)	315	(9.5)	0.009
Non-cardiac death	67	(1.3)	61	(1.8)	0.681
Myocardial infarction	51	(1.0)	63	(1.9)	0.072
Re-PCI	389	(7.6)	210	(6.3)	0.110
TVR	69	(1.5)	42	(1.4)	0.516
Non-TVR	190	(3.7)	94	(2.8)	0.227
TLR	138	(2.7)	79	(2.3)	0.574
CABG	25	(0.5)	27	(0.8)	0.132
Composite	1,162	(22.7)	676	(20.4)	0.121

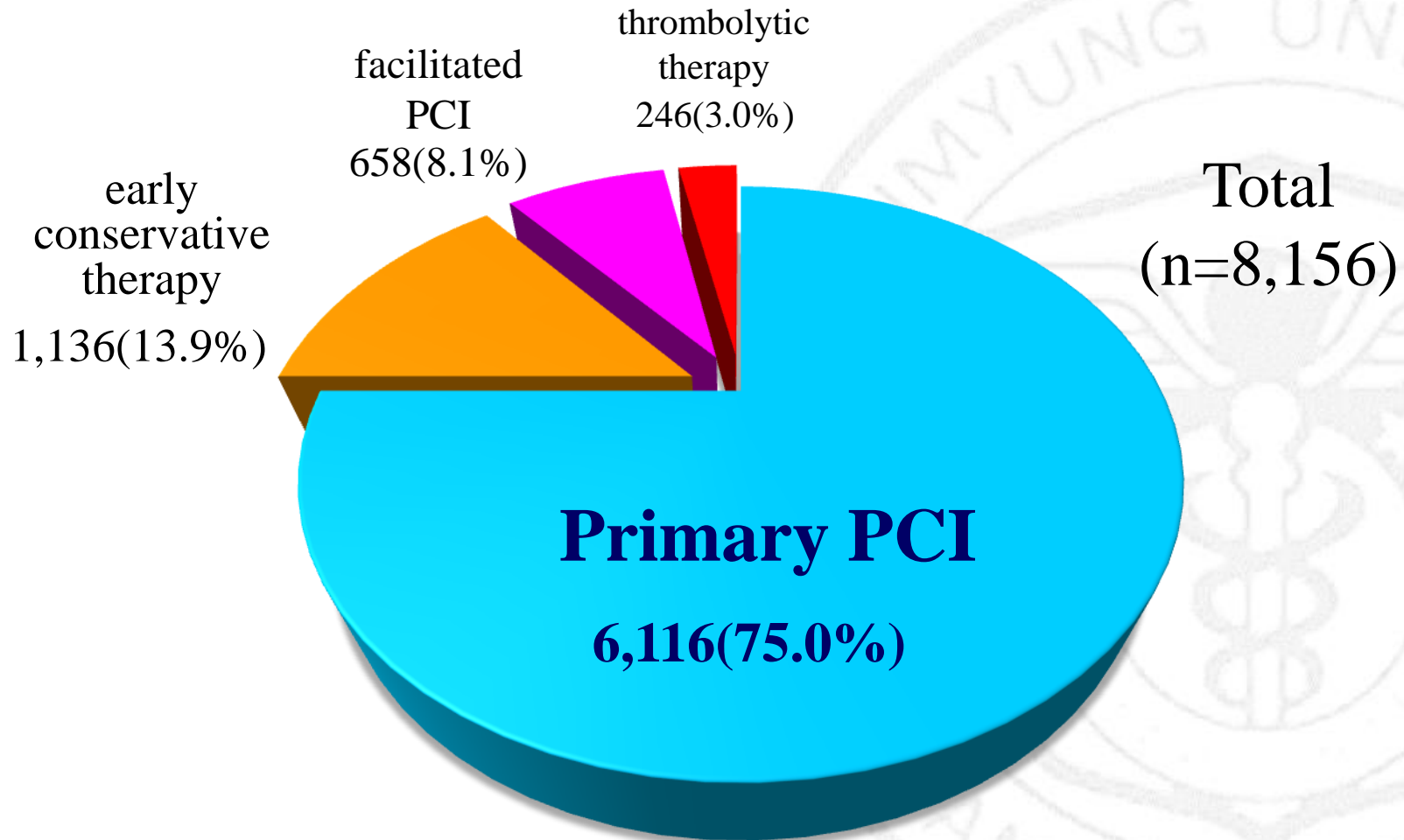
Predictors of One-Year Mortality

- elderly patient (≥ 75 yo)
- ventricular arrhythmia/fibrillation during admission
- left ventricular dysfunction
- multi-vessel disease
- biomarker
 - troponin, CK-MB
 - B-type natriuretic peptide (BNP)
 - N-terminal natriuretic peptide (NT-proBNP)

CURRENT TREATMENT STATUS OF STEMI



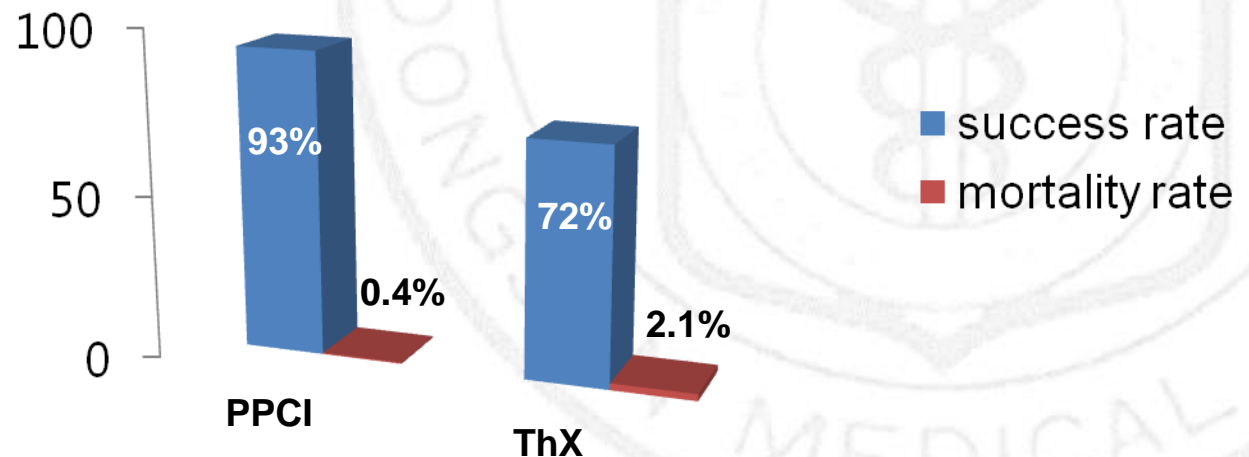
Initial Strategy of Reperfusion Therapy in STEMI



Results of PCI bw Therapeutic Modality

STEMI (n=4019)	P-PCI (n=2847)	ThX (n=501)	ConTx (n=625)	p-value
Methods of PCI, n (%)				<0.001
Balloon only	203 (7)	52 (13)	87 (19)	
Stent implantation	2526 (93)	365 (88)	372 (81)	
Type of deployed stent, n (%)				0.005
DES	2292 (92)	329 (91)	336 (91)	
BMS	202 (8)	33 (9)	34 (9)	

Results by therapeutic modality

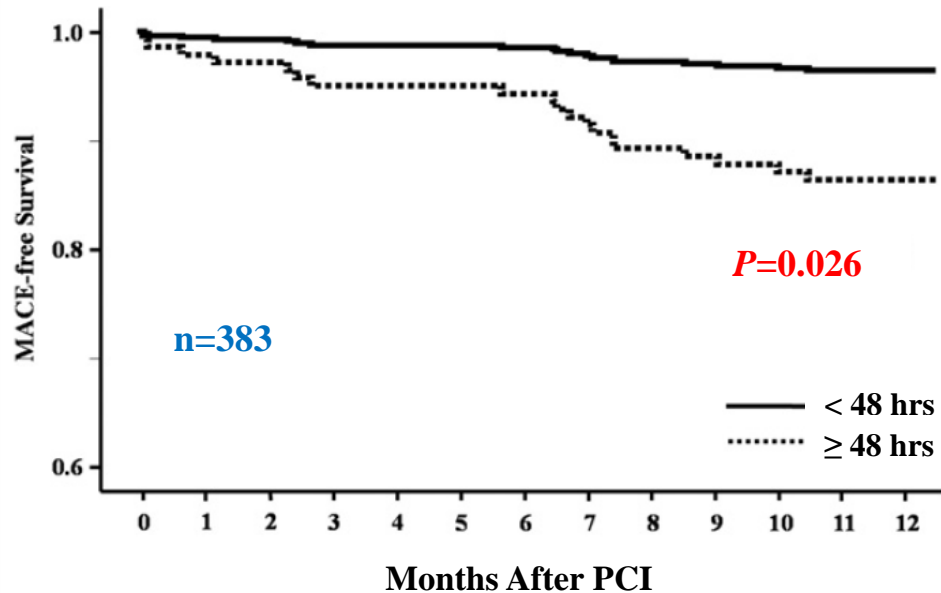


Multivariate Analysis on Decision of Strategy (P-PCI vs. Thrombolytic therapy) in STEMI

