

**A Novel Risk Stratification (NERS)
score in outcome prediction for
unprotected left main stenting:
comparison with the SYNTAX score**

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On behalf of the NERS study investigators

Background (1)

- * PCI of unprotected left main coronary artery stenosis (UPLMS) remains controversial
- * CABG remaining the gold standard in many parts of the world.
- * clinical co-morbidities likely also contribute to post-CABG and post-PCI clinical outcomes
- * MAIN-COMPARE study addressed the efficacy of PCI vs. CABG for UPLMS

Background (2)

* Current risk scoring systems—

EUROSCORE

PARSONNET

DUKE score

MAYOR score

SYNTAX score

—**lack of balance of clinical and lesions specificities**

Study design

Registry study of UPLMS(n=597) receiving stents: January 21, 1999~march 1, 2009

337 pts: 1999~2004,
October 2006~March2009
Angiogram F/U:86.8%

NERS score

SYNTAX score

260 pts, January 1,
2005~September 30,
2006

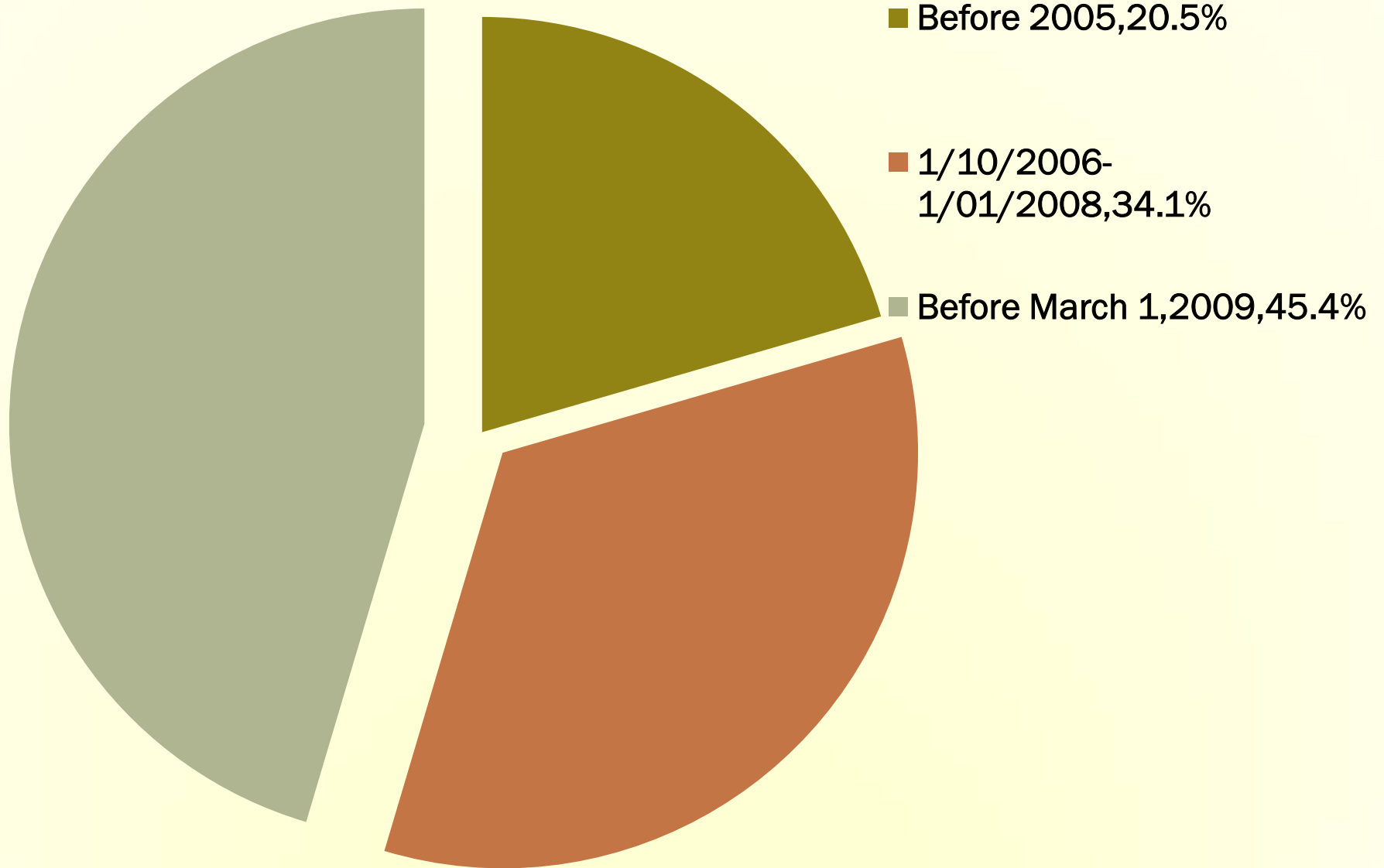
DISTAL study

126 variables were
selected

NERS scoring system: 17
clinical, 4 procedural, 33
lesions variables,
all with $p \leq 0.05$



