Diabetic Acute Myocardial Infarction Disease Registry in Korea

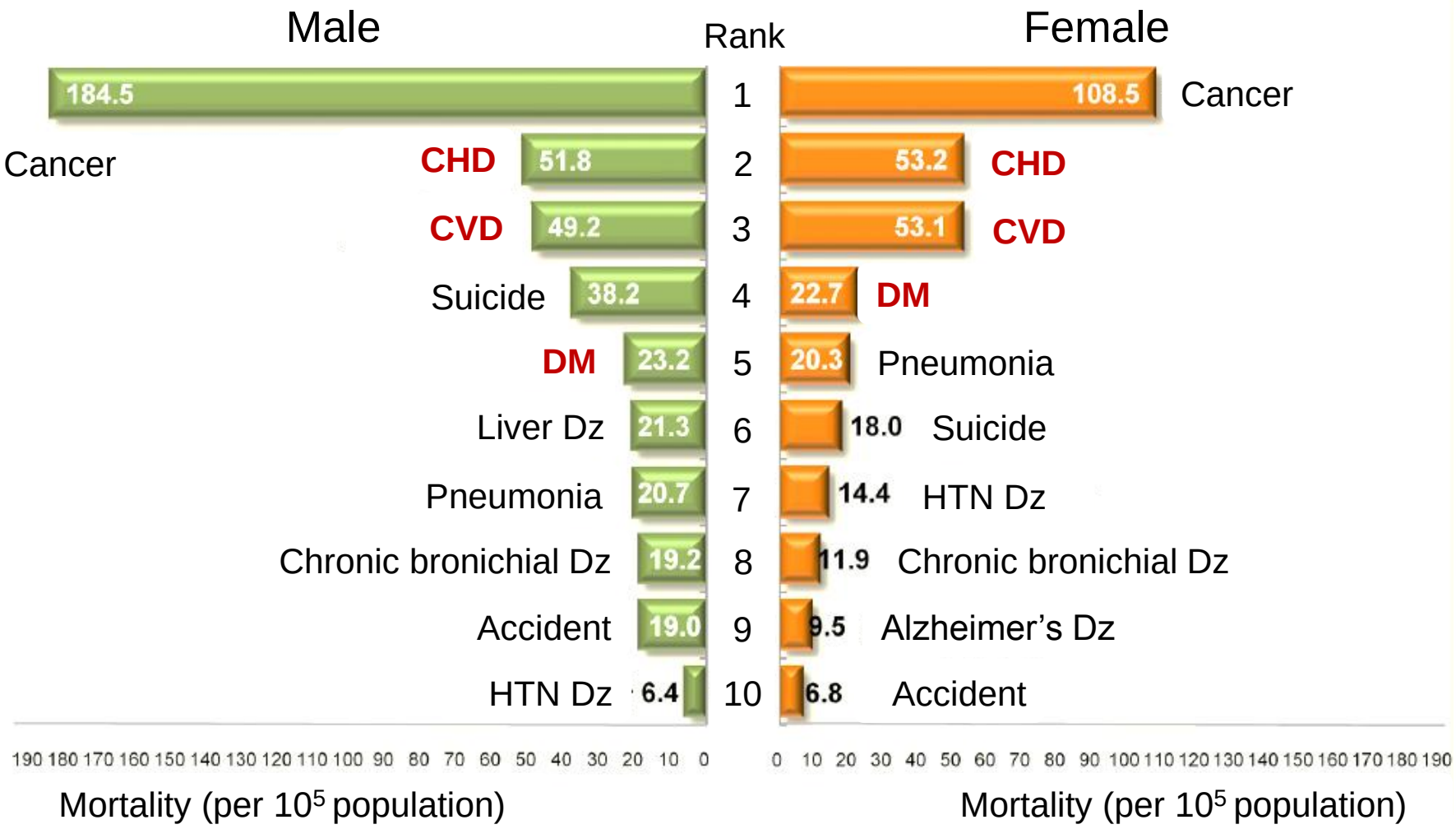
DIAMOND

DIABETIC ACUTE MYOCARDIAL INFARCTION DISEASES REGISTRY IN KOREA

Seung-Ho Hur, Wooyeong Jang, Jang-Whan Bae, Dong-Ju Choi, Young-Keun Ahn, Jong-Sun Park, Rak-Kyeong Choi, Dong-Hoon Choi, Joon-Hong Kim, Kyoo-Rok Han, Hun-Sik Park, So-Yeon Choi, Jung-Han Yoon, Hyeon-Cheol Gwon, Seung-Woon Rha, Kyung-Kuk Hwang, Do-Sun Lim, Jang-Ho Bae, Kyung- Tae Jung, Seok-Kyu Oh, Jae-Hwan Lee, Eun-Seok Shin, Kee-Sik Kim and Hyo-Soo Kim

DIAMOND Study Investigators

Causes of Death in Korea (2012)



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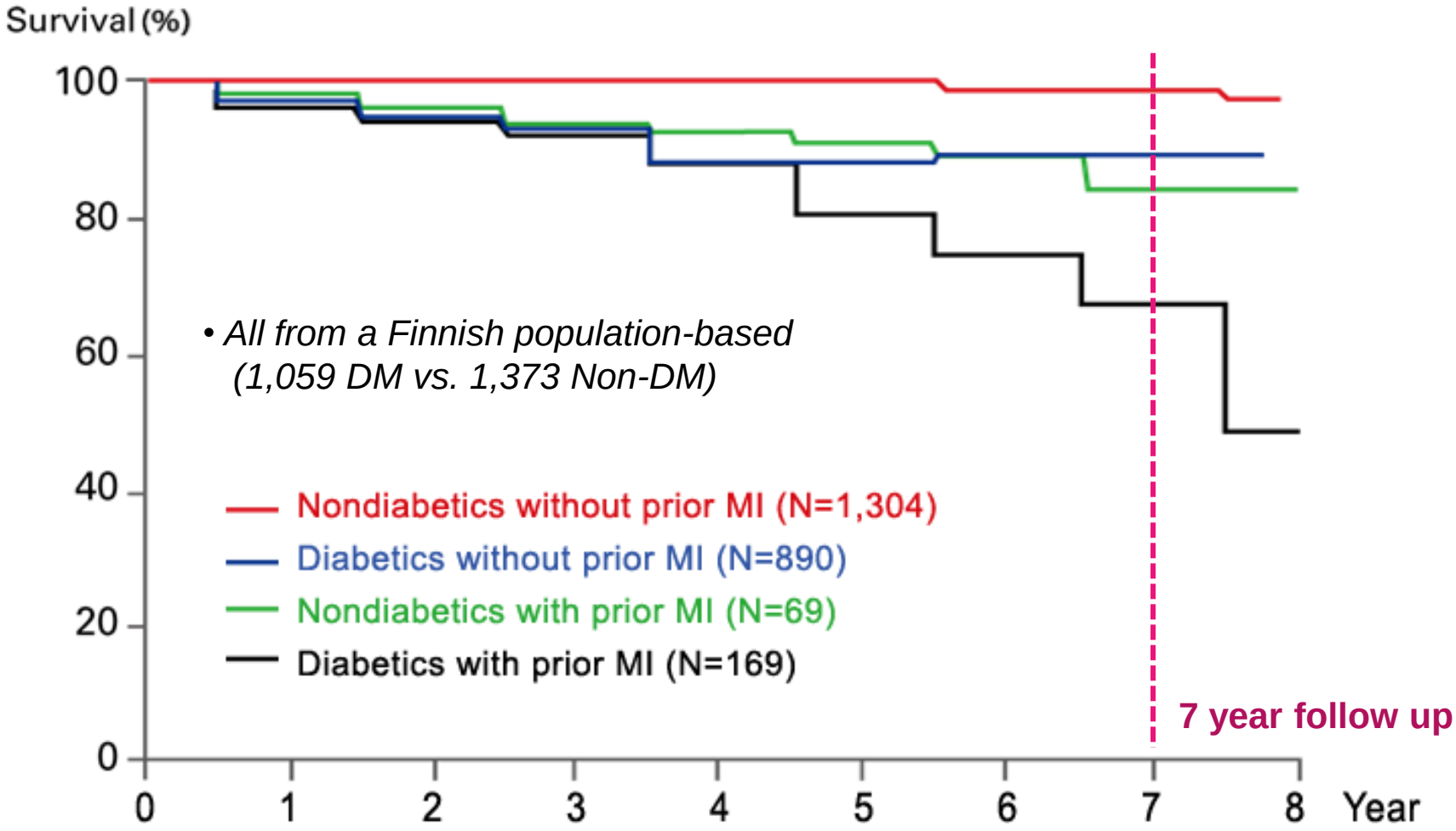
Diabetes as a CHD Risk Equivalent