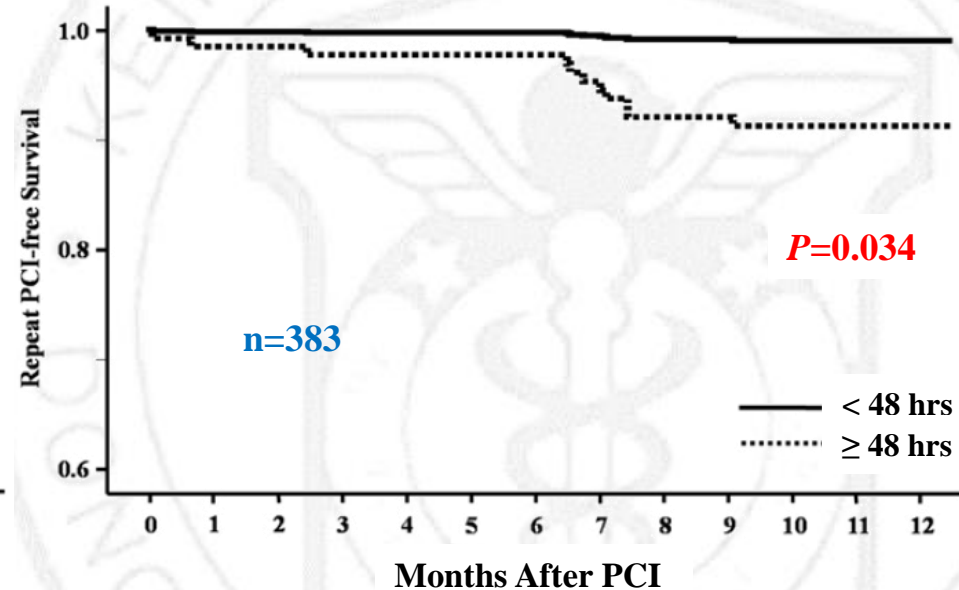
Variables	Odds ratio (95% CI)	p-value
CAVB	0.240 (0.096-0.597)	0.002
Pre-infarct AP	0.706 (0.573-0.869)	0.001
Age >75	0.666 (0.457-0.969)	0.034
Onset to door time		0.001
61~180	0.907 (0.678-1.214)	0.371
181~360	1.039 (0.766-1.409)	0.214
361~720	0.702 (0.477-1.033)	0.051
721~1440	0.455 (0.281-0.738)	0.001
1441~	0.421 (0.241-0.735)	0.002

Safety and Benefit of Early Elective PCI After Successful Thrombolytic Therapy for AMI