Annual distribution



**Table 1. Clinica (n=17) and
procedural (n=4) variables for NERS
score**

Variables	Definition(s)	Score
Age\geq70yr.	Plus 1 score per 5 years increment	1.5
Gender	Female	0.1
Serum creatinine	\geq2.0mg/dl, plus 1 score per 1.0mg/dl increatment	1
dysfunction	LVEF\leq40%, plus 1 score per 10% reduction	1.5
Peripheral arterial disease	$>$50% stenosis in diameter	1.5
Previous MI	Myocardial infacrction\geq14 days	5.5
Acute myocardial infarction	AMI within 14 days	7.3
Cardiomyocyte biomarkers*	TNI /TNT at least one time more than normal limit	2.5
Diabetic mellitus	Diagnostic diabetes	1.8
Cardiogenic shock	By AHA/ACC criteria	5.6
Needing IABP	Before or during procedure	4.9
Hypertension	Blood pressure \geq160/90mmHg at admission	1.2
smoker	Including quitting $<$3 months	1.2
Stroke	Within 6-month	0.5

Variables	Definition(s)	Score
Not-taking statin	Without taking statin<2 weeks	0.5
LDL	>5.2mmol/L	1.8
Gastrointestinal bleeing	Within 6-month	0.2
Incomplete revascularization	Right dominance: RCA/LAD-4.2, LCX-0.5 Left dominance: LAD- 5.1; LCX-3.3	
Non-left main CTO failure	CTO in RCA(right dominance), LAD and LCX	10.2
Without IVUS-guidance	IVUS not used to guide the PCI procedure	0.5
2-stent technique	2-stent technique used for distal left main stenosis	3.5
Classical crush stenting	See reference 7	3.3
DK crush stenting	See reference 7	0.02
Culotte	See reference 8	2.1
T stenting	See reference 8	0.6
V or SKS stenting	See reference 8	2.6

Table 2. Anigraphic variables(n=33)



variables	Right dominance	Left dominance
RCA		
CTO	1.0	0
true bifurcation	1.0	0
long lesion	0.5	0
proximal vessel <2.0mm	0.5	0
severe calcification	0.5	0
tortuous	0.5	0
thrombus-containing	1.0	0
LAD		
CTO	3.5	5.8
true bifurcation	3.5	5.8
long lesion	1.8	2.9
proximal vessel <2.0mm	1.8	2.9
severe calcification	1.8	2.9
tortuous	1.8	2.9
thrombus-containing	3.5	5.8

variables	Right dominance	Left dominance
LCX		
CTO	1.8	4.2
true bifurcation	1.8	4.2
long lesion	1.0	2.1
proximal vessel <2.0mm	1.0	2.1
severe calcification	1.0	2.1
tortuous	1.0	2.1
thrombus-containing	1.8	4.2
LMT		
distal non-bifurcation	2.4	5.9
distal true bifurcation	5.3	10
distal trifurcation	5.3	10
CTO	5.3	10
Severe calcification	4.6	7.3
whole stem	2.4	5.9
ostial	1.6	3.5
body	1.2	2.1
thrombus-containg	5.3	10.0
No collateral from RCA	3.5	0.5
Restenotic lesions	ISR within LMT	6.4
Multivessel diseases	downstream lesions and diseased RCA	5.3

Results



Table 3. Baseline characteristics of 337 patients

Indexes	Values
Age(yr.)	66.55 ± 10.49
Male,n(%)	266(78.9)
Acute myocardial infarction,n(%)	85(25.2)
STEMI	74(21.9)
NSTEMI	11(3.3)
Previous myocardial infarction,n(%)	46(13.6)
Diabetic mellitus,n(%)	85(25.2)
Hypertension,n(%)	238(70.6)
Current smoker,n(%)	121(35.9)
Abnormal lipidemia,n(%)	126(37.4)
LVEF<40%,n(%)	64(19.0)
Intro-aortic balloon pumping,n(%)	21(6.2)
Temporary cardiac pacemaking,n(%)	5(1.5)
Emergency procedure for left main disease,n(%)	22(6.5)

Table 4. Angiographic and procedural characteristics

Indexes	values
Collaterals to left coronary artery,n(%)	169(50.1)
Restenotic lesions,n(%)	10(3.0)
Chronic total occluded ,n(%)	
In left main trunk	8(2.1)
In non-left main vessel	78(23.1)
Location of lesions in left main trunk,n(%)	
Ostial	107(31.8)
Body	102(30.5)
Distal lesions	282(83.7)
2-stent technique,n(%)	122(36.2)
DK crush	41(33.6)
Classical crush	32(26.2)
Culotte	21(17.2)
T	20(16.4)
V/SKS	8(6.6)
Isolated left main,n(%)	83(24.6)
Complete revascularization,n(%)	202(59.9)