- Diabetes increases coronary mortality in pts with and without a prior MI

Haffner SM et al. N Eng J Med 1998;339:229-234

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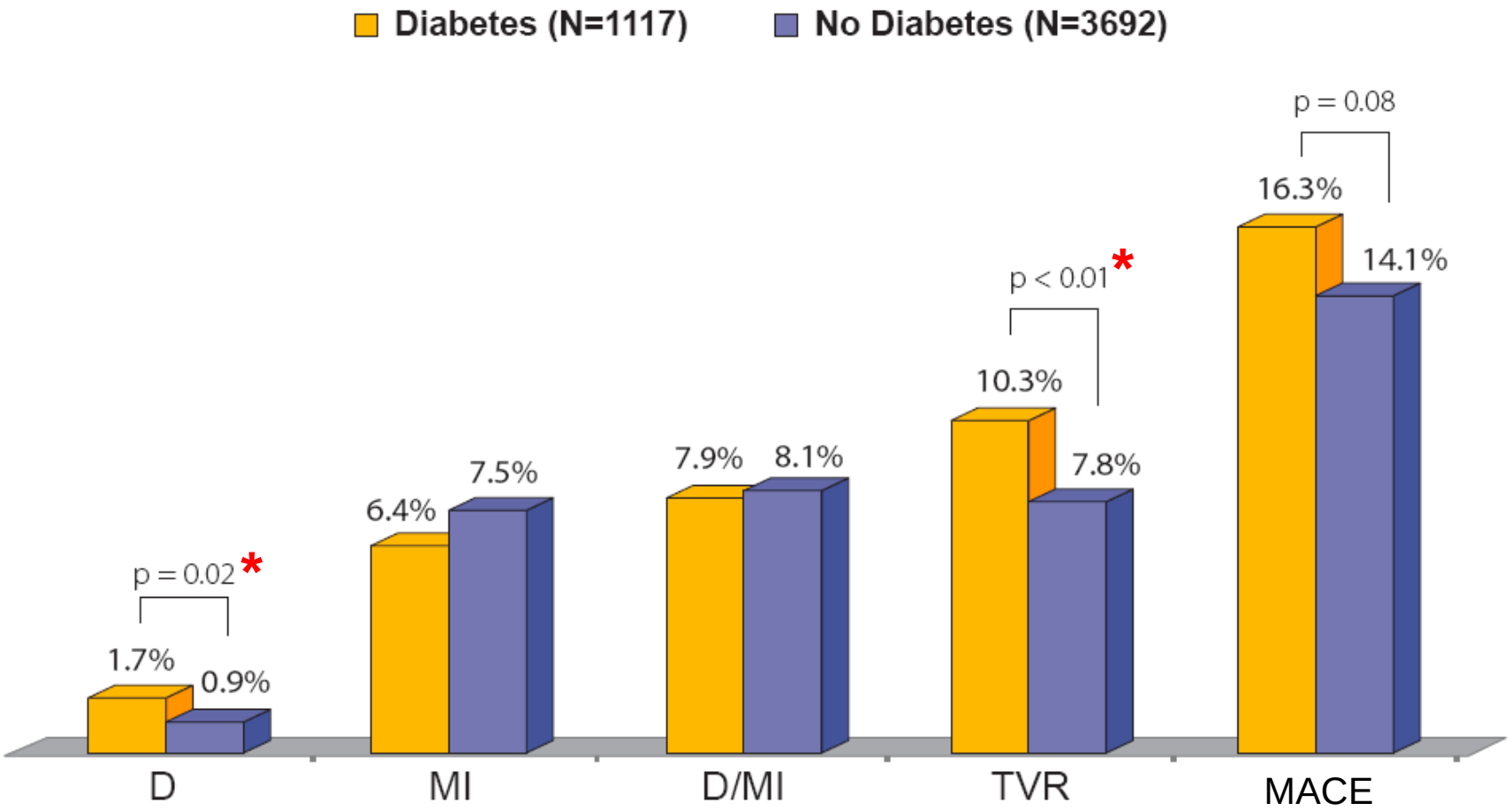
Impact of DM in Patients with Stenting

Outcomes at 6 months in the **TARGET** trial
Patients undergoing PCI with Stent implantation



Roffi M et al. Circulation 2002;105:2347-2354.

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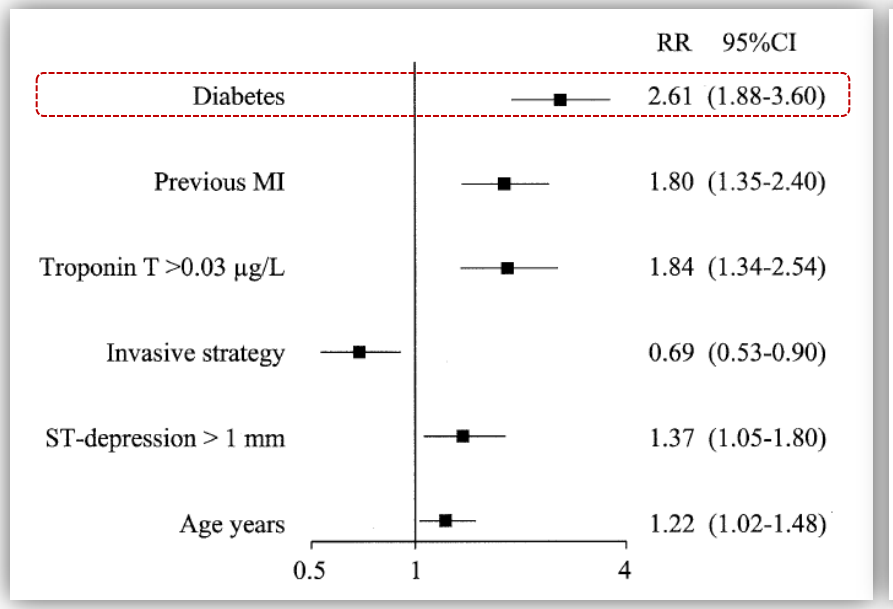
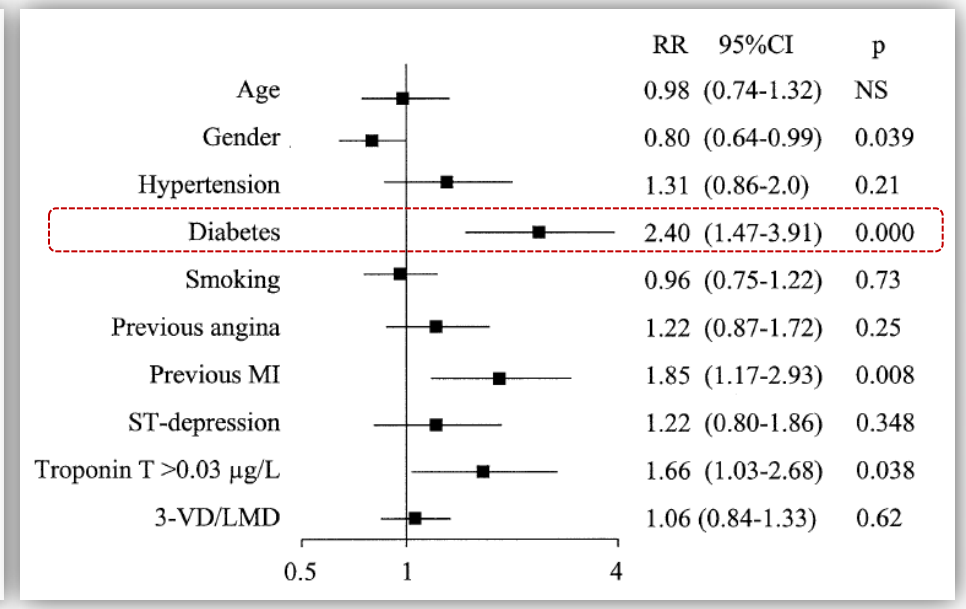
DM as an Independent Predictor for Death or MI in ACS

- **FRISC II**: a prospective, randomized multicenter trial recruiting patients admitted to hospital because of unstable CAD.
- 2,457 pts: DM (n=299) vs. Non-DM (n=2,158) / Invasive (n=1,222) vs. noninvasive (n=1,235)



total patient cohort (invasive and noninvasive strategy patients)



noninvasive strategy patients

J Am Coll Cardiol 2004;43:585–91

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Possible Factors for Poor Prognosis among Diabetic Patients with AMI

- diffuse coronary atherosclerosis
- increased propensity to thrombus formation
- impaired fibrinolytic function
- possible diabetic cardiomyopathy
- autonomic neuropathy with impaired pain
- perception increased heart rate

Eur Heart J 2005:26, 650–661

ORIGINAL ARTICLE
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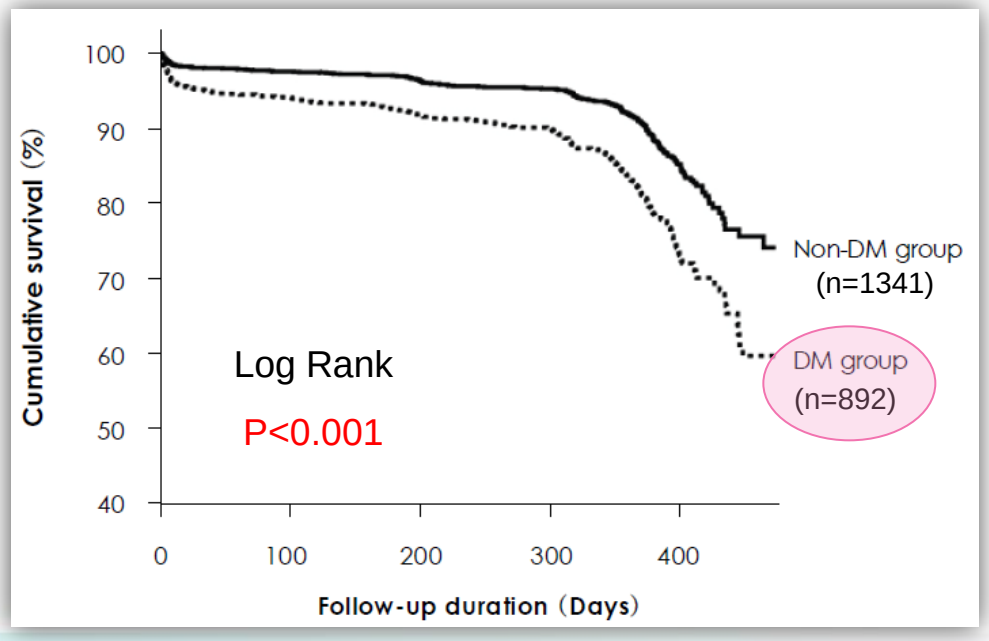
*~ Data from **KAMIR** (Korea AMI Registry) ~*

Comparison of Clinical Outcomes Following Acute Myocardial Infarctions in Hypertensive Patients With or Without Diabetes

Min Goo Lee, MD[1], Myung Ho Jeong, MD[1], Youngkeun Ahn, MD[1], Shung Chull Chae, MD[2], Seung Ho Hur, MD[3], Taek Jong Hong, MD[4], Young Jo Kim, MD[5], In Whan Seong, MD[6], Jei Keon Chae, MD[7], Jay Young Rhew, MD[8], In Ho Chae, MD[9], Myeong Chan Cho, MD[10], Jang Ho Bae, MD[11], Seung Woon Rha, MD[12], Chong Jim Kim, MD[13], Donghoon Choi, MD[14], Yang Soo Jang, MD[14], Junghan Yoon, MD[15], Wook Sung Chung, MD[16], Jeong Gwan Cho, MD[1], Ki Bae Seung, MD[16], Seung Jung Park, MD[17] and Other Korea Acute Myocardial Infarction Registry Investigators