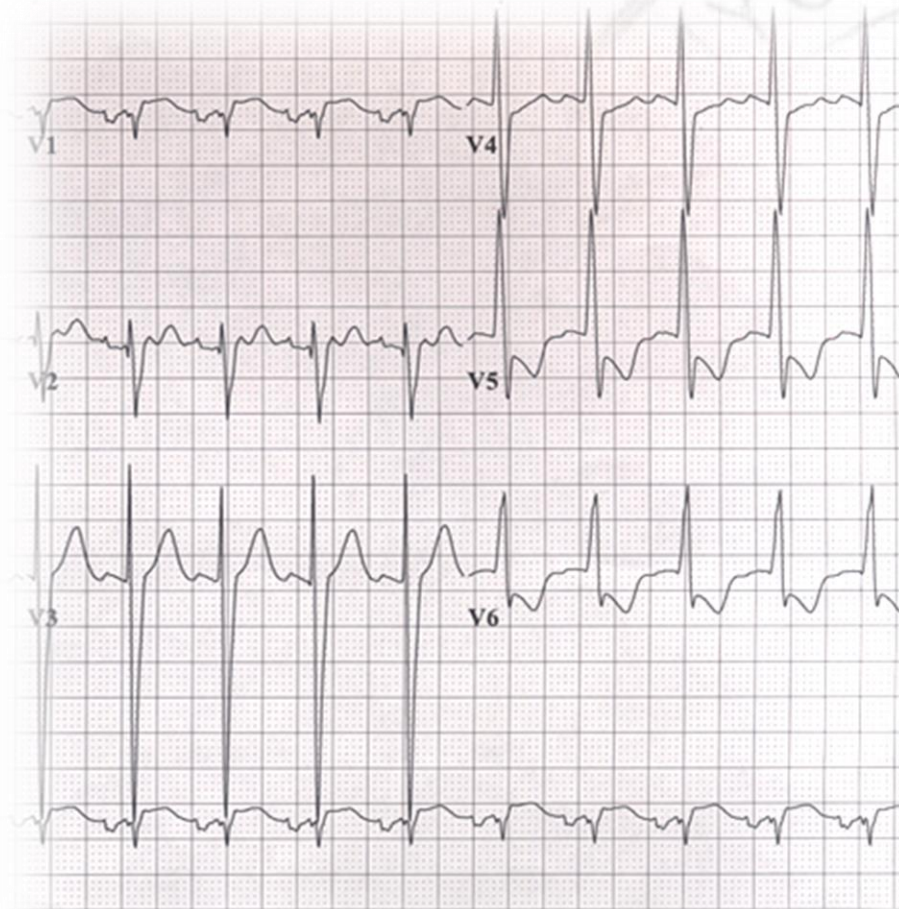
MACE-free Survival



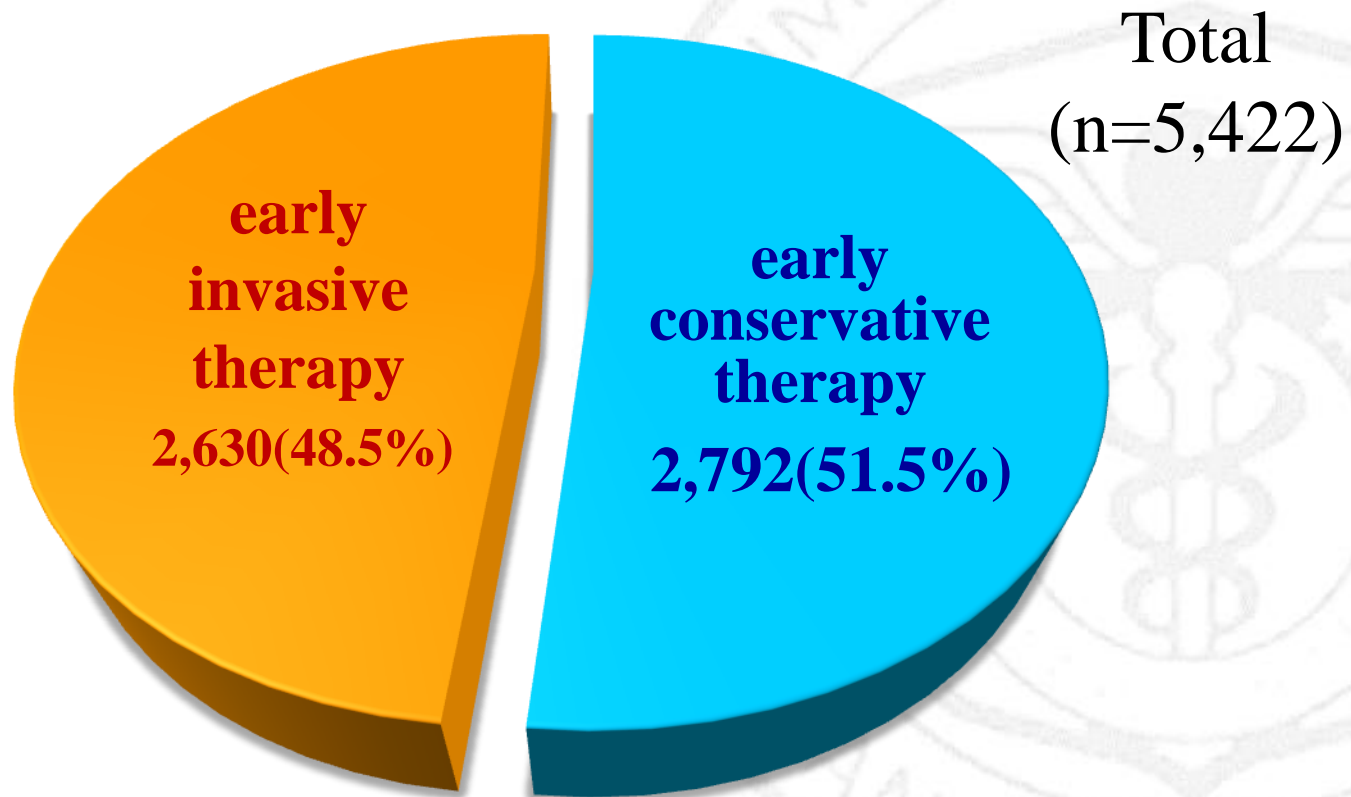
Repeat PCI-free Survival



CURRENT TREATMENT STATUS OF NSTEMI



Initial Strategy of Reperfusion Therapy in STEMI

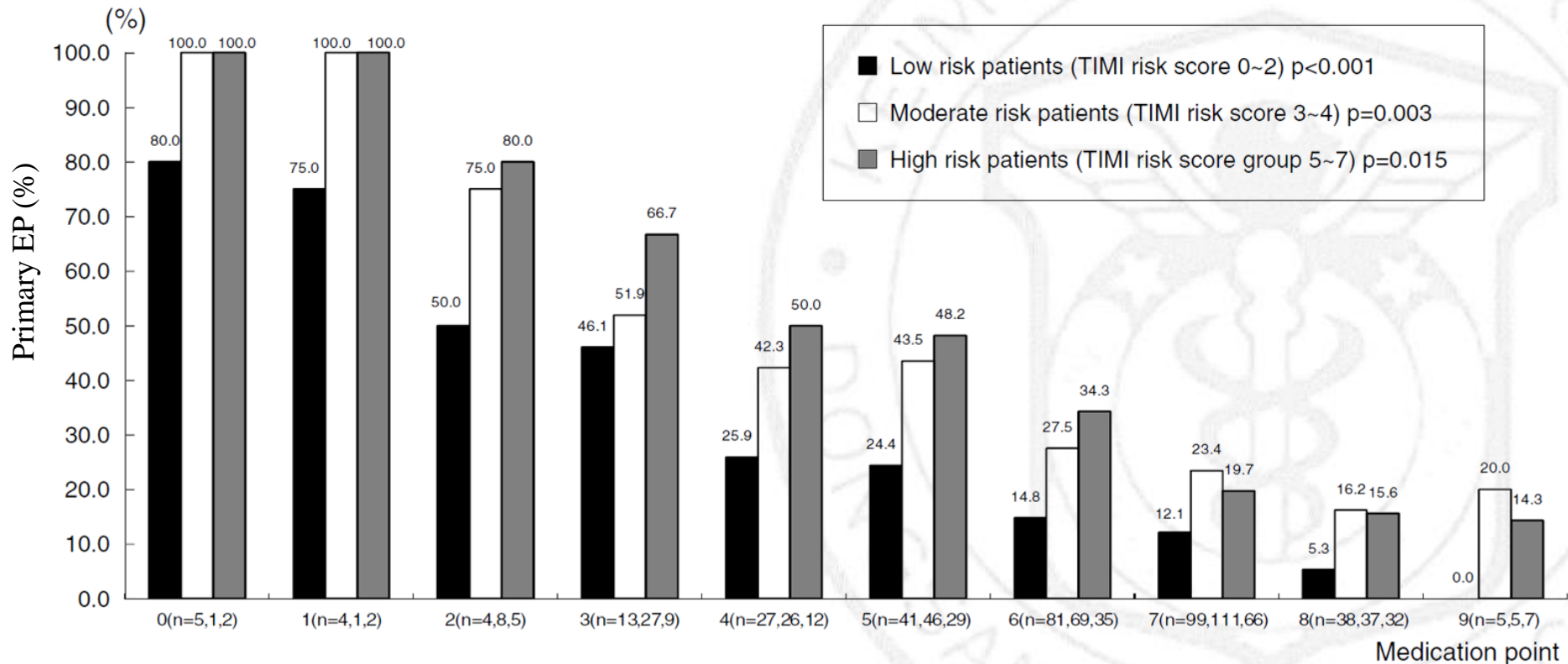


PCI in NSTEMI

	NSTEMI (n=4,955)		
	Invasive (n=2,415)	Conservative (n=2,540)	p-value
Methods of PCI, n (%)			<0.001
Balloon only	361 (14)	402 (15)	
Stent implantation	1837 (76)	1473(58)	
Type of deployed stent, n (%)			0.041
DES	1679 (92)	1319 (90)	
Bare metal stent	139 (7)	141 (7)	

Primary Endpoints According to Conservative Pharmacotherapy Index Values

- Primary endpoint was the combined in-hospital mortality and morbidity and major adverse cardiac events during 1 month of clinical follow-up.

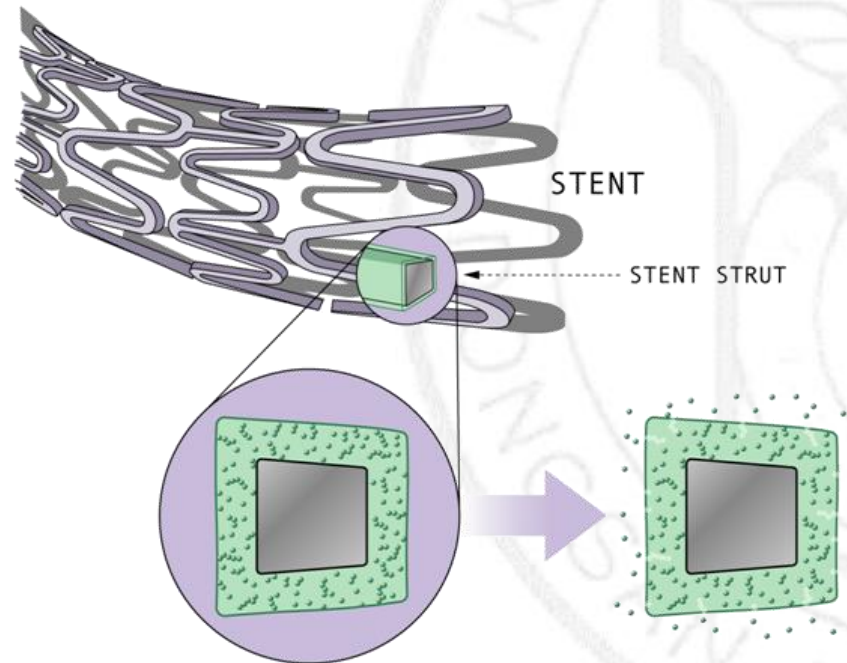


The range of points was from 0 to 10; ASA, clopidogrel, GP IIb/IIIa inhibitor, LMWH or UFH, β -blocker, ACEI/ARB, statin, cilostazol, nicorandil, nitrate

Multivariate Analysis of Predictors for Primary Endpoints in NSTEMI

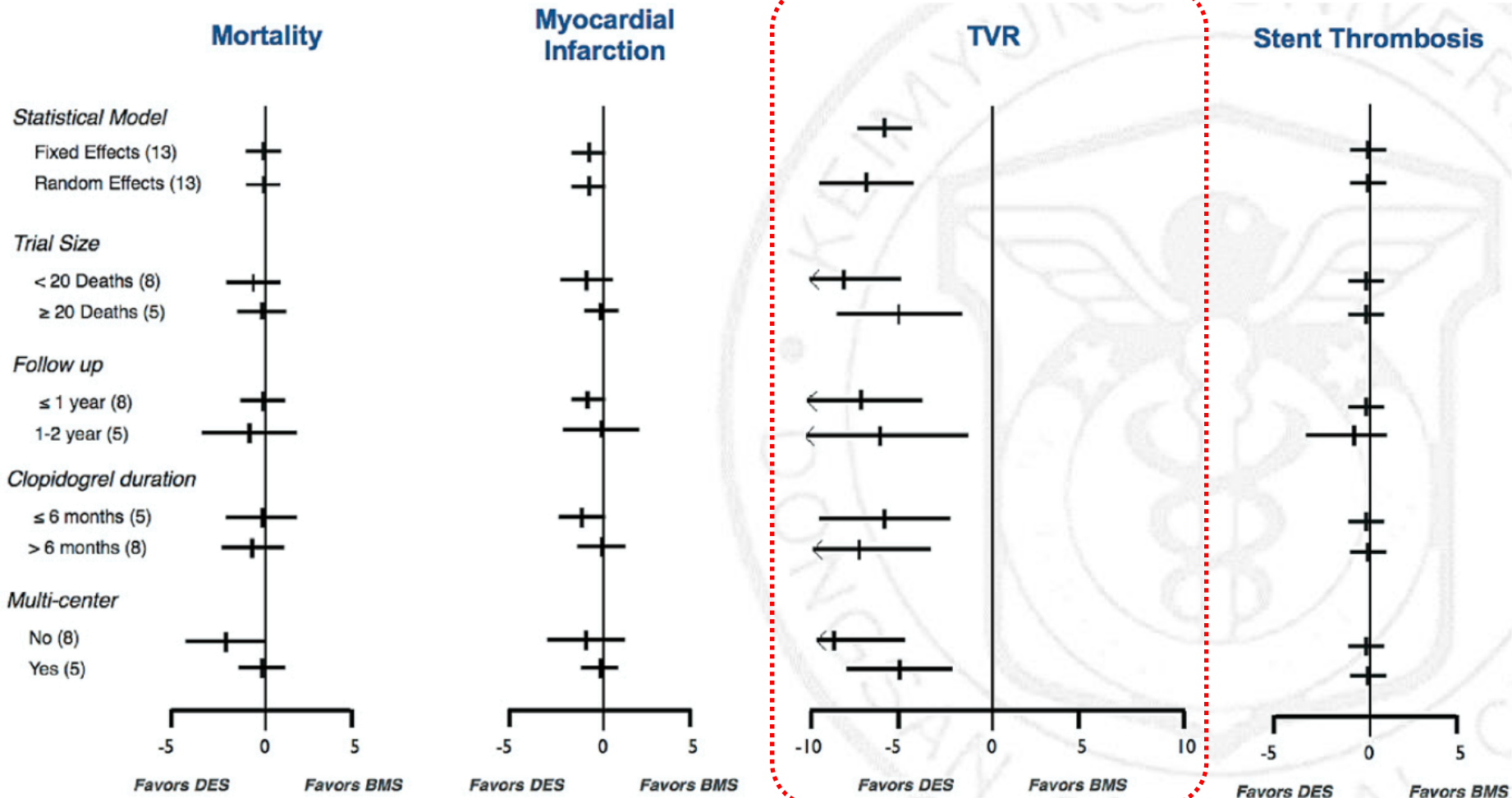
	OR	95% CI	<i>P</i>
High Killip class (\geq II)	2.68	1.831 – 3.924	< 0.001
Low pharmacologic therapy index (\leq 4points)	1.38	1.247 – 1.538	< 0.001
High NT-pro-BNP (\geq 1.018pg/ml)	2.64	1.245 – 5.586	0.011
High hs-CRP (\geq 0.875 mg/dl)	2.19	1.177 – 4.097	0.013
High TIMI risk score (\geq 5 points)	1.33	1.024 – 1.727	0.033
Old age (\geq 65 years)	1.97	0.748 – 5.208	0.169
Diabetes	1.32	0.607 – 2.849	0.487
High LDL (\geq 100mg/dl)	1.26	0.627 – 2.545	0.513
Low ejection fraction (50%)	1.00	0.974 – 1.037	0.752
High troponin I (\geq 10ng/ml)	1.00	0.995 – 1.005	0.999