Table 4. Continued

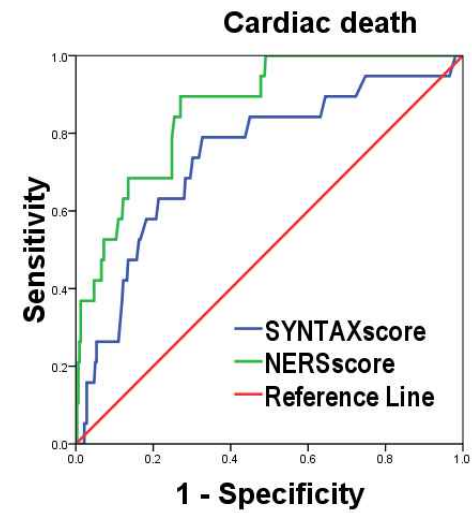
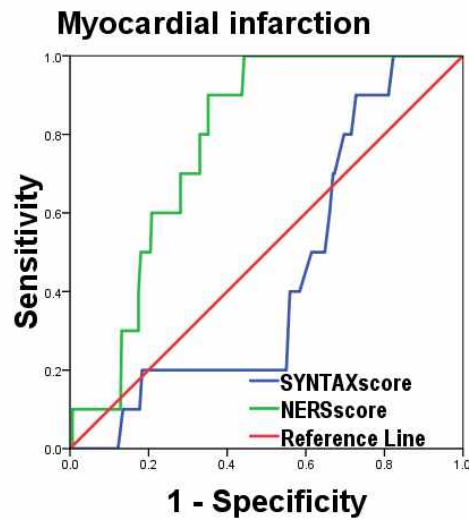
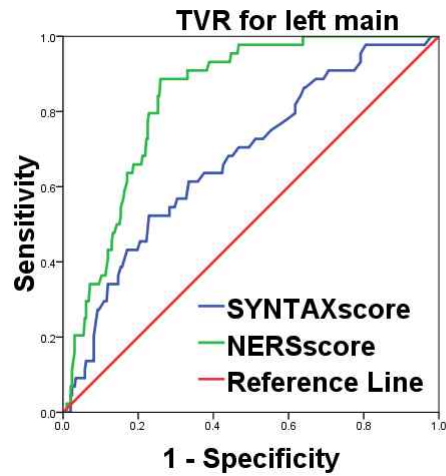
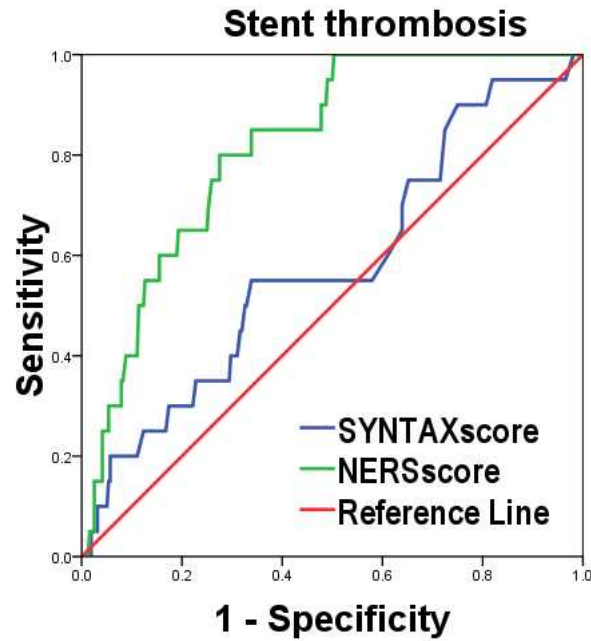
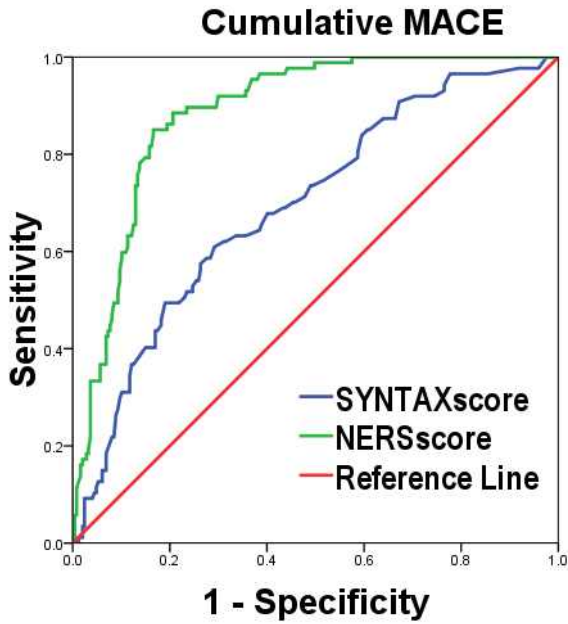
Indexes	values
Stent number in left main(n)	441
Per-patient(n)	1.31 ± 0.47
Bare metal stent,n(%)	56(12.69)
Drug-eluting stent,n(%)	385(87.31)
Stent diameter in left main(mm)	3.44 ± 0.50
Stent length in left main(mm)	27.79 ± 14.14
Overall stent number(n)	1089
Per-patient(n)	3.23 ± 0.74
Bare metal stent,n(%)	135(12.40)
Drug-eluting stent,n(%)	954(87.60)
Overall stent diameter(mm)	3.19 ± 0.47
Overall stent length(mm)	77.13 ± 21.38
TIMI 3 flow in left main pre-procedure,n(%)	331(98.2)
TIMI 3 flow in non-LMT pre-procedure,n(%)	238(70.6)
Angiographic success in left main,n(%)	336(99.7)
Angiographic success in non-LMT,n(%)	298(88.4)