In Korean hypertensive AMI pts

- ***DM*** was associated with
  - worse clinical and angiographic features
  - higher risk of HF and MACE at 1year FU

Korean Circ J 2009; 39:243-250

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Current Status

- Data are lacking regarding the influence of DM on long-term outcomes in AMI patients
- Little is known of the clinical characteristics and natural course of diabetic AMI patients in our daily practice

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- a single-country, prospective, multi-center, web-based registry

Participating Centers

22 university
or tertiary hospitals

- Principal Investigator

: Hyo-Soo Kim, MD, PhD

Seoul National University Hospital

	Site	PI
1	Seoul National University Hospital	Kim, HS
2	Severance Hospital	Choi, DH
3	Samsung Medical Center	Gwon, HC
4	Seoul National University Bundang Hospital	Choi, DJ
5	Hallym University Kandong Sacred Heart Hospital	Han, KR
6	Korea University Guro Hospital	Nah, SY
7	Chonnam National University Hospital	Ahn, YK
8	Kyungpook National University Hospital	Park, HS
9	Pusan National University Yangsan Hospital	Kim, JH
10	Wonju Severance Christian Hospital	Yoon, JH
11	Sejong General Hospital	Park, JS
12	Yeungnam University Medical Center	Park, JS
13	Keimyung University Dongsan Medical Center	Hur, SH
14	Ajou University Hospital	Choi, SH
15	Chungbuk National University Hospital	Bae, JH
16	Daegu Catholic University Medical Center	Kim, GS
17	Konyang University Hospital	Bae, JH
18	Daejun Eulji University Hospital	Jung, KT
19	Chungnam National University Hospital	Lee, JH
20	Wonkwang University Medical Center	Oh, SK
21	Ulsan University Hospital	Shin, ES
22	Korea University Anam Hospital	Yim, DS

Study Objectives

- Compile clinical data set to extend knowledge of AMI with diabetes in Korea

- Provide a better understanding of clinical consequences following AMI in those patients

DIAMOND: Inclusion Criteria

- Age ≥ 45 years
- Documented AMI (STEMI or NSTEMI)
  - an elevated cardiac enzyme w/ angiographical confirmation
- Documented T2DM
  - previously or newly diagnosed
- Signed written informed consent within 1 month after admission
- April 2010 ~ June 2012, consecutively enrolled

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Study Endpoints

Primary endpoint

a cumulative incidence of major adverse cardiac events (MACE) including all-cause death, recurrent MI, target vessel revascularization at 2-year follow-up

Secondary endpoints

During 2 years clinical follow-up, the incidence of

- all-cause death
- recurrent MI
- target vessel revascularization
- stent thrombosis (definite or probable by ARC)

Follow-up Schedule

	Baseline	FU at 1 mo ± 2 wk	FU at 6 mo ± 1 mo	FU at 12 mo ± 3 mo	FU at 24 mo ± 3 mo
Data Collection	CRF	CRF; since baseline	CRF; since last FU	CRF; since last FU	CRF; since last FU
	Patient demographics **Medical history** **Clinical examination** **Intervention & medication**	Clinical outcomes Medications			
		FU angiography if performed			

CRF = Case Report Form

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RESULTS

Clinical Characteristics (I)

	Total	STEMI	NSTEMI	*p*
No. of patients	1,198	545	647	-
Age, yrs	65.0±9.9	64.5±10.0	65.5±9.8	0.073
Male gender, %	65.8	67.9	64.0	0.157
Pain, %	84.6	90.2	79.7	<0.0001
Prior MI, %	7.0	6.2	7.7	0.317
Hypertension, %	66.3	63.3	68.8	0.046
Hyperchol., %	25.4	20.8	29.1	0.001
Current smoker, %	33.6	38.4	29.4	0.001
FBS, mg/dl	181.7±70.5	187.2±68.0	176.5±72.5	0.031
RBS, mg/dl	234.8±83.0	236.5±82.3	233.5±83.8	0.725
TC, mg/dl	173.9±45.4	177.0±43.1	171.3±47.1	0.040
TG, mg/dl	136.8±100.1	136.2±105.0	137.3±95.7	0.867
HDL, mg/dl	43.5±16.7	43.3±15.4	43.8±17.9	0.631
LDL, mg/dl	104.5±40.8	108.6±37.9	101.9±43.1	0.027

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Clinical Characteristics (II)

	Total	STEMI	NSTEMI	*p*
No. of patients	1,198	545	647	-
NT-pro BNP, pg/dl	3128.7±6783.4	2026.4±5299.4	4052.2±7699.9	<0.0001
Max CK-MB, ng/dl	82.2±128.2	127.5±159.8	44.2±75.2	<0.0001
Troponin-I, ng/dl	30.9±59.8	53.9±77.9	12.2±28.0	<0.0001
Creatinine	1.3±1.4	1.1±0.9	1.4±1.6	0.001
hs-CRP	4.6±13.9	4.4±12.4	4.8±15.2	0.611
Diagnosis, %				-
STEMI	45.7	-	-	
NSTEMI	54.3	-	-	
Killip Class, %				0.582
Class I, II	88.6	87.9	89.0	
Class III, IV	11.4	12.1	11.0	
Height, cm	163.0±8.6	163.6±8.5	162.4±8.6	0.018
Weight, kg	64.2±10.8	64.8±10.6	63.8±10.9	0.096
BMI, kg/m^2	24.1±3.1	24.1±3.0	24.1±3.1	0.817
SBP, mmHg	129.8±28.1	126.1±28.5	132.9±27.4	<0.0001
DBP, mmHg	76.6±16.5	75.3±17.2	77.6±15.9	0.014
HR	80.2±19.6	79.0±20.3	81.2±18.9	0.058
LVEF, %	50.6±12.1	49.3±11.2	51.2±12.8	<0.0001

* NT-proBNP: data from DAMOND (n=623))

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Clinical Characteristics (III)

	Total	STEMI	NSTEMI	*p*
No. of patients	1,198	545	647	-
CCU admission, %	82.5	89.4	76.8	<0.0001
Medication				
BB, %	84.5	88.5	81.0	<0.0001
CCB, %	13.6	8.5	17.9	<0.0001
Nitrate, %	27.7	27.1	28.2	0.667
ACEI or **ARB**, %	83.7	86.1	81.7	0.041
Nicorandil, %	19.8	20.6	19.1	0.528
Statin, %	85.5	85.7	85.3	0.828
ASA, %	98.4	98.7	98.1	0.432
Clopidogrel, %	95.2	97.8	93.1	<0.0001
Cilostazol, %	18.7	19.5	18.0	0.513
DAPT, %	92.6	96.0	90.6	<0.0001
TAPT, %	17.8	19.3	16.7	0.248

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Angiographic & Procedural Characteristics

	Total (n=1198)	STEMI (n=545)	NSTEMI (n=647)	*P*
CAG (%)	1,130 (94.3)	536 (98.3)	594 (91.8)	
Infarct related Artery, %				
LAD	58.5	58.4	58.6	0.948
LCX	29.6	18.7	39.4	<0.0001
RCA	41.2	45.0	37.9	0.016
LM	3.5	1.5	5.4	<0.0001
Multi-vessel disease, %	64.5	58.4	70.0	<0.0001
ACC/AHA lesion type B2/C, %	82.8	83.2	82.5	0.749
PCI (%)	1,084 (95.9)	523 (97.6)	561 (94.4)	
Pre-PCI TIMI flow grade 0, %	41.3	55.3	28.3	<0.0001
Post-PCI TIMI flow grade ≥2, %	97.8	97.9	97.7	0.811
PCI success, %	99.1	98.3	99.8	0.009
Complete Revascularization, %	55.4	53.9	56.7	0.360
Stent implantation (%)	1,031 (95.1)	498 (95.2)	533 (95.0)	
Use of DES, %	97.6	97.4	97.7	0.708
Stent diameter, mm	3.1±0.4	3.2±0.4	3.1±0.4	0.005
Stent length, mm	25.0±8.5	25.3±8.8	24.7±8.2	0.291
No. of Stent	1.6±0.8	1.5±0.7	1.7±0.9	<0.0001

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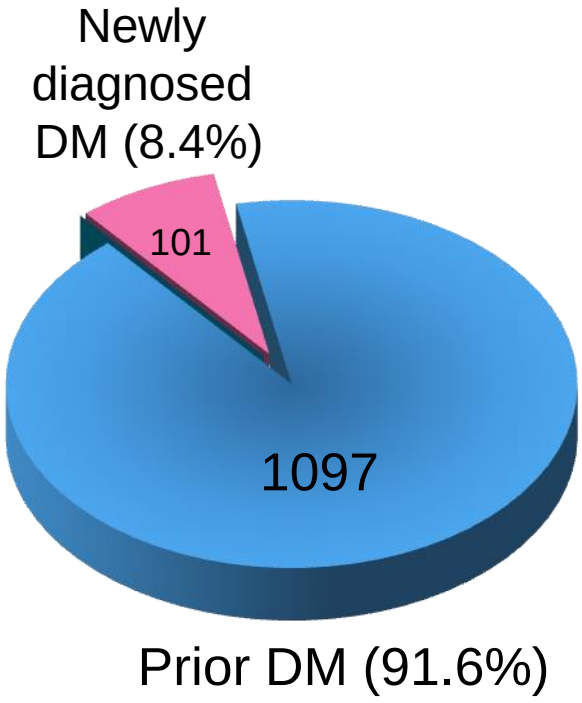
Diabetic Profile