DRUG-ELUTING STENT TREATMENT IN AMI



DES in AMI: Meta-analysis

- ✓ 13 RCTs: 7,352 patients randomized to DES (n=4,515) or BMS (n=2,837)
- ✓ 18 Registry studies (“real-world” setting): 26,521 patients treated with DES (n=11,866) or BMS (n=14,656)



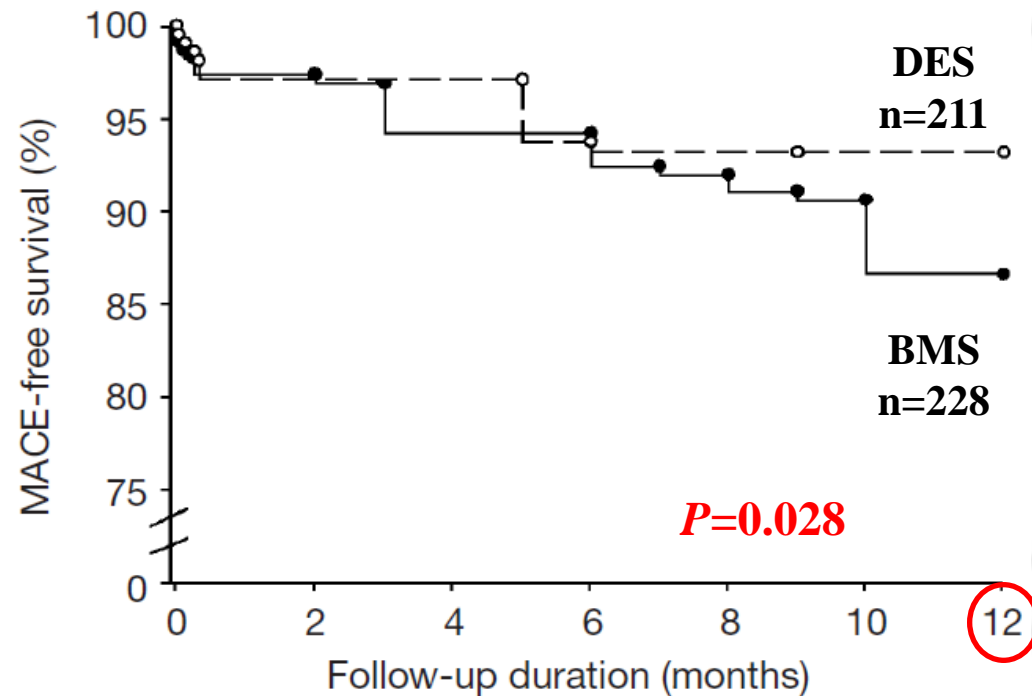
Clinical Outcomes: DES vs. BMS

~ AMC data ~

**Clinical Outcomes
in 30 days and 1 year**

	BMS (n=228)	DES (n=211)	p Value
30-day MACE(%)	5(2.2)	4(1.9)	1
Death(%)	1	0	1
MI(%)	4(1.8)	4(1.9)	1
TVR(%)	0	0	0
Stent thrombosis(%)	2(0.9)	4(1.9)	0.434
One-year MACE(%)	32(14.0)	14(6.6)	0.011
Death(%)	3(1.3)	0(0)	0.249
MI(%)	7(3.1)	5(2.4)	0.653
TVR(%)	22(9.6)	9(4.2)	0.028
Stent thrombosis(%)	2(0.9)	0(0)	0.5

**Survival free
of Death, MI, TVR**



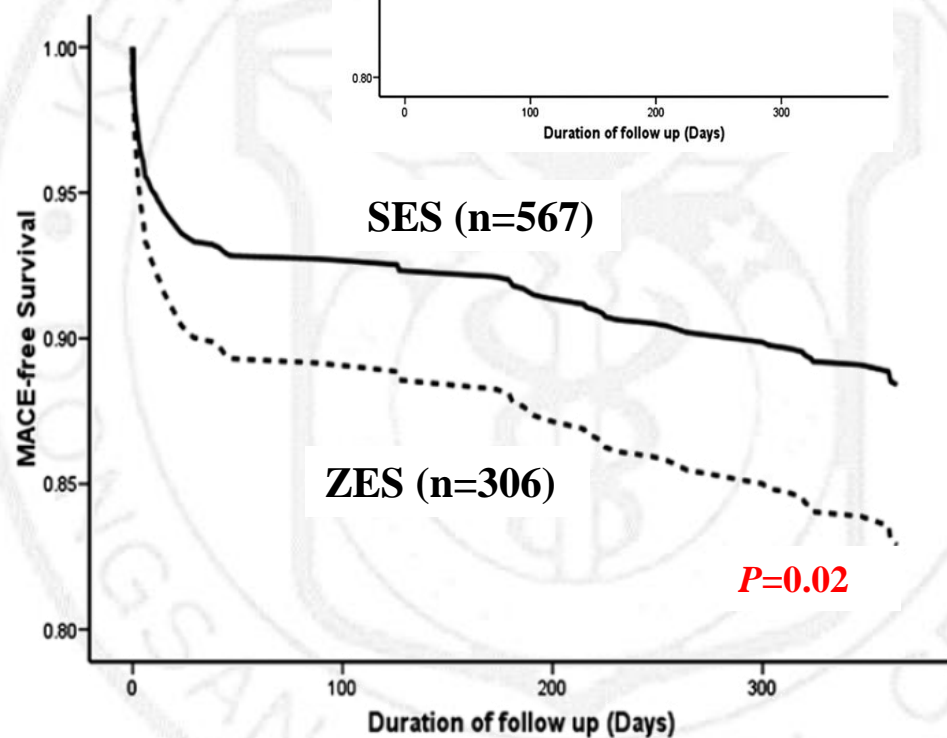
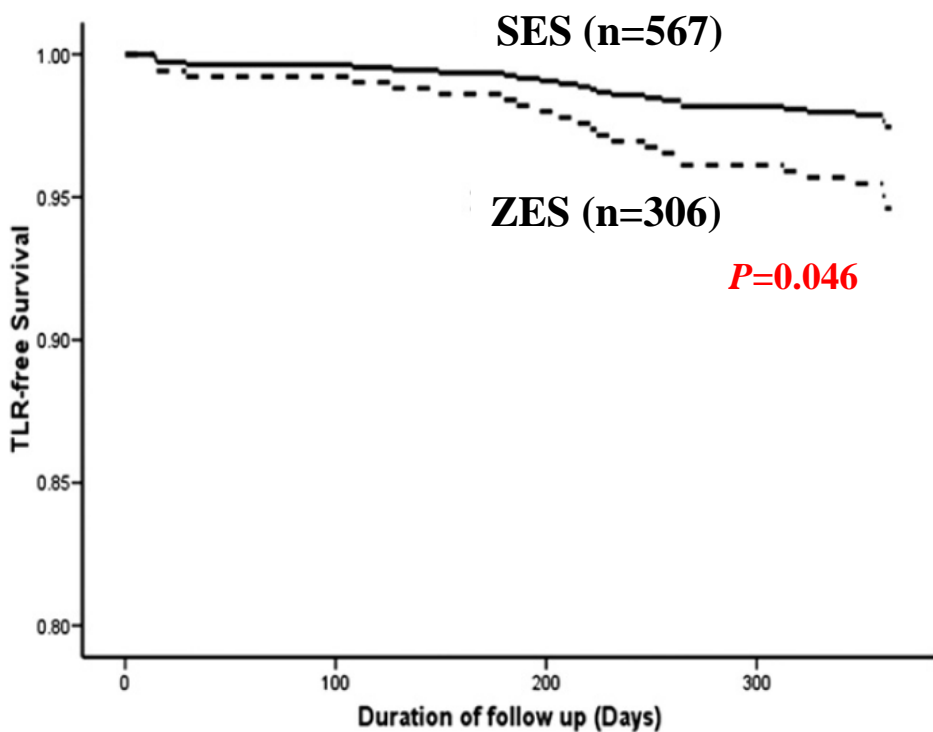
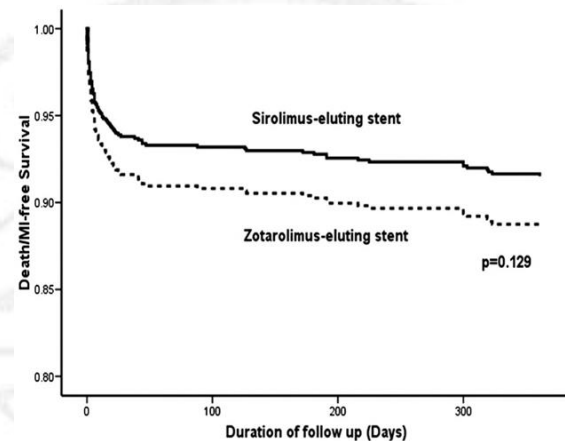
MACE at 1 month, 6 months after SES or PES implantation in AMI patients