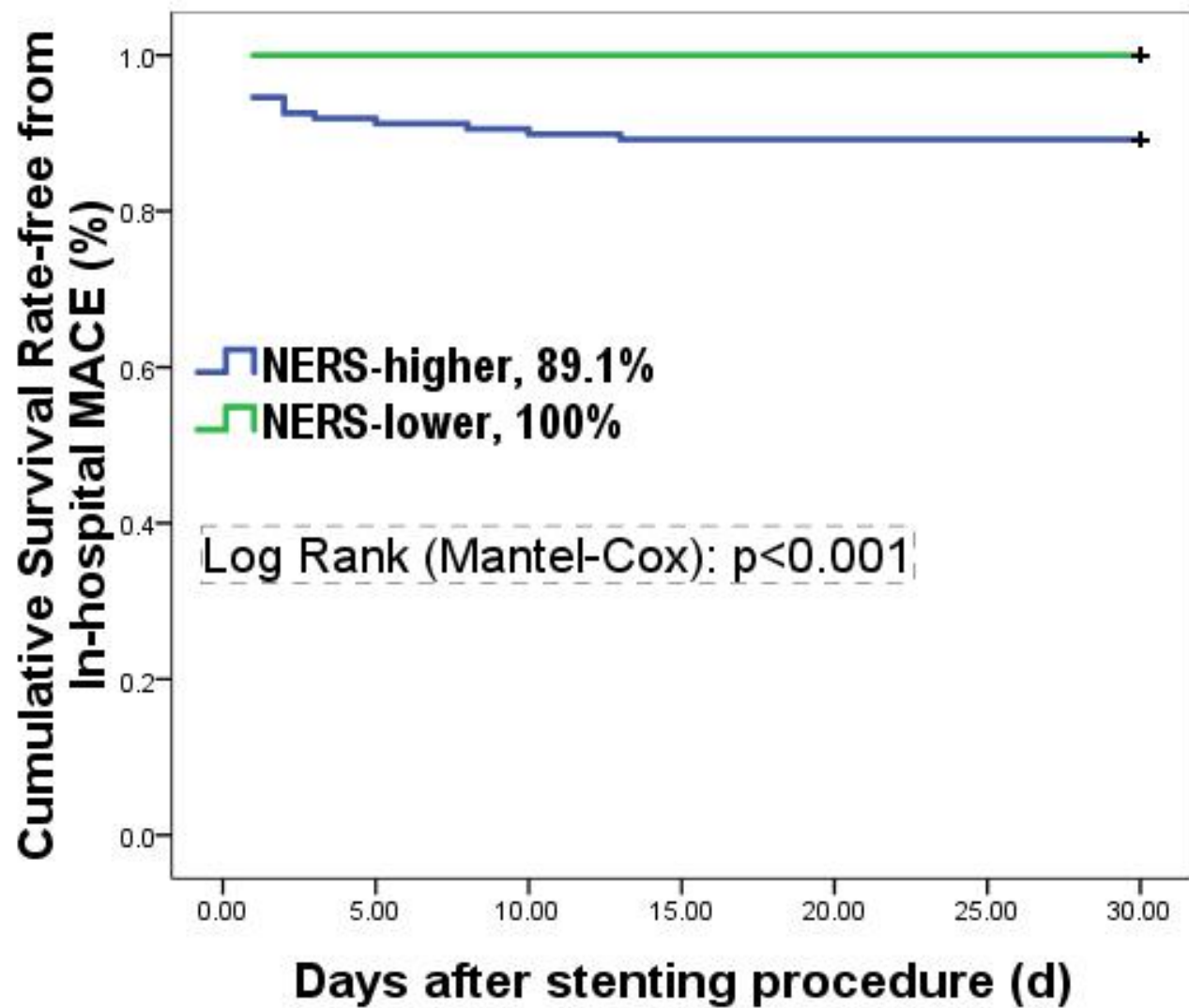
Table 5. ROC curve analysis

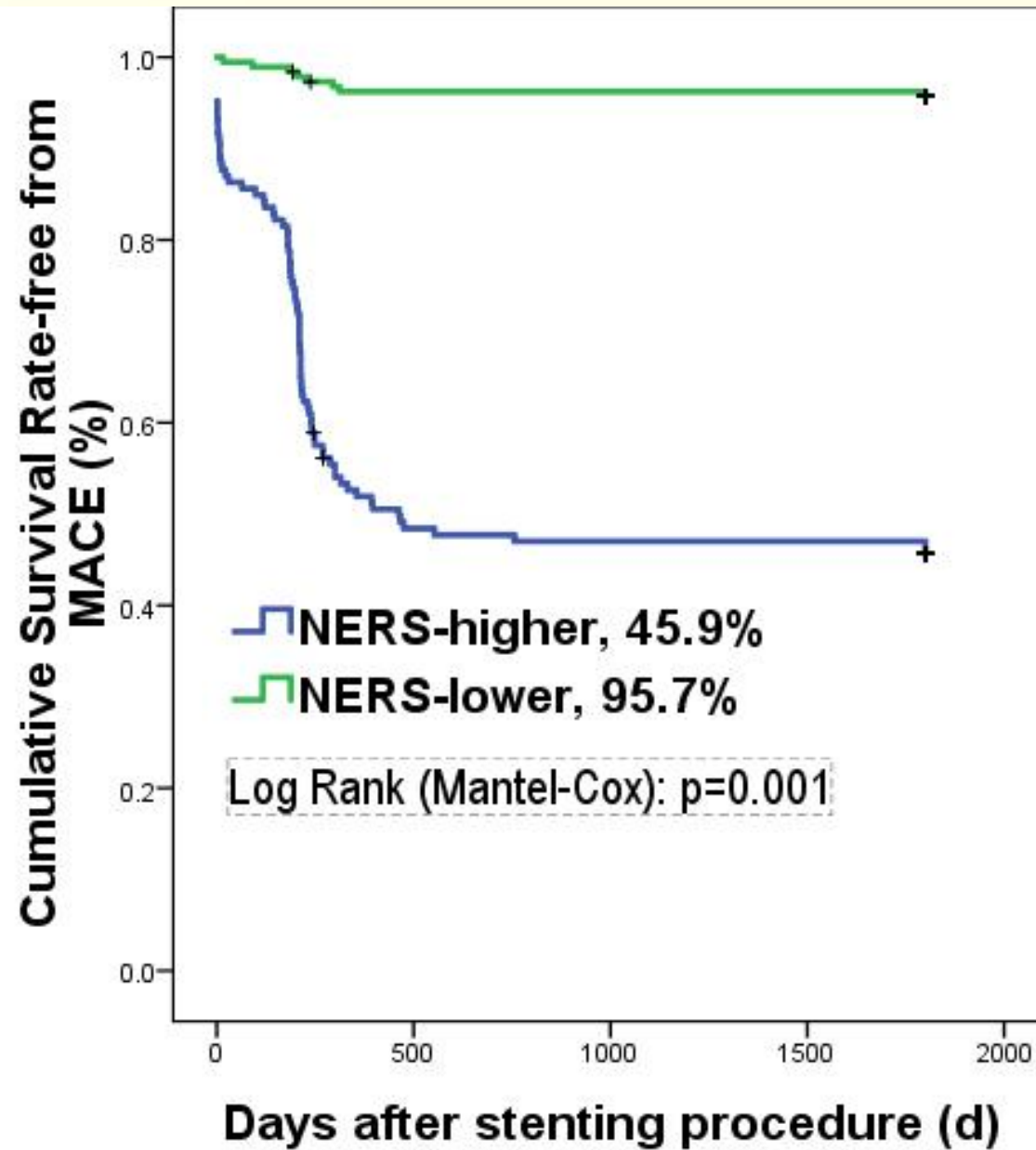
	NERS score			SYNTAX score		
	Area	95% CI	p	Area	95% CI	p
In-hospital						
Cardiogenic	0.926	0.855-0.997	0.000	0.775	0.612-0.937	0.013
death	0.871	0.733-0.958	0.011	0.617	0.360-0.875	0.419
MI	0.688	0.574-0.801	0.091	0.665	0.539-0.786	0.188
TVR	0.861	0.800-0.922	0.000	0.635	0.503-0.768	0.067
Cumu MACE	0.847	0.726-0.967	0.004	0.541	0.327-0.755	0.732
ST						
At the follow-up						
All-cause death	0.785	0.693-0.876	0.000	0.707	0.598-0.817	0.001
Cardiogenic	0.864	0.793-0.935	0.000	0.742	0.543-0.752	0.000
death	0.777	0.694-0.861	0.003	0.545	0.305-0.583	0.545
MI	0.836	0.787-0.886	0.000	0.675	0.592-0.759	0.000
TVR	0.891	0.857-0.926	0.000	0.695	0.632-0.758	0.000
Cumu MACE	0.818	0.743-0.892	0.000	0.580	0.447-0.712	0.232
ST						