DM duration		10.8±8.5
HbA1c		7.7±1.4
Medication		
at admission	Insulin, %	9.6
	Metformin, %	31.8
	Sulfonylurea, %	32.3
	DPP4-I, %	3.8
	Others, %	11.3
at discharge	Insulin, %	15.7
	Metformin, %	45.6
	Sulfonylurea, %	39.4
	DPP4-I, %	4.7
	Others, %	13.4

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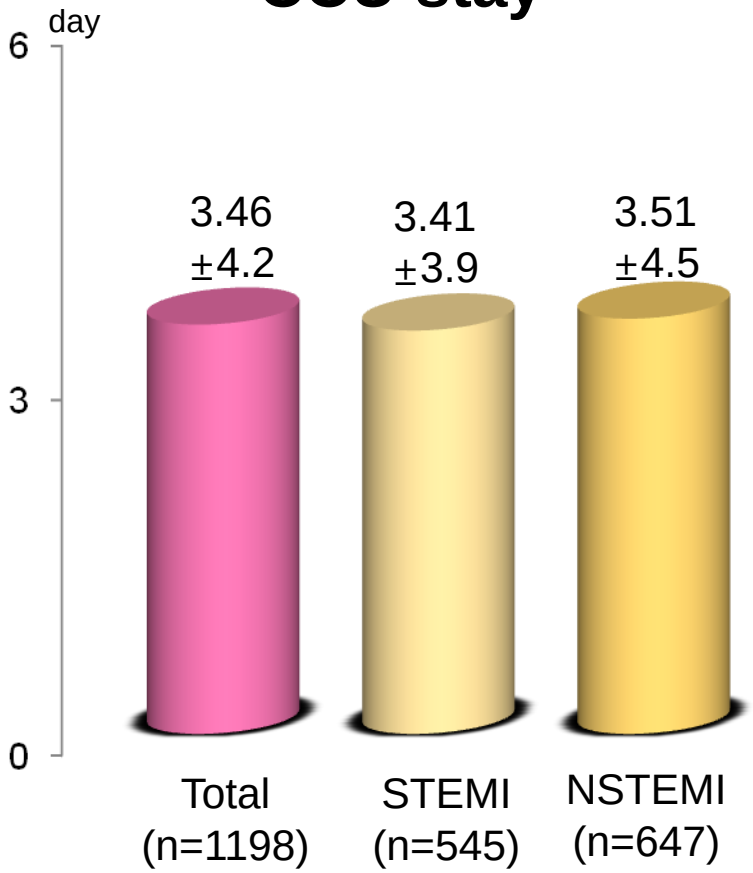
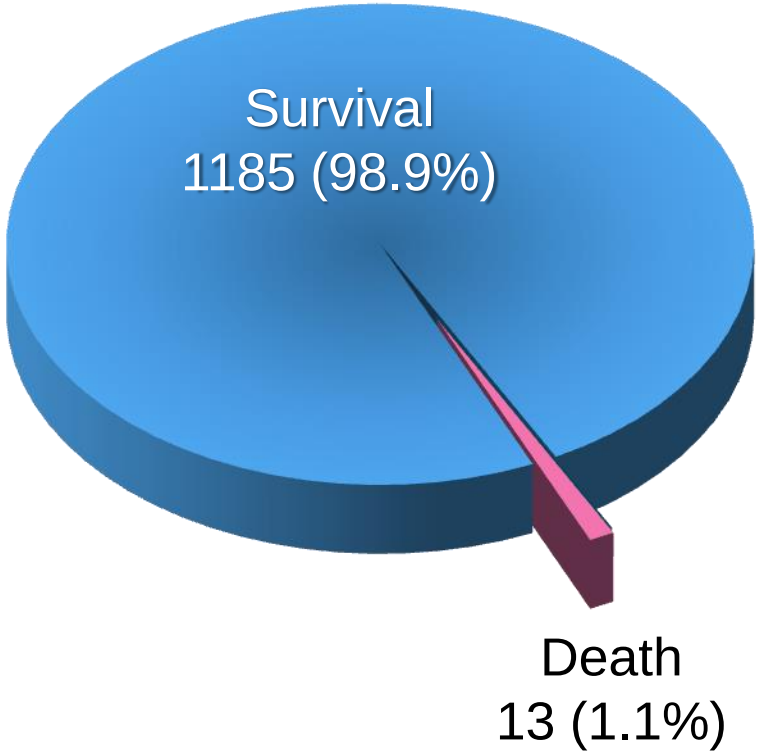
In-hospital Outcomes

CCU stay



In-hospital Death



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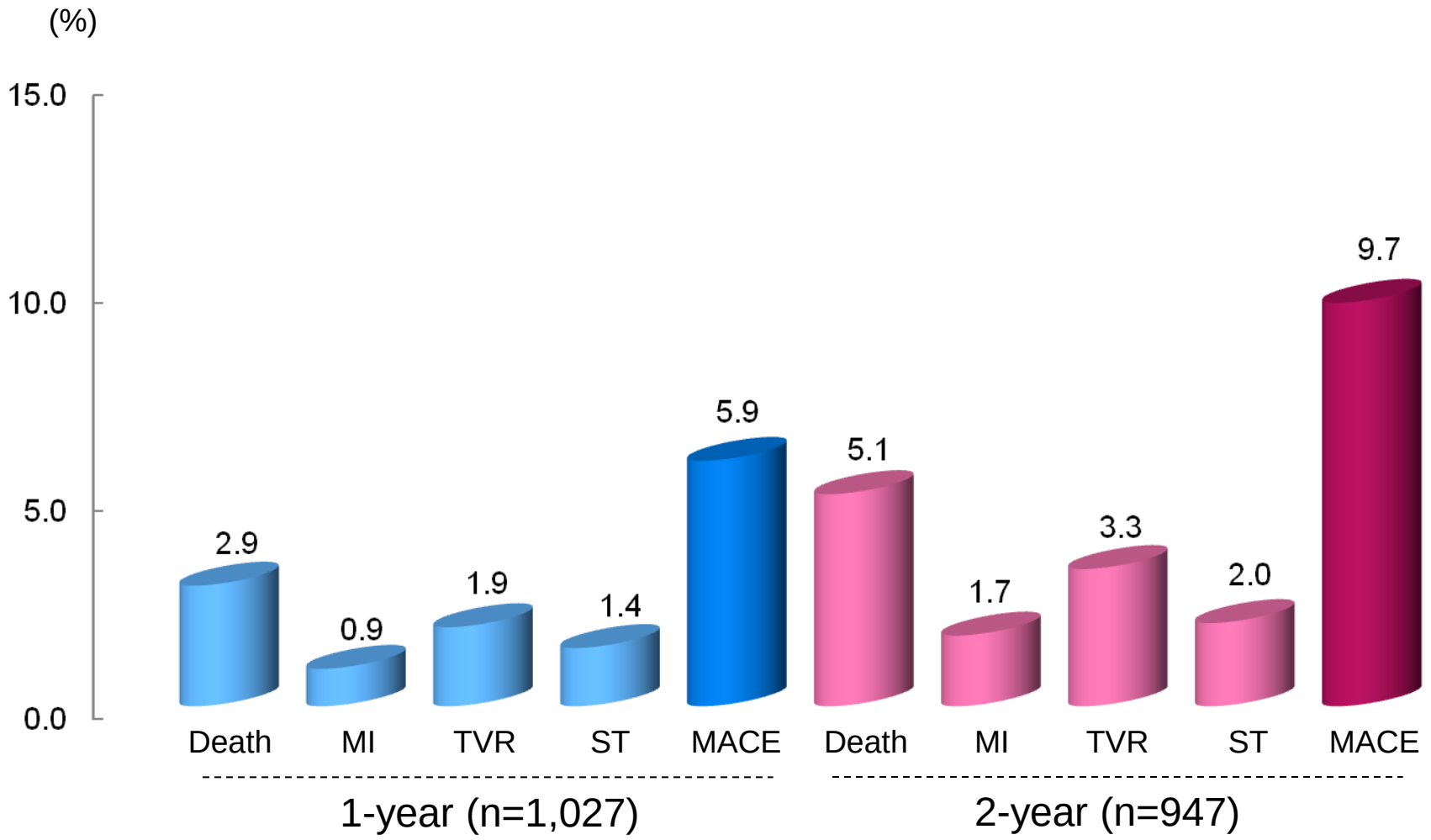
1- and 2-Year Clinical Outcomes