~ *KAMIR data* ~

	SES (n=834)	PES (n=707)	<i>P value</i>
1 month			
<i>Death</i>	0 (0.0%)	2 (0.3%)	0.210
<i>MI</i>	6 (0.7%)	2 (0.3%)	0.301
<i>TLR</i>	1 (0.1%)	3 (0.4%)	0.339
<i>MACE</i>	7 (0.8%)	7 (1.0%)	0.793
6 months			
<i>Death</i>	4 (0.5%)	6 (0.8%)	0.527
<i>MI</i>	7 (0.5%)	5 (0.7%)	1.000
<i>TLR</i>	21 (2.5%)	26 (3.7%)	0.234
<i>MACE</i>	32 (3.8%)	37 (5.2%)	0.177
Stent thrombosis			
<i>Total</i>	9 (1.1%)	8 (1.1%)	1.000
<i>Early</i>	2 (0.2%)	1 (0.2%)	1.000
<i>Late</i>	7 (0.8%)	7 (1.0%)	0.793

12 Month TLR and MACE free survival in STEMI with SES and ZES

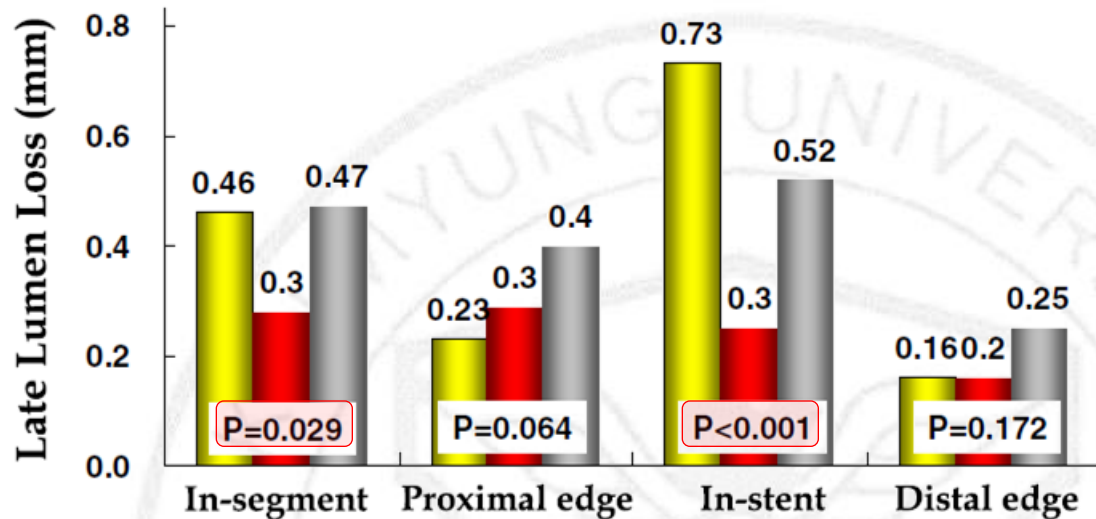
~ *KAMIR data* ~



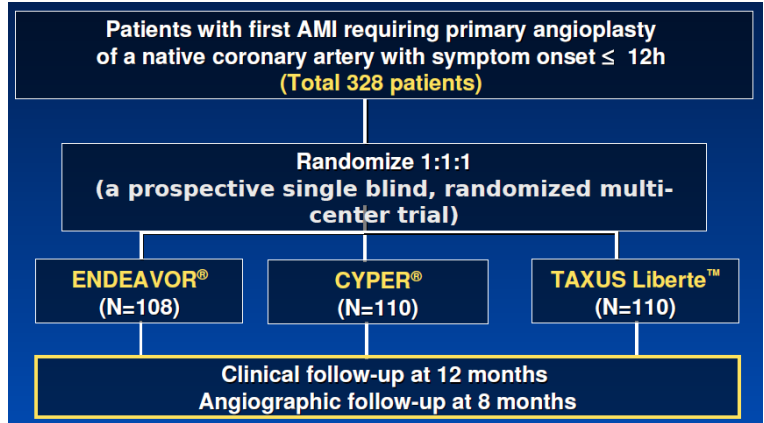
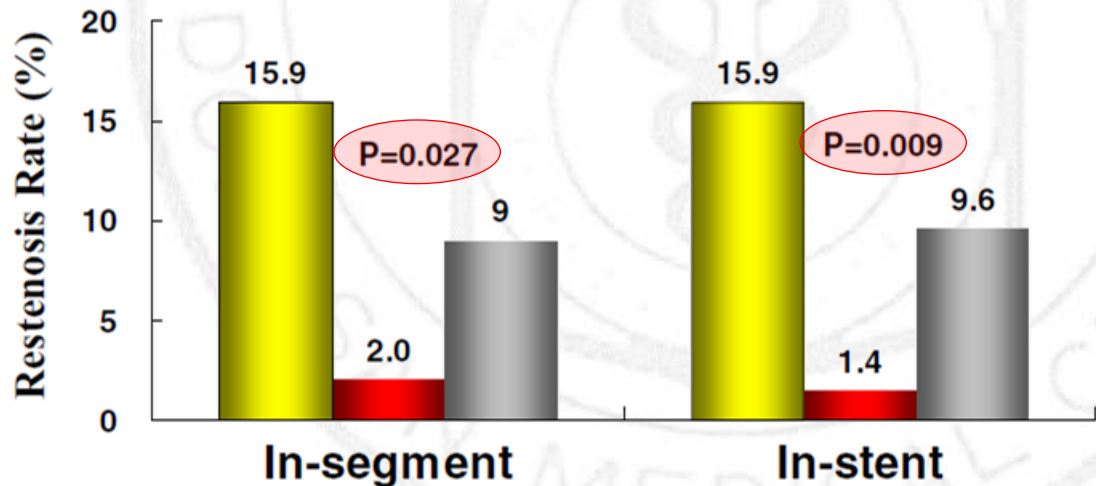
ZES vs. SES vs. PES during PPCI

~ ZEST-AMI trial ~

Between Sept 2006 and Sept 2007
328 pts with STEMI were enrolled
and randomized to
the ZES group (n=108),
the SES group (n=110),
the PES group (n=110).

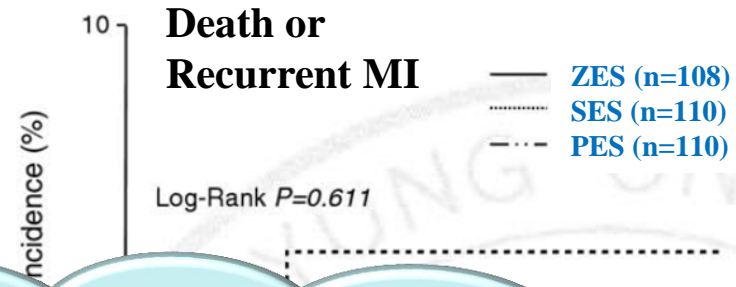
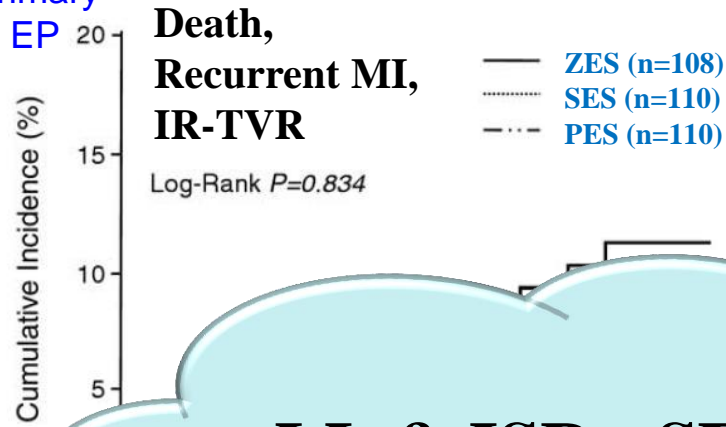


ZES (n = 108) SES (n = 110) PES (n = 110)