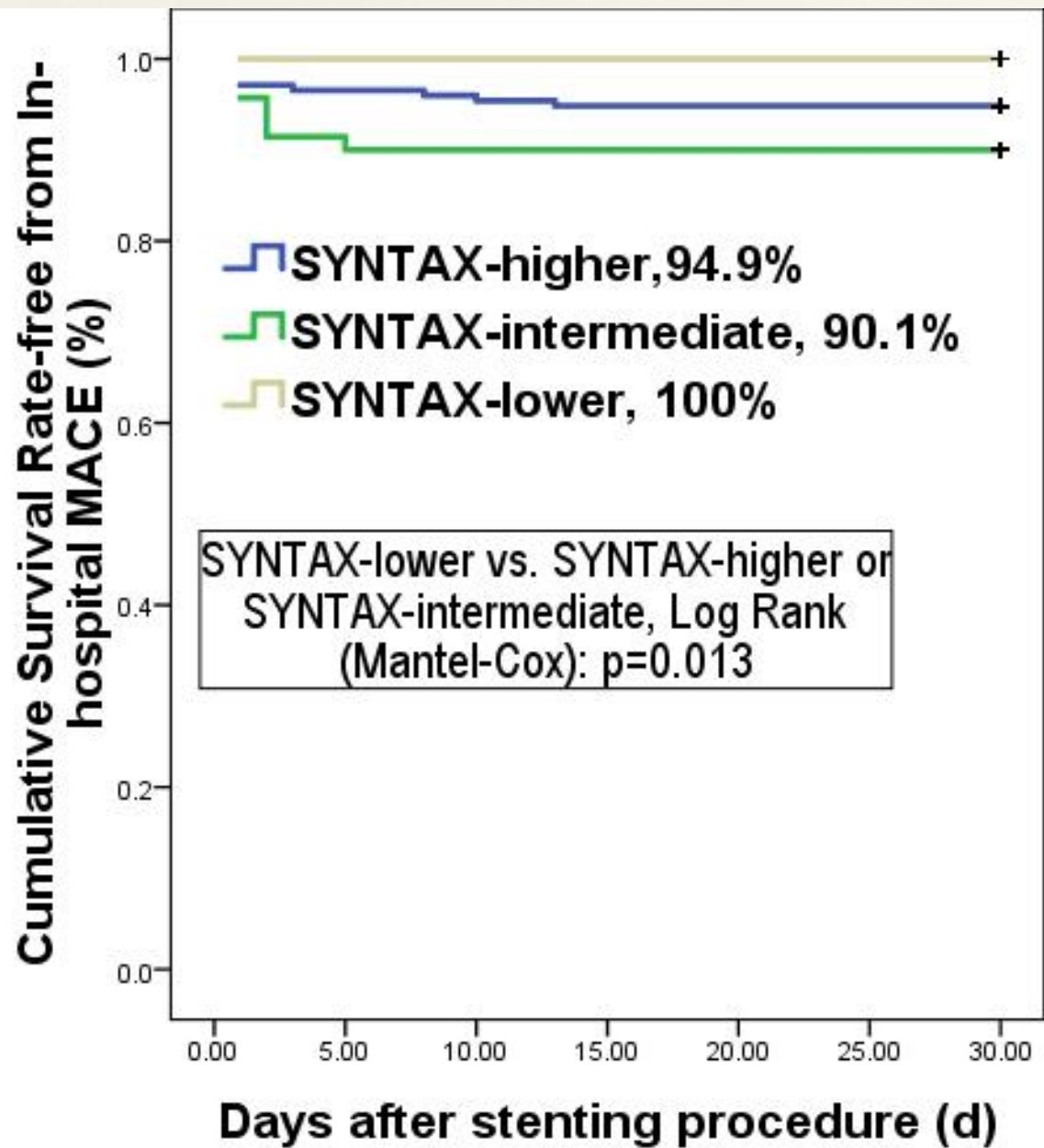
Table 6. Sensitivity, specificity by NERS and SYNTAX score

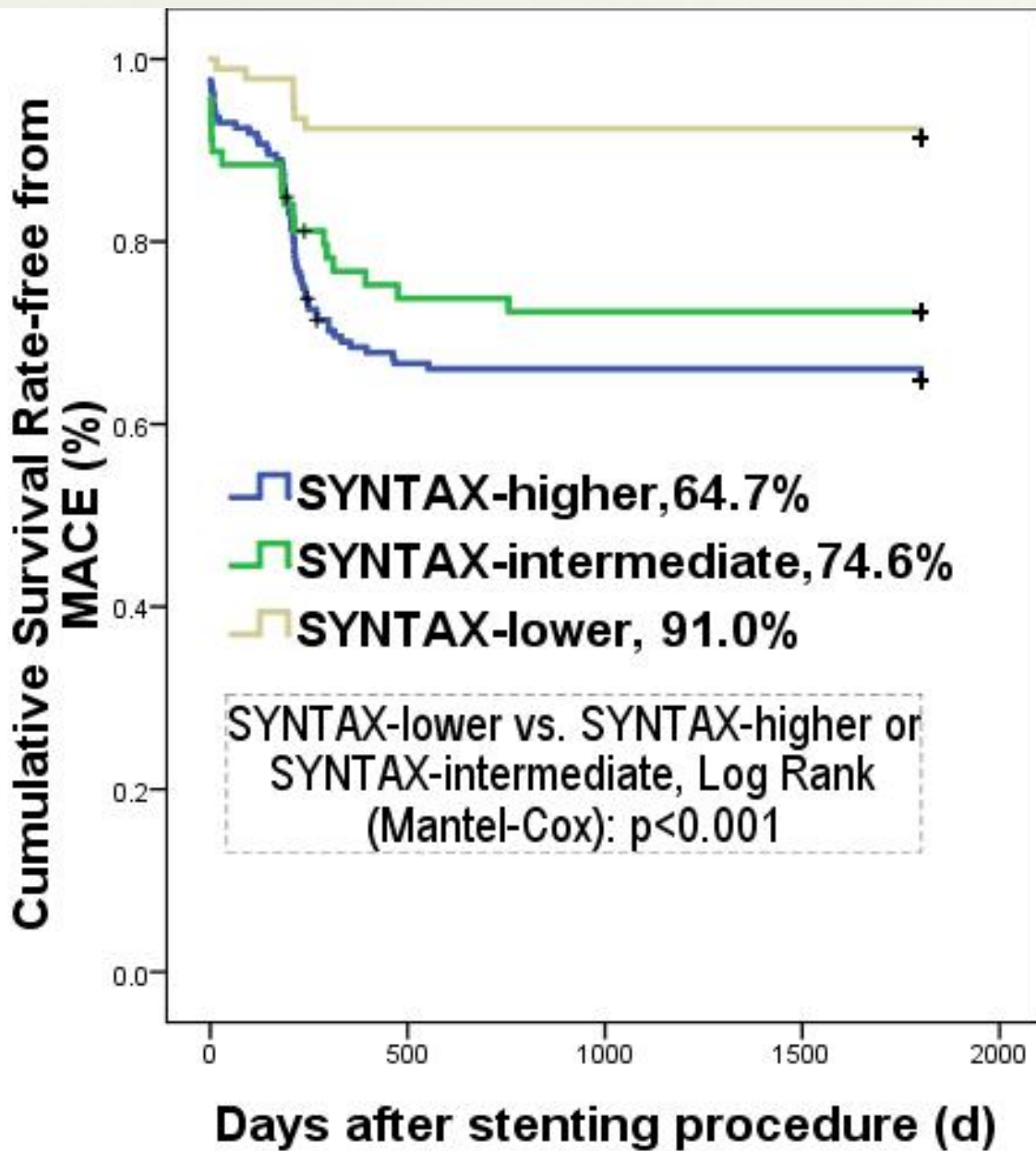
	SYNTAX score			NERS score (≥ 25 scores)	P*
	≥ 33 scores	23~32 scores	≥ 23 scores		
Sensitivity(%)	70.5	20.5	90.9**	92.0***	<0.001
False positive(%)	64.6	74.6	67.6	25.9	<0.001
Specificity(%)	35.4	25.4	32.4	74.1	<0.001
False negative(%)	29.5	79.5	9.1**	8.0	<0.001