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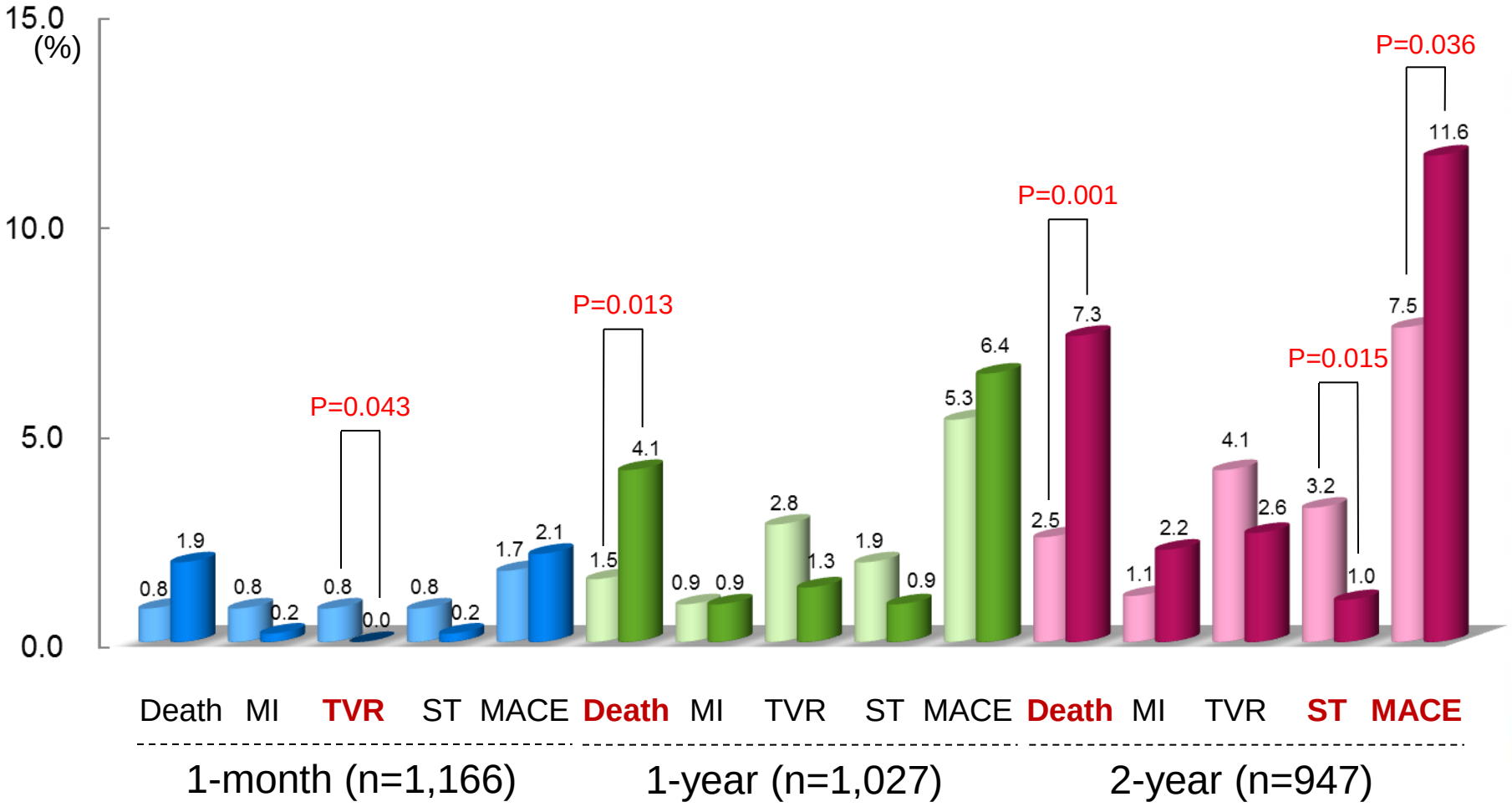
Clinical Outcomes



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Propensity Score Matching Analysis

For evaluation of the effect of diabetes on clinical outcomes

Control (non-DM) group

- Korea AMI Registry (***KORMI***)
  - Feb 2008 ~ present
  - documented AMI (STEMI or NSTEMI)
  - prospective, multicenter, online national survey

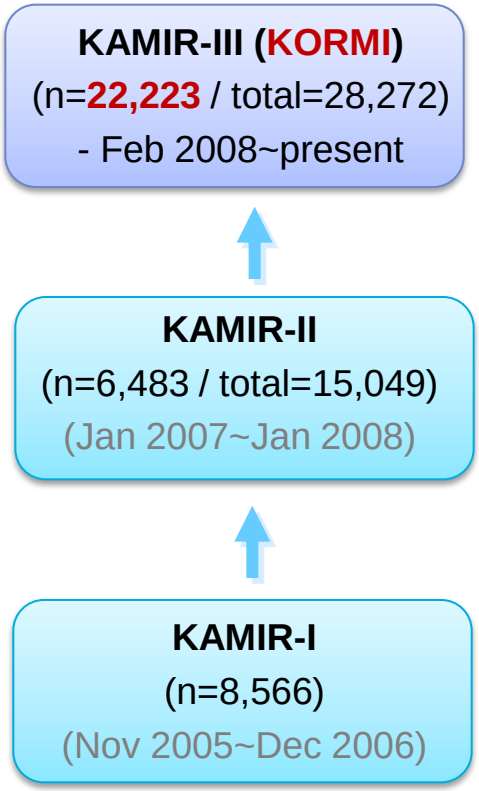
Controlled variables

: age, gender, hypertension, hyperlipidemia, smoking, prior MI, LVEF, BMI, clinical diagnosis, aspirin, statin clopidogrel, cilostazol, stent length, stent diameter, stent type, stent number (***17 variables***)

Matching

- DM in **DIAMOND** : Non-DM in **KORMI**

  = 1 (n=833) : 3 (n=2,409)



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Clinical Characteristics:
DIAMOND vs. KORMI-NonDM

1:3 propensity score matching for 17 variables

Propensity score matching	DIAMOND (n=833)	KORMI NonDM (n=2,409)	*p*
Age, yrs	64.4±9.7	64.1±12.5	0.439
Male gender, n(%)	561 (67.3)	1,660 (68.9)	0.403
Prior MI, n(%)	38 (4.6)	85 (3.5)	0.178
Hypertension, n(%)	524 (62.9)	1,475 (61.2)	0.391
Hyperlipidemia, n(%)	194 (23.3)	518 (21.5)	0.283
Smoking, n(%)	295 (35.4)	889 (36.9)	0.577
Statin, n(%)	724 (86.9)	2,082 (86.4)	0.722
Aspirin, n(%)	827 (99.3)	2,391 (99.3)	0.938
Clopidogrel, n(%)	819 (98.3)	2,376 (98.6)	0.518
Cilostazol, n(%)	164 (19.7)	489 (20.3)	0.705
STEMI, n(%)	420 (50.4)	1,220 (50.6)	0.912
LVEF, %	51.2±11.5	51.2±11.5	0.965
BMI, kg/m^2	24.1±3.0	24.0±3.2	0.965
DES n(%)	816 (98.0)	2,365 (98.2)	0.695
Stent diameter, mm	3.1±0.4	3.1±0.4	0.199
Stent length, mm	24.8±8.0	24.3±8.5	0.199
Stent number	1.6±0.8	1.6±0.9	0.297

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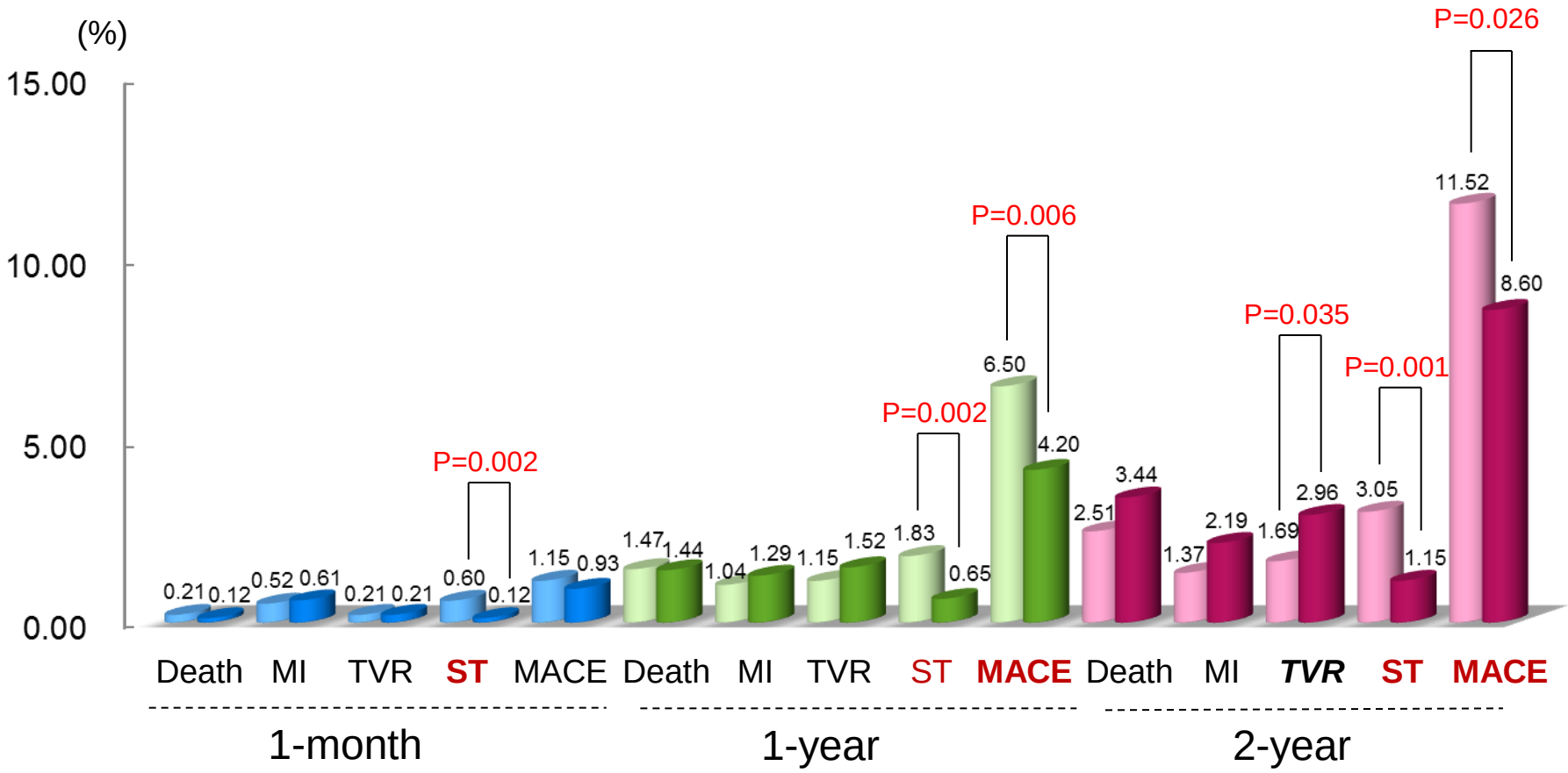
1:3 propensity score matching