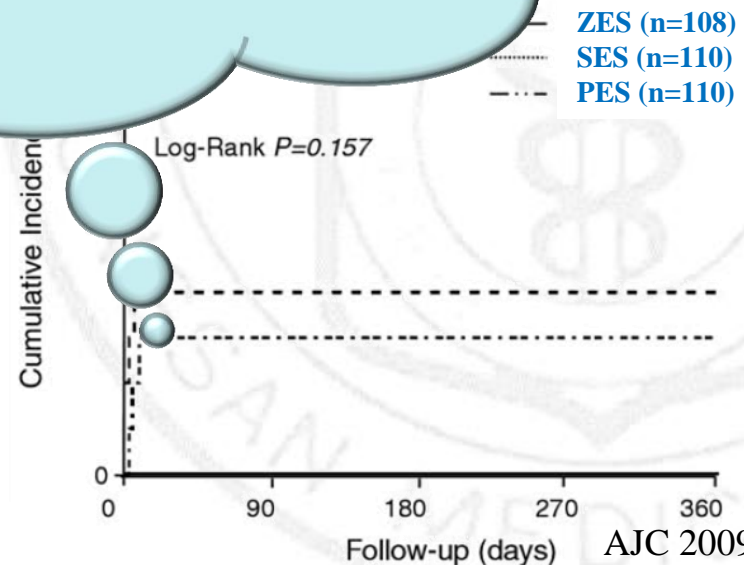
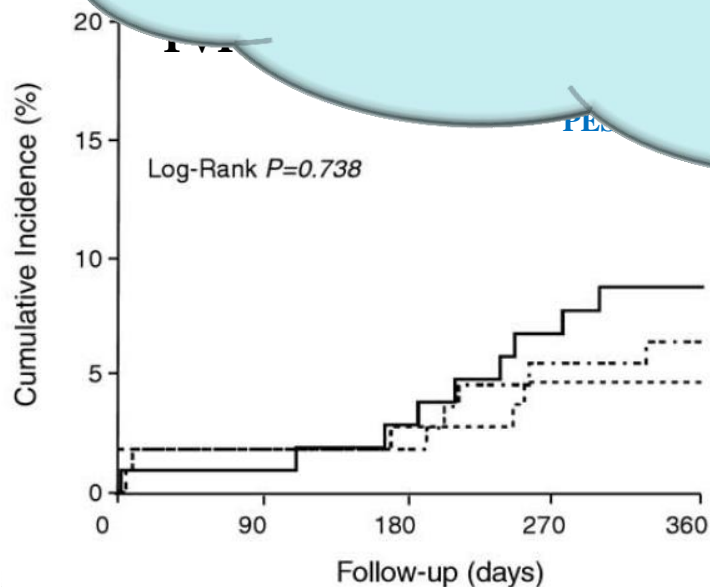


ZEST-AMI: Endpoints

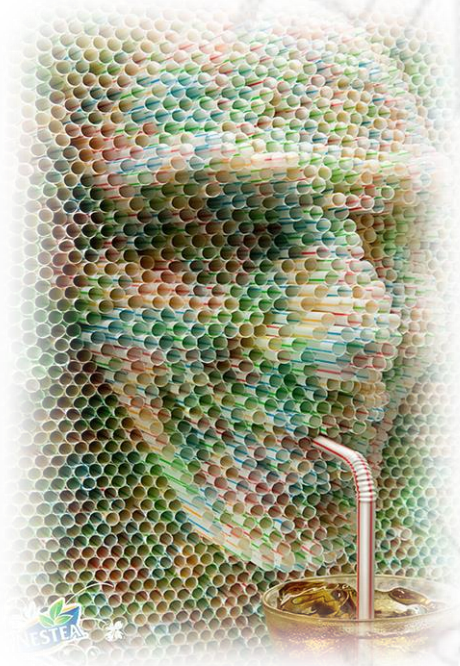
Primary
EP



- **LL & ISR: SES < ZES or PES**
- **ST & IR-TLR: ZES = SES = PES**



THROMBUS ASPIRATION IN STEMI



ESTEA



Recommendations	Class	Level
If performed by an experienced team as soon as possible after FMC	I	A
Time from FMC - balloon should be < 2h in any case and <90min in patients presenting early(e.g.<2 h) with large infarct and low bleeding risk	I	B
Patients in shock & contraindications to fibrinolysis irrespective of time delay	I	B
Antiplatelet co-therapy		
Aspirin	I	B
NSAID and COX-2 selective inhibitors	III	B
Clopidogrel loading dose	I	C
GPIIb/IIIa antagonist		
Abciximab	IIa	A
Tirofiban	IIb	B
Eptifibatide	IIb	C
Antithrombin therapy		
Heparin	I	C
Bivalirudin	IIa	B
Fondaparinux	III	B
Adjunctive devices		
Thrombus aspiration	IIb	B

AHA Scientific Statement

2009 Focused Updates: ACC/AHA Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction (Updating the 2004 Guideline and 2007 Focused Update) and ACC/AHA/SCAI Guidelines on Percutaneous Coronary Intervention (Updating the 2005 Guideline and 2007 Focused Update)

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

2009 Joint STEMI/PCI Focused Update	
Recommendation	Comments

Class IIa

What would ETAMI say?

(Efficacy of Thrombosuction in primary percutaneous coronary intervention of **Acute Myocardial Infarction**)

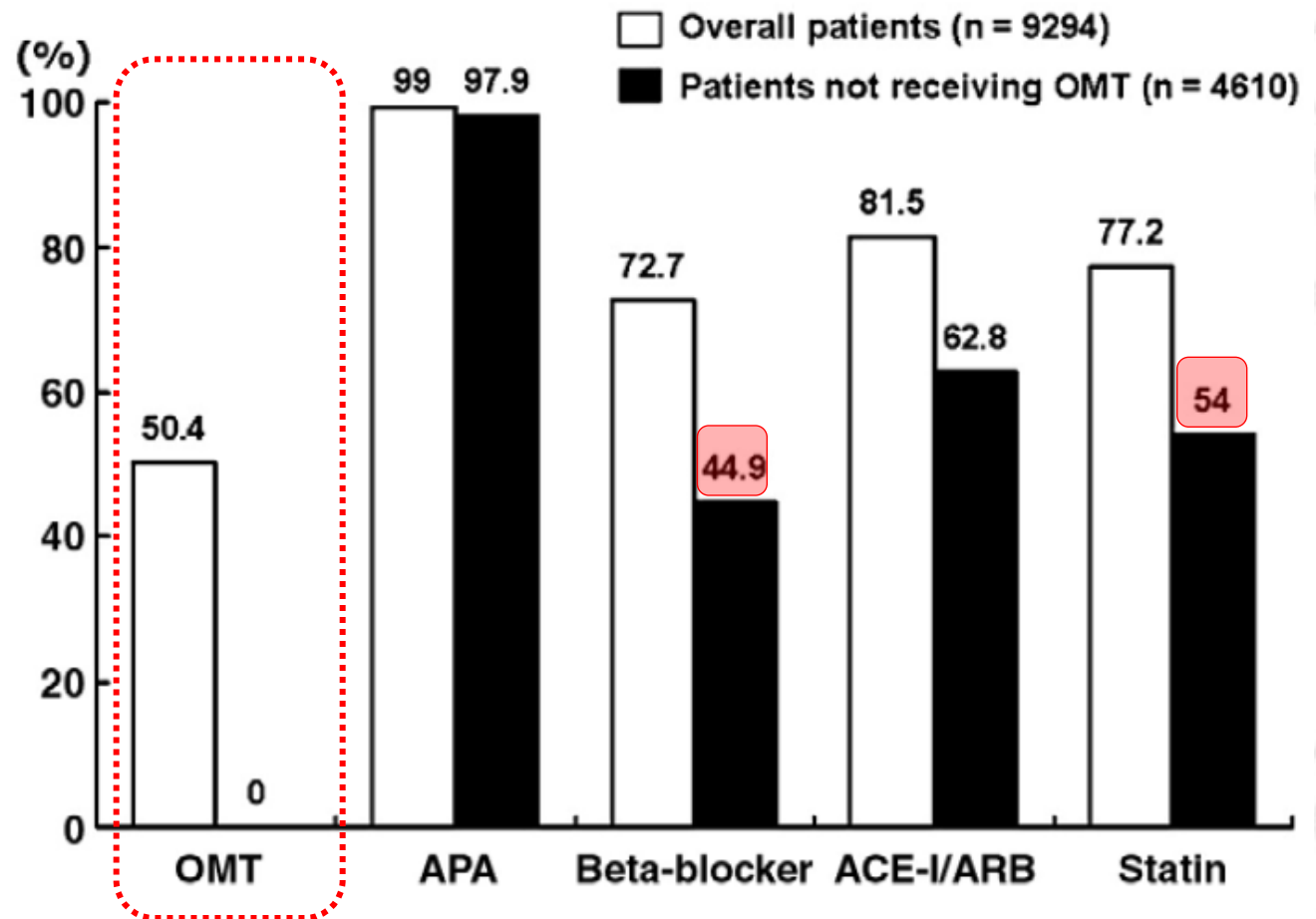
PHARMACOLOGICAL TREATMENT



Suboptimal Use of Evidence-Based Medical Therapy in Patients with AMI from KAMIR

❖ Use of Discharge Medication in Overall patients and Patients not Receiving Optimal Medical Therapy

- Optimal evidence-based medical therapy (OMT) : defined as the use of all 4 indicated medications