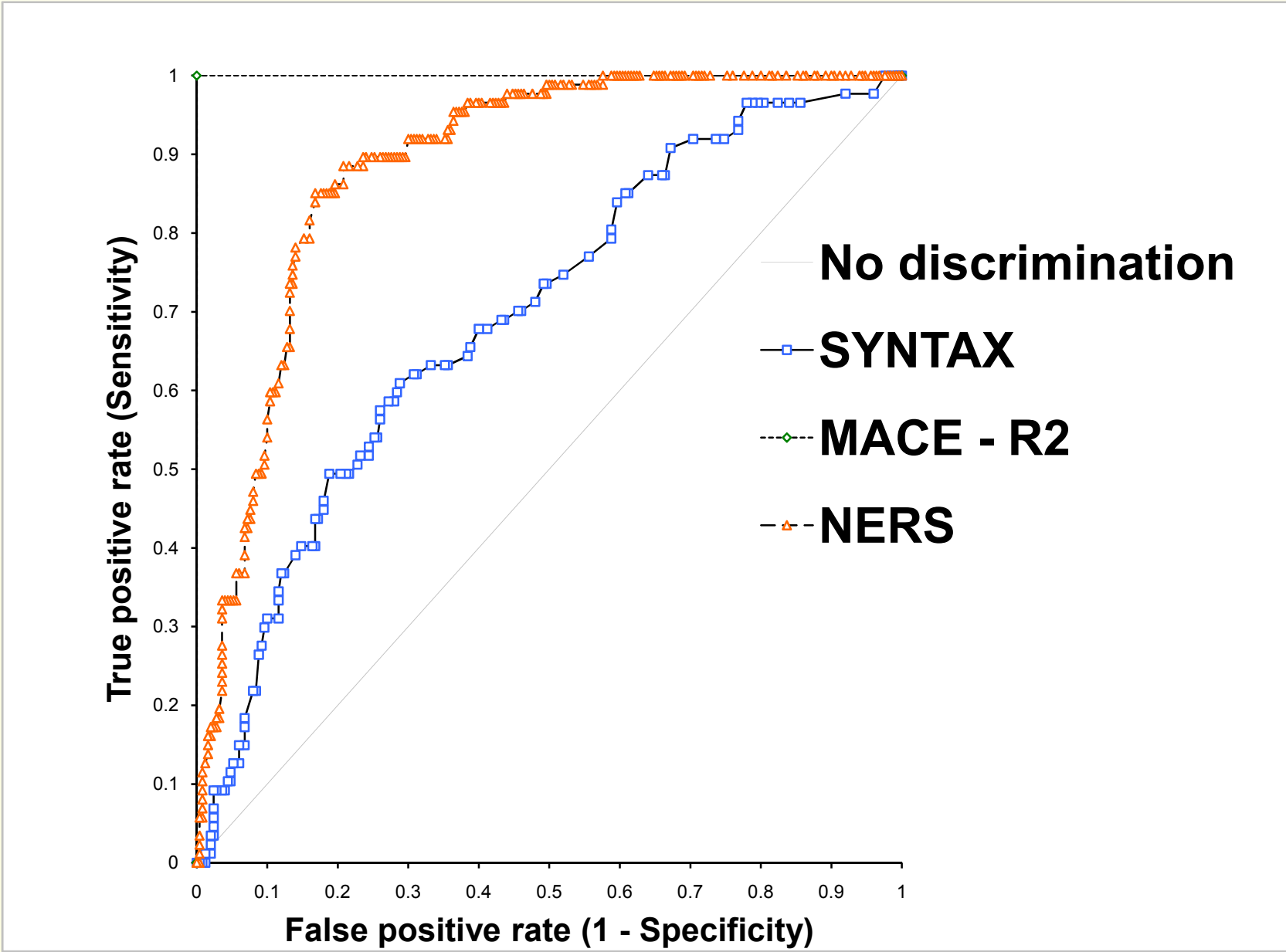


DeLong-DeLong analysis

Contrast	Difference	95% CI	Z	p
SYNTAX vs. MACE	-0.31	-0.37 to -0.24	-9.40	<0.0001
SYNTAX vs. NERS	-0.19	-0.25 to -0.13	-6.09	<0.0001
MACE vs. NERS	0.11	0.08 to 0.15	6.27	<0.0001

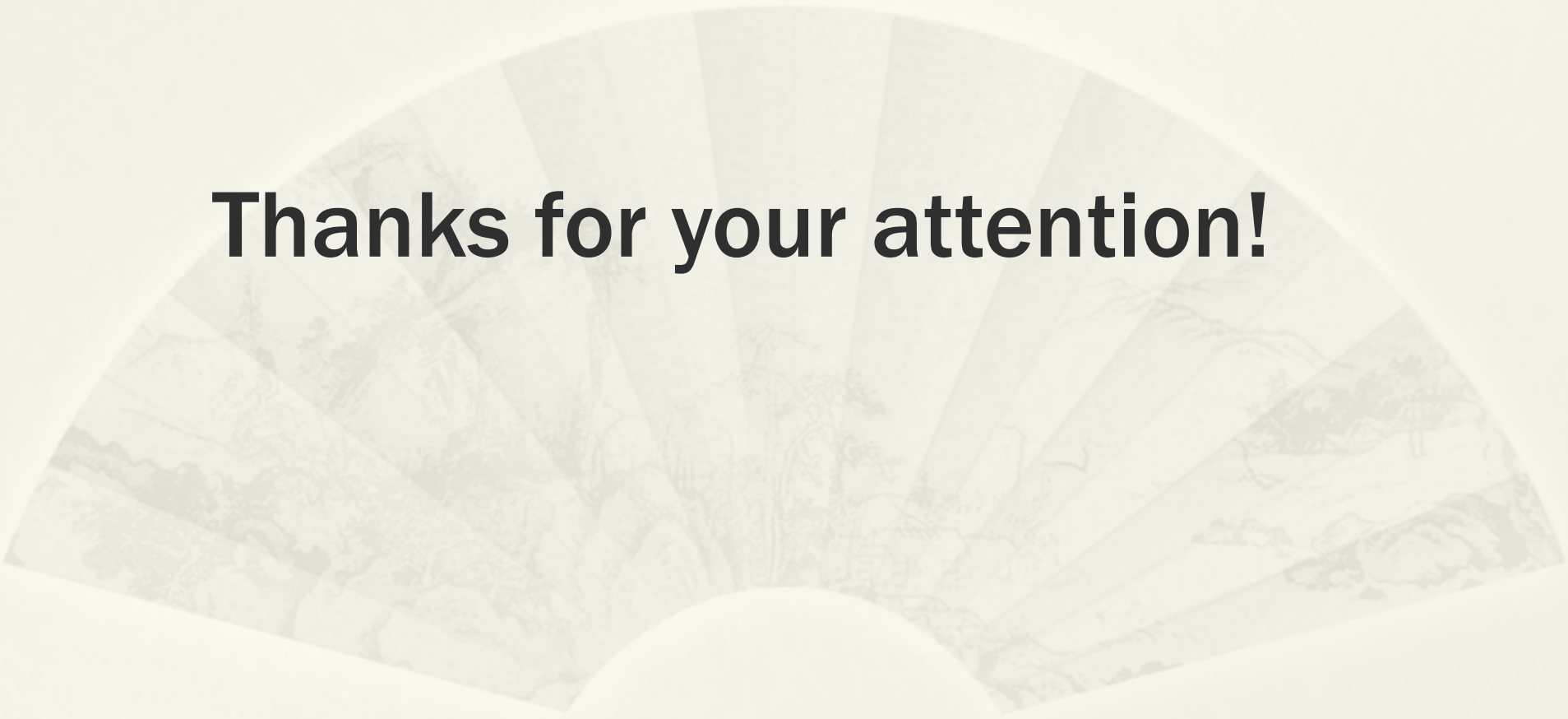
H_0 : Difference between areas = 0,

H_1 : Difference between areas \neq 0,



Conclusions

- * NERS is consisted of comprehensive variables, including 17 clinical, 4 procedural and 33 angiographic variables.
- * NERS was predictive, as compared to SYNTAX score in outcome prediction for UPLMS patients
- * Further randomized studies are mandatory to compare PCI vs. CABG for UPLMS patients by NERS score



Thanks for your attention!