Clinical Outcomes:
DIAMOND vs. KORMI-NonDM



DIAMOND KorMI Non-DM

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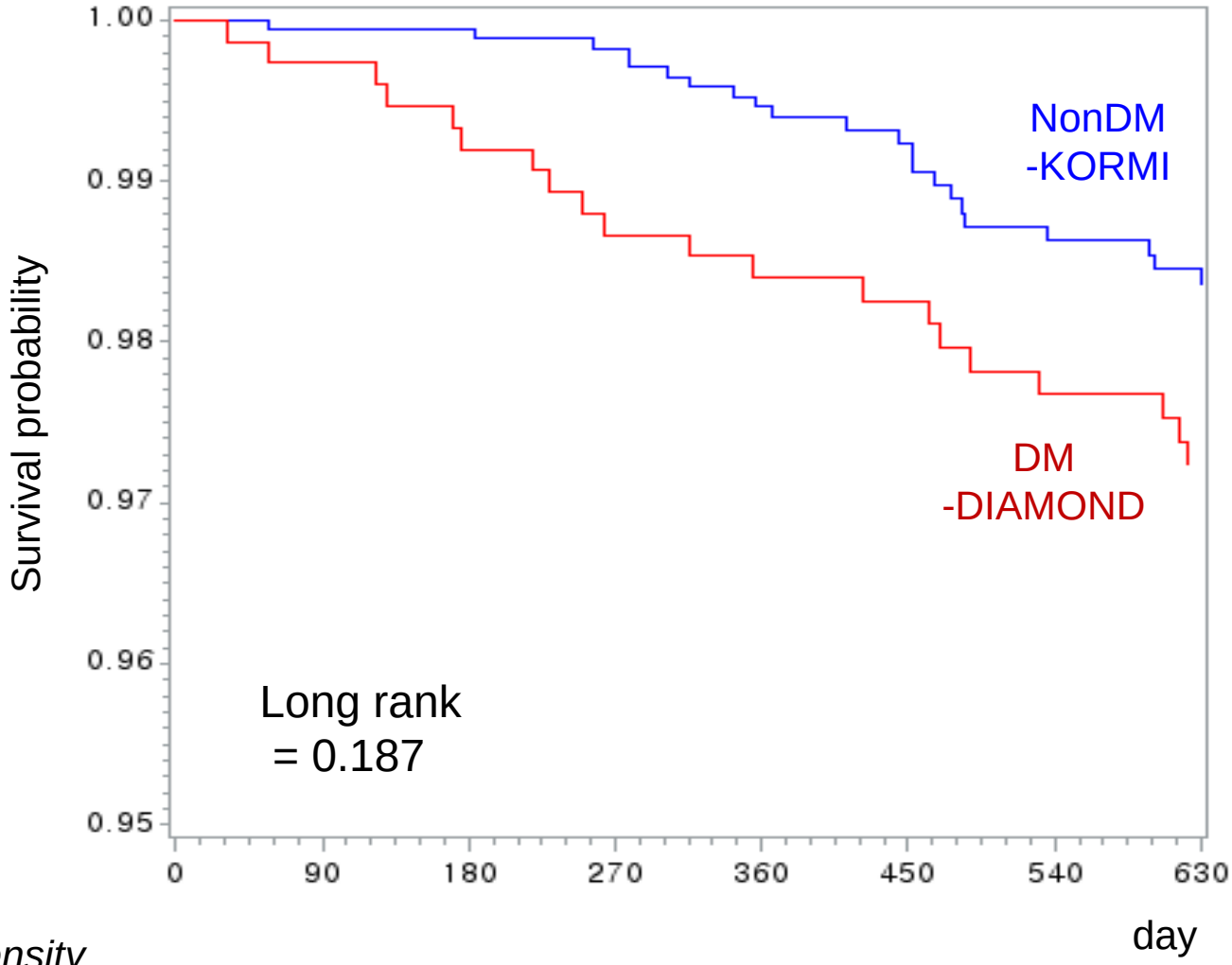
2-Year Kaplan-Meier Survival Curve



1:3 propensity score matching

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DIABETIC ACUTE MYOCARDIAL INFARCTION DISEASES REGISTRY IN KOREA

Summary

- Patient with prior DM and newly diagnosed DM was 91.6% and 8.4%, respectively.
- Mean duration of DM was 10.8±8.5 years and mean HbA1c level was 7.7±1.4%.
- Most patients received PCI with DES implantation.
- The rate of in-hospital mortality was low (1.1%)
- At 2-year clinical follow-up (n=947), MACE occurred in 92 (9.7%) patients including death (5.1%), recurrent MI (1.7%), TVR (3.3%), and ST (2.0%)
- Compared to non-DM patients in KORMI, DM patients in DIAMOND had higher rates of MACE and ST at 1- and 2-year follow-up.

Study Limitations

- Single-arm registry
  with nonrandomized assignment
- Laboratory data: from individual institute
- Lack of data on angiographic and interventional information
- Lack of long-term clinical outcomes

Conclusion

- DIAMOND cohort study demonstrated that diabetic patients with AMI in Korea mostly underwent PCI with DES and were discharged alive.

- Acceptable clinical outcomes were observed in these patients up to 24 months of follow-up

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Thank you for your attention

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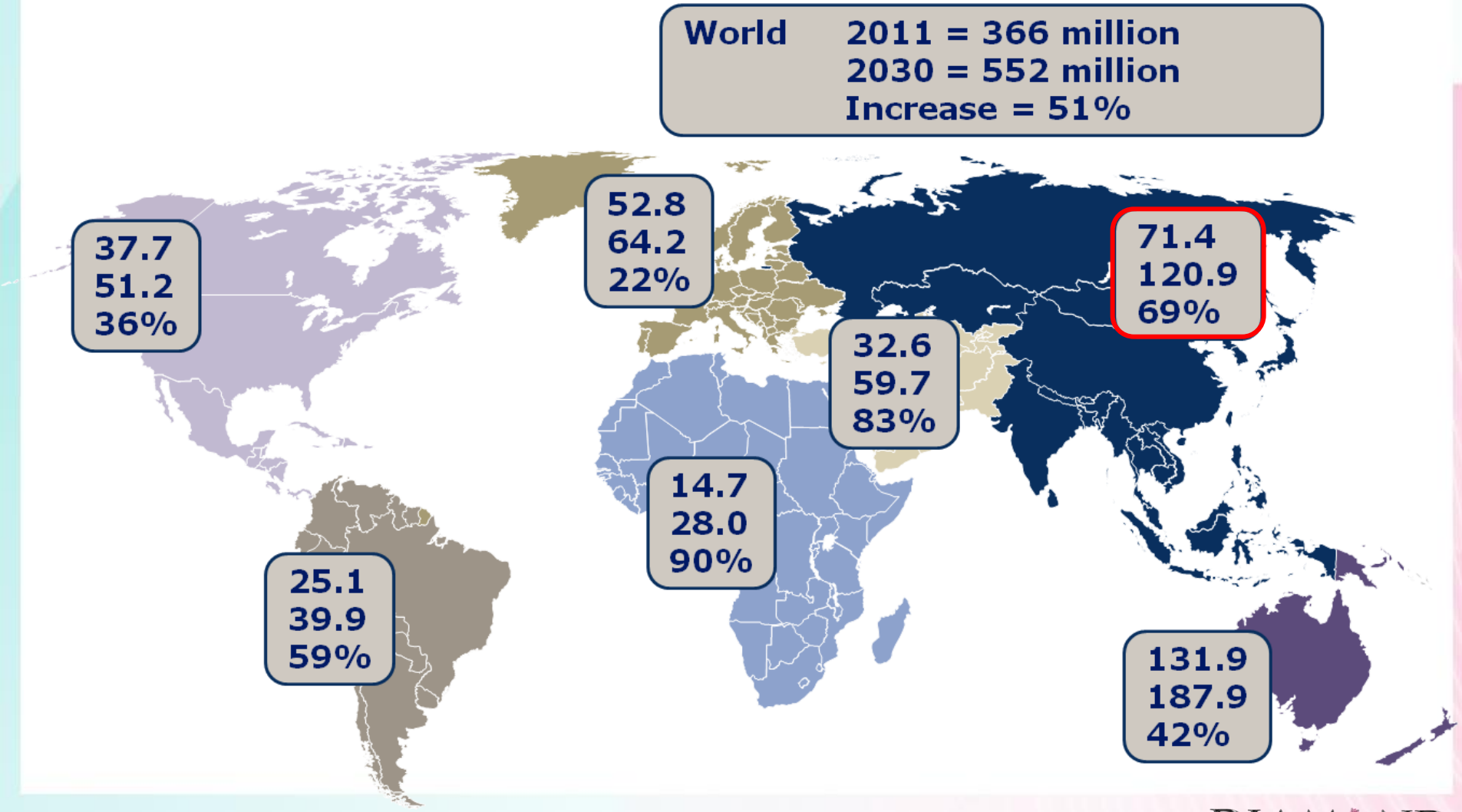
The Diabetes Epidemic: Global Projections, 2010–2030