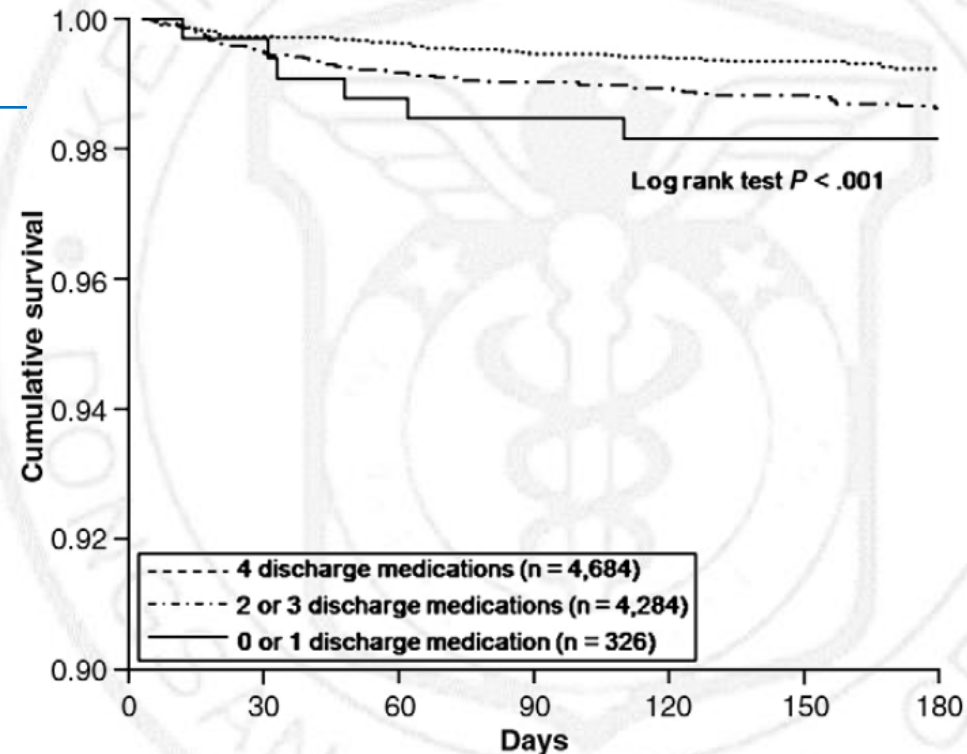


Suboptimal Use of Evidence-Based Medical Therapy in Patients with AMI from KAMIR

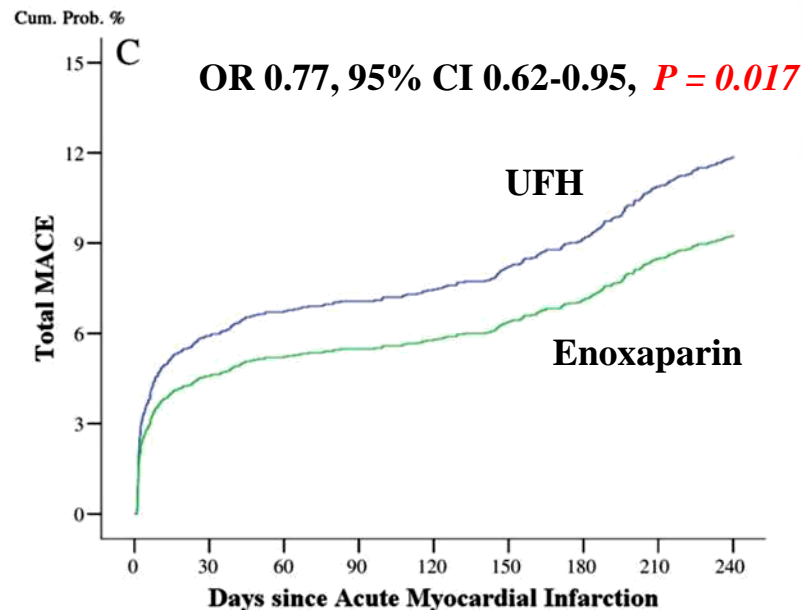
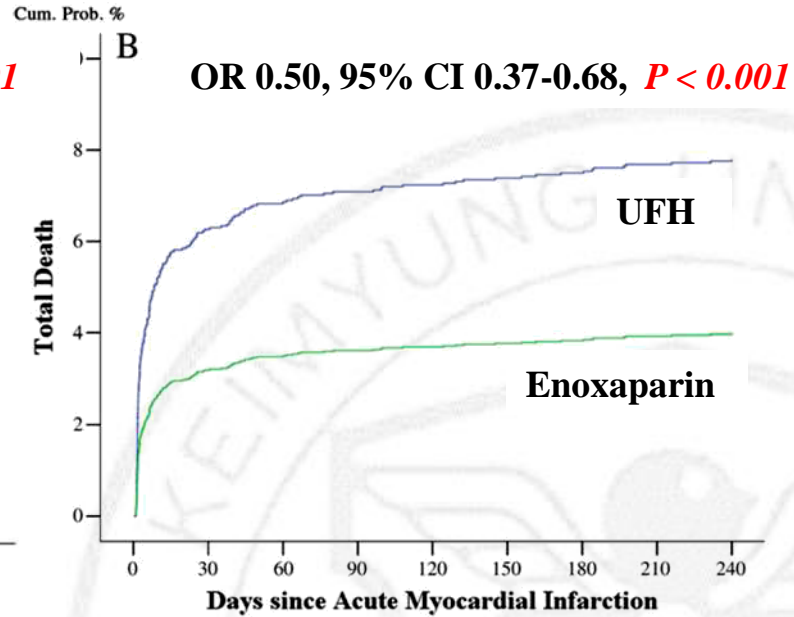
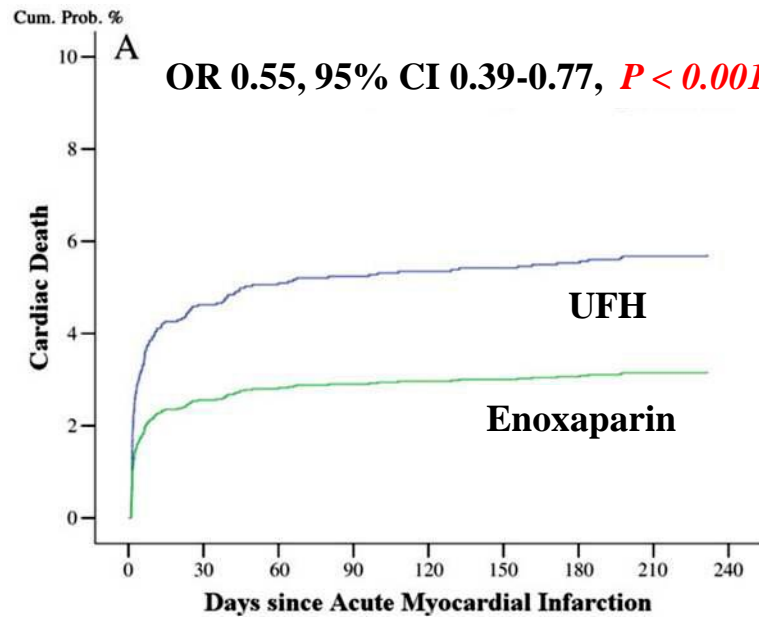
Multivariate Analysis for Predicting OMT at Discharge

Kaplan-Meier Survival Curve of 6-Month Mortality

Variable	OR (95% CI)	P
Age ≥ 70	0.840(0.756-0.934)	.001
SBP per 1mmHg increase	1.005(1.003-1.007)	<.001
STEMI	1.046(0.939-1.165)	.414
Killip Class >1 at admission	0.771(0.684-0.869)	<.001
Previous Coronary Heart Ds	0.890(0.767-1.031)	.121
Previous CHF	0.850(0.566-1.278)	.435
LVEF < 40%	0.806(0.702-0.925)	.002
S-Cr per 1mg/dL \uparrow	0.717(0.600-0.857)	<.001
Peak Tn-I per 1ng/mL \uparrow	1.001(1.000-1.001)	.059
Total Cholesterol per 1mg/dL \uparrow	1.003(1.002-1.004)	<.001
PCI at index hospitalization	1.390(1.198-1.614)	<.001
CABG at index hospitalization	0.281(0.171-0.463)	<.001



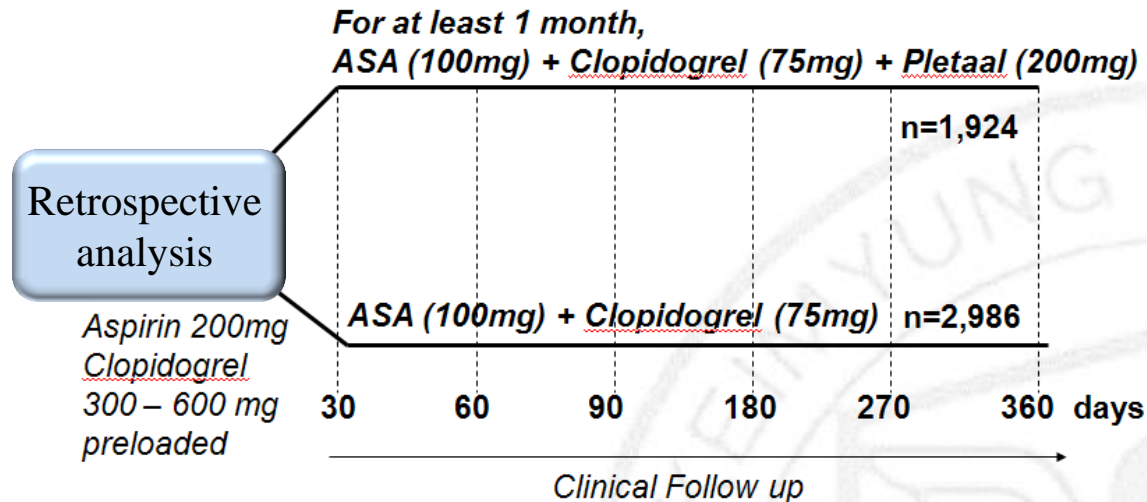
UFH vs ENOX in STEMI Undergoing PPCI with DES