IDF. Diabetes Atlas 5th Ed. 2011

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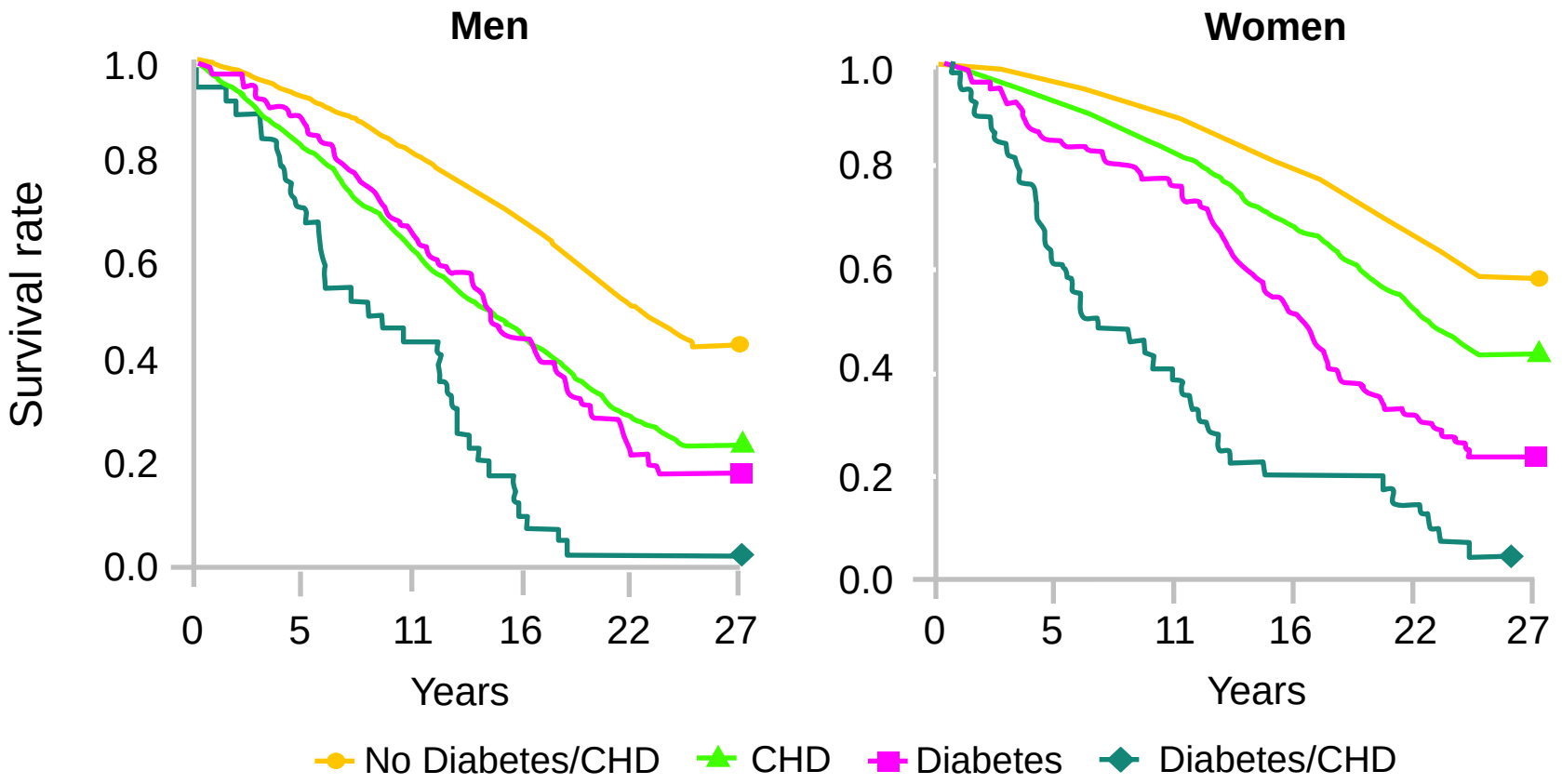
Diabetes as a CHD Risk Equivalent: Impact on Mortality in Men and Women

N = 7052 men, 8354 women; age 45–64 yrs, follow-up 25 years



Whiteley L et al. Diabetes Care. 2005;28:1588-93.

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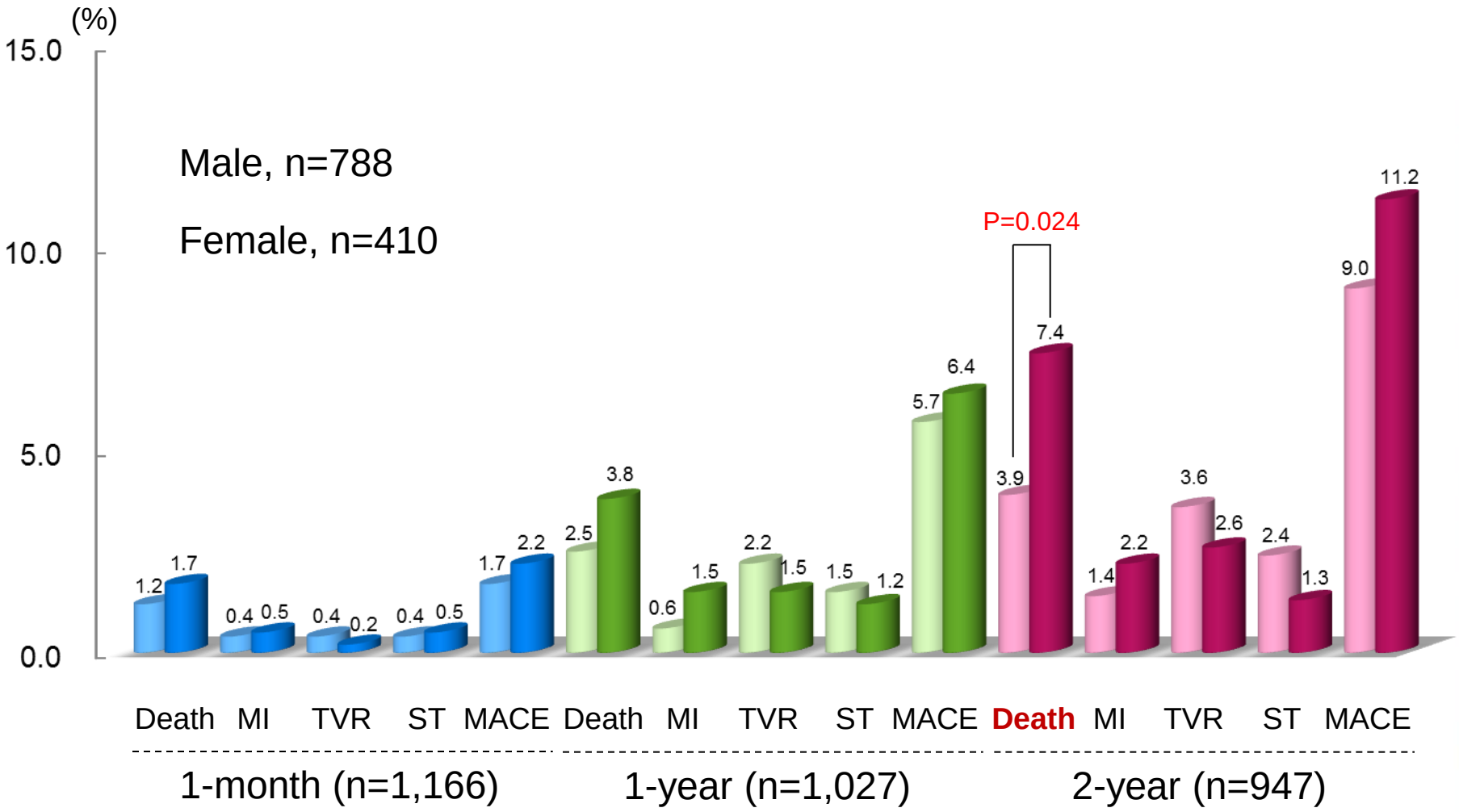
Clinical Outcomes: Male vs. Female



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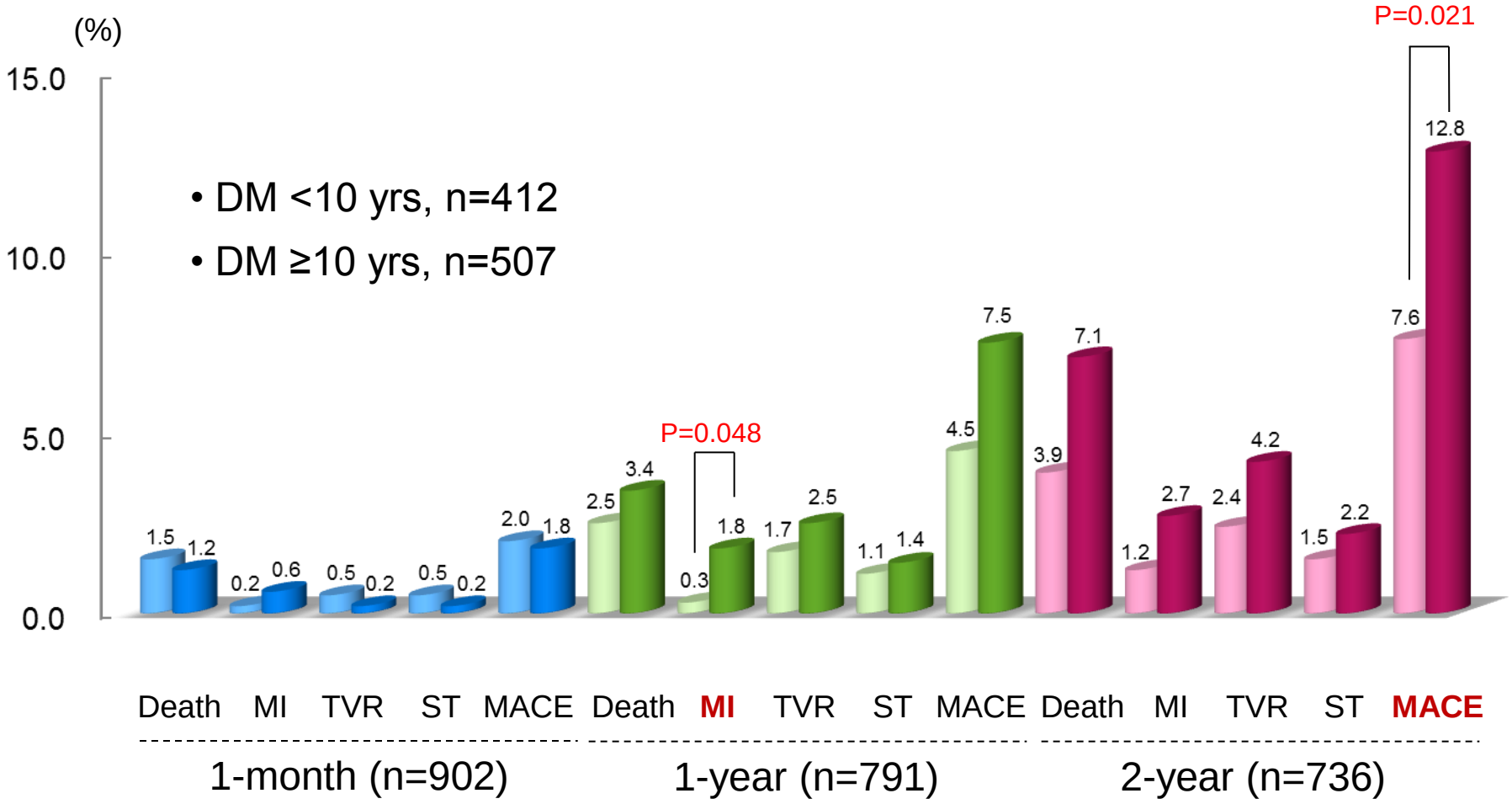
Clinical Outcomes: DM duration <10 yrs vs. ≥ 10 yrs