- ❖ UFH group (n=1,841)
UFH Bolus 5000U IV
→ 24,000U/day x 2days
- ❖ Enoxaparin group (n=1,531)
Enoxaparin 1mg/kg, bid 3-5 days
+ UFH 50U/kg

TAT vs DAT after PCI in STEMI

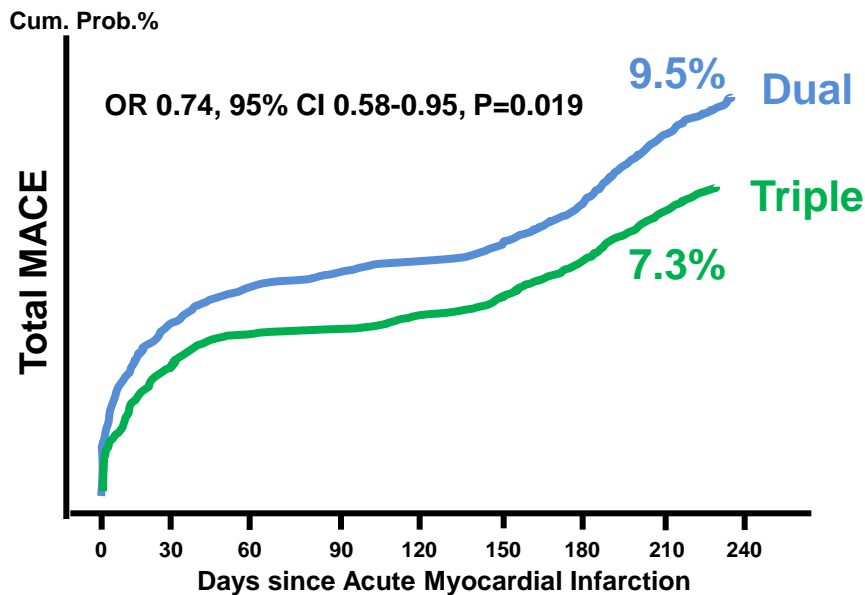
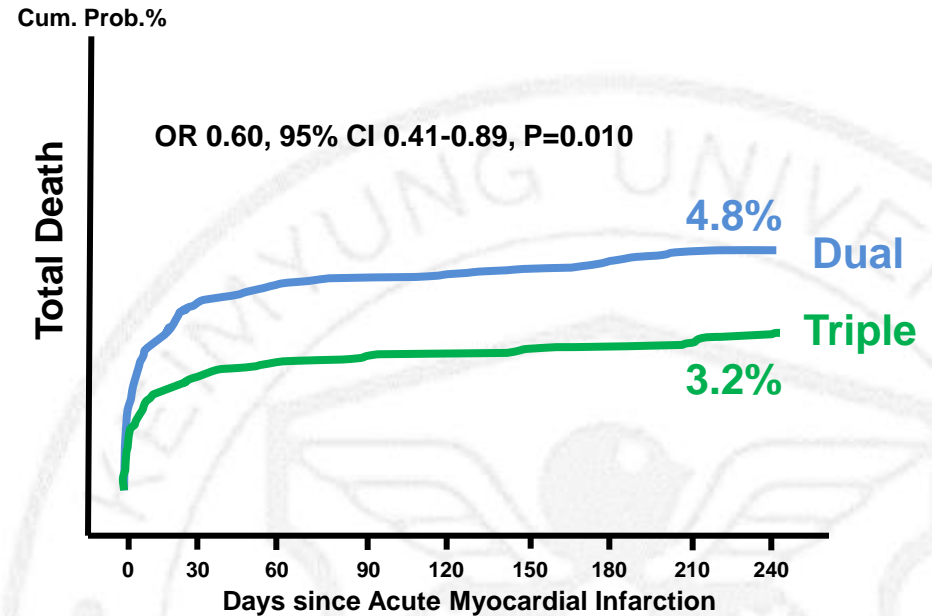
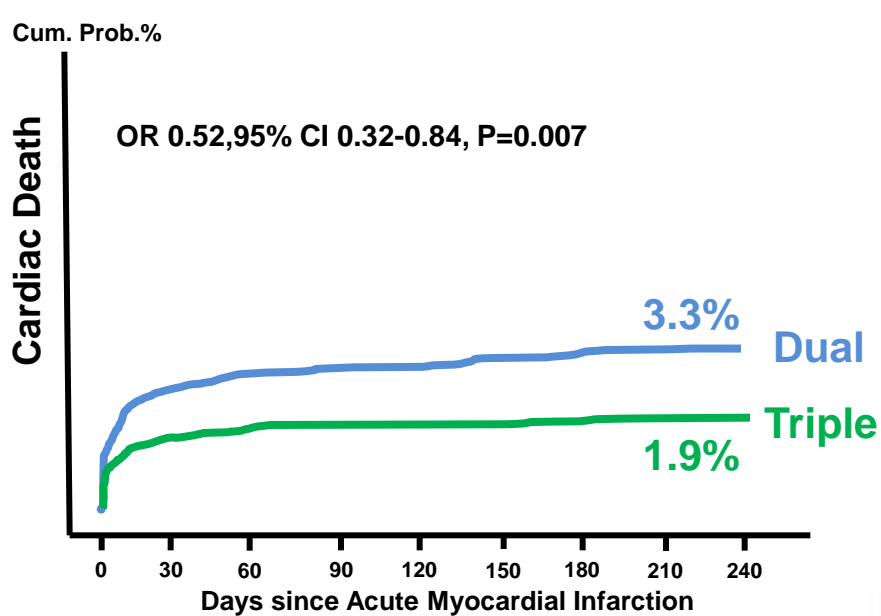
Korea Acute Myocardial Infarction Registry



Variables, n (%)	Dual (n=2,569)	Triple (n=1,634)	P value
Age, years	62.01 ± 12.91	61.97 ± 12.41	0.928
Body mass index, Kg/m ²	24.05 ± 3.18	23.97 ± 3.18	0.442
Male	1917 (74.6)	1224 (74.9)	0.834
Past history			
Hypertension	1165 (45.3)	716 (43.8)	0.331
Diabetes mellitus	629 (24.5)	390 (23.9)	0.649
Current smoking	1265 (49.2)	795 (48.7)	0.930
Dyslipidemia	207 (8.1)	116 (7.1)	0.479
Family history of CAD	190 (7.4)	98 (6.0)	0.216

TAT vs DAT after PCI in STEMI

Korea Acute Myocardial Infarction Registry



- Mortality and MACE were consistently lower in the TAT group in AMI patients who had undergone PCI with DES

FUTURE PERSPECTIVES



Korea vs. Western Contury

- ◆ **Acute MI in Korea**, compared to the West
 - Similar clinical characteristics, prognoses, and predictors of outcome

	Korea	Western
• In-hospital mortality	4.9%	5~7%
• 1 month MACE	7.5%	-
• 1 year MACE	12.7%	20%

Am J Cardiol 2009; 104:182-9, Korean J Med 2010;78:582-5

To Be Continued Our Current Strategy

- Preferred Primary PCI in STEMI
- Preferred DES during PCI in AMI

Future Perspectives

**‘Real world
in Korea’**

- ♂ Smoking (76.4%)
- ♀ HTN (61.6%) / DM (33.1%)
- Untreated or undercontrolled dyslipidemia (69%)

**Nationwide
Educations
for Coronary
Heart Disease**

**Primary
Clinical Efforts to**

- Education
- Early diagnosis for CHD
- Early refer to PCI center

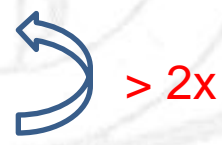
**Control
Risk Factors**

- ✓ Smoking
- ✓ HTN
- ✓ DM
- ✓ CVA
- ✓ Kidney Disease



Time Delay & Transport Status of All STEMI w/ PPCI

Variables	All (n=364)
Symptoms to decision (median value) *	101.4±10.6 (50 min)
First visit hospital (CNUH/others)	96/268 (26%/74%)
Referral hospital (general hospital/private clinic)	179/89 (67%/33%)
Transfer time (median value)	95.4±5.1 (70 min)
Transport vehicle	
Ambulance	79 (22%)
Others	285 (78%)
Private car	120 (33%)
Private car-ambulance	118 (32%)
Taxi	12 (3%)
Others	35 (10%)
Pain to door (CNUH ER, median)	222.1±12.4 (172 min)
Door to balloon (median)	89.0±6.0 (65 min)
Pain to balloon (median)	311.0±13.6 (250 min)



How to Reduce Symptom - Treatment Time ?

**Improve Emergency Rescue System
(☎ 119)**

Develop Critical Pathway

**Specialized & Organized MI Response team
Diagnosis→Early intervention→Refer→PCI**

Conclusion

**Comparable or Even better
Strategy and Outcomes in AMI Treatment**

Need for Active Treatments in NSTEMI

Need for OMT

**Further Investigation of Korean MI
based on National Registry**