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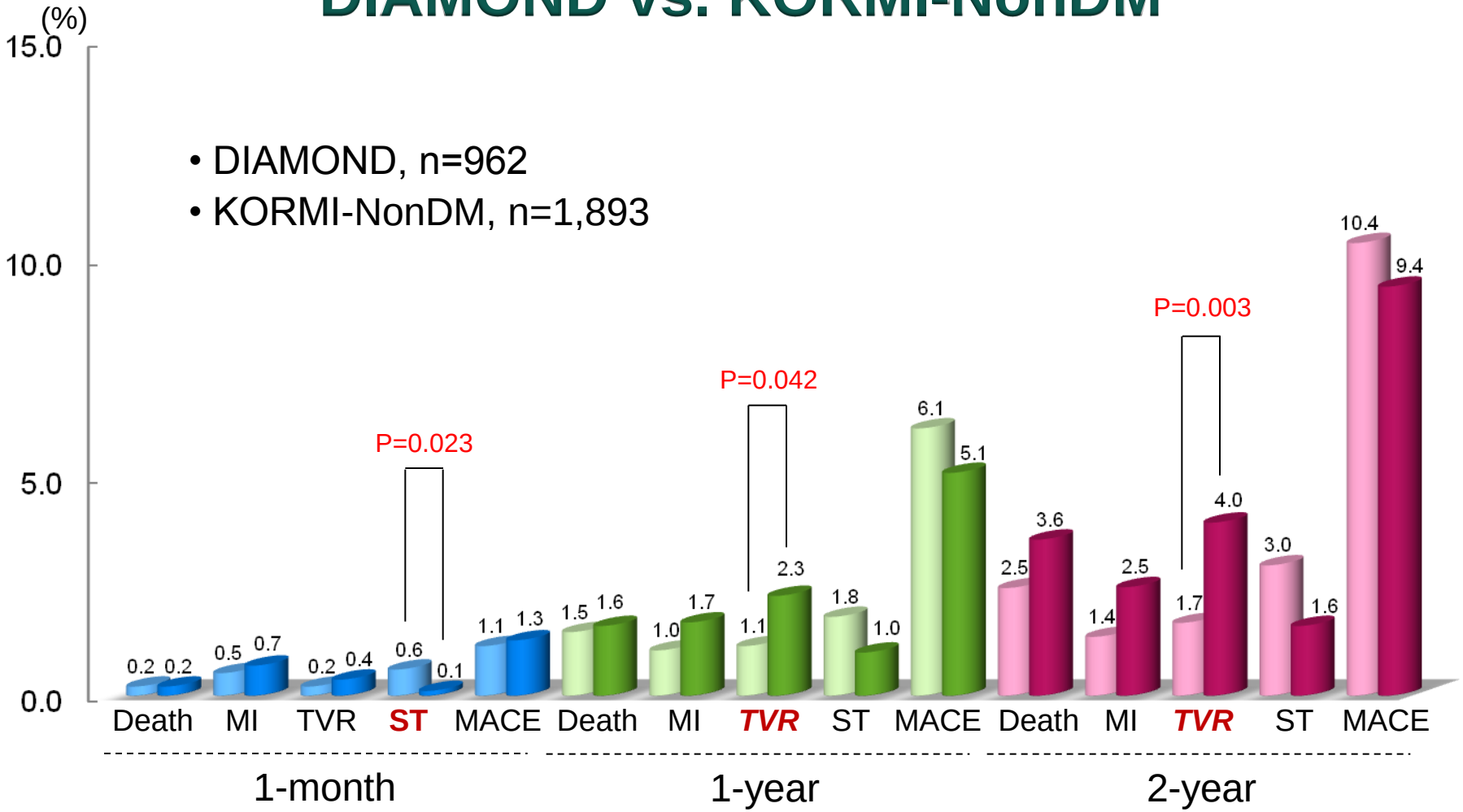
1:2 propensity score matching

Clinical Outcomes:
DIAMOND vs. KORMI-NonDM



DIAMOND KOR-NonDM

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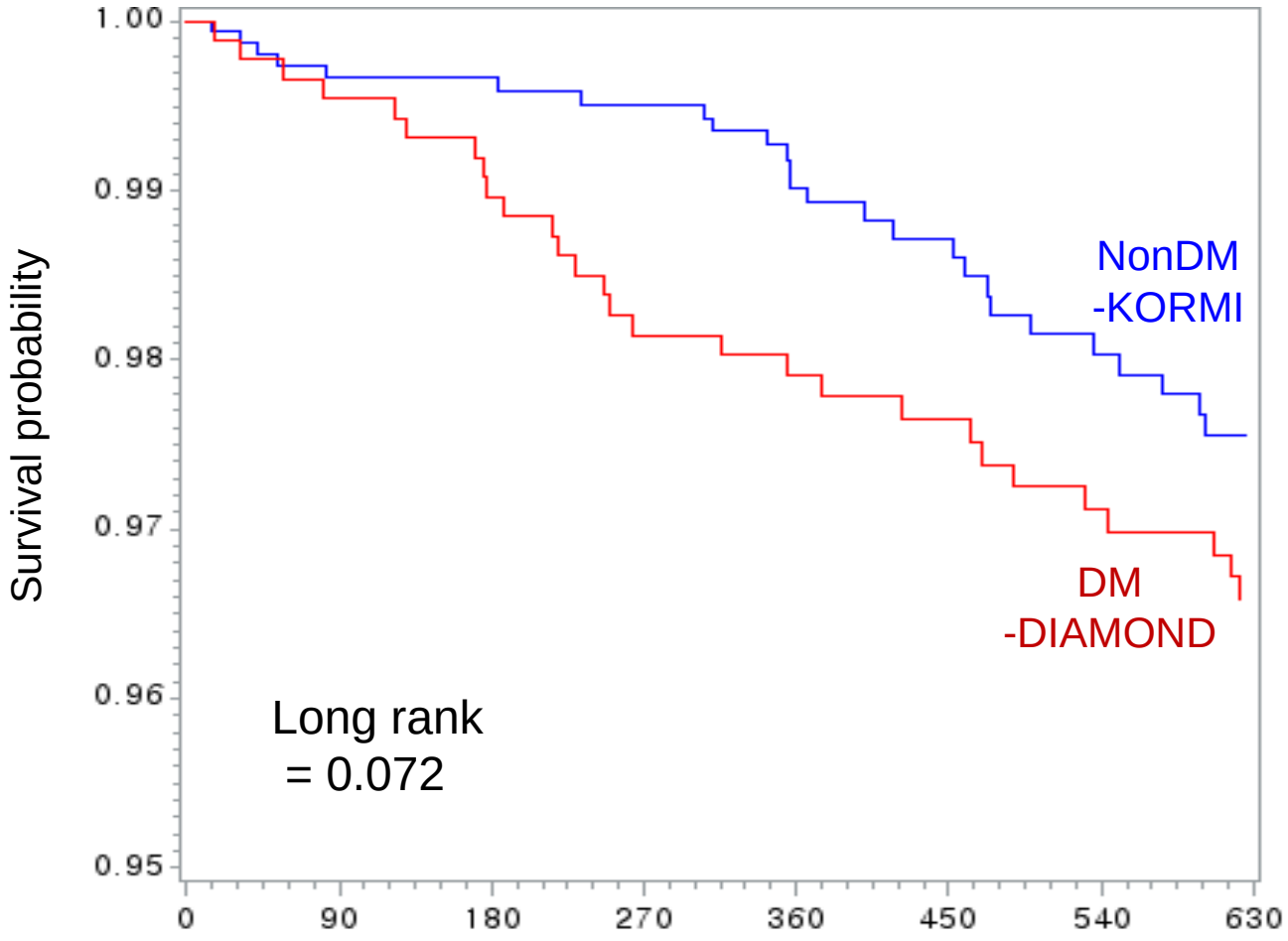
2-Year Kaplan-Meier Survival Curve



1:2 propensity score matching

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DIABETIC ACUTE MYOCARDIAL INFARCTION DISEASES REGISTRY IN KOREA

Clinical Characteristics:
DIAMOND vs. KORMI-NonDM

Pre-matching

Propensity score matching	DIAMOND (n=967)	KORMI NonDM (n=7,777)	*p*
Age, yrs	64.9±9.9	62.2±11.3	<0.001
Male gender, n(%)	635 (65.7)	5,952 (76.5)	<0.001
Prior MI, n(%)	64 (6.6)	205 (2.6)	<0.001
Hypertension, n(%)	633 (65.5)	3,443 (44.3)	<0.001
Hyperlipidemia, n(%)	242 (25.0)	929 (11.9)	<0.001
Smoking, n(%)	328 (33.9)	3,616 (46.5)	<0.001
Statin, n(%)	825 (85.3)	5,987 (77.0)	<0.001
Aspirin, n(%)	953 (98.6)	7,651 (98.4)	0.687
Clopidogrel, n(%)	923 (95.4)	7,369 (94.8)	0.357
Cilostazol, n(%)	179 (18.5)	1,855 (23.9)	<0.001
STEMI, n(%)	459 (47.5)	4,369 (56.2)	<0.001
LVEF, %	50.7±11.7	53.7±11.3	<0.001
BMI, kg/m^2	24.1±3.0	23.9±3.1	0.088
DES n(%)	825 (98.0)	5,845 (92.4)	<0.001
Stent diameter, mm	3.1±0.4	3.2±0.5	0.087
Stent length, mm	24.9±8.1	23.2±7.9	<0.001
Stent number	1.6±0.8	1.5±0.8	0.001

DIAMOND
DIABETIC ACUTE MYOCARDIAL INFARCTION DISEASES REGISTRY IN KOREA