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Prevalence of early repolarization in Thailand and long term risk of cardiac mortality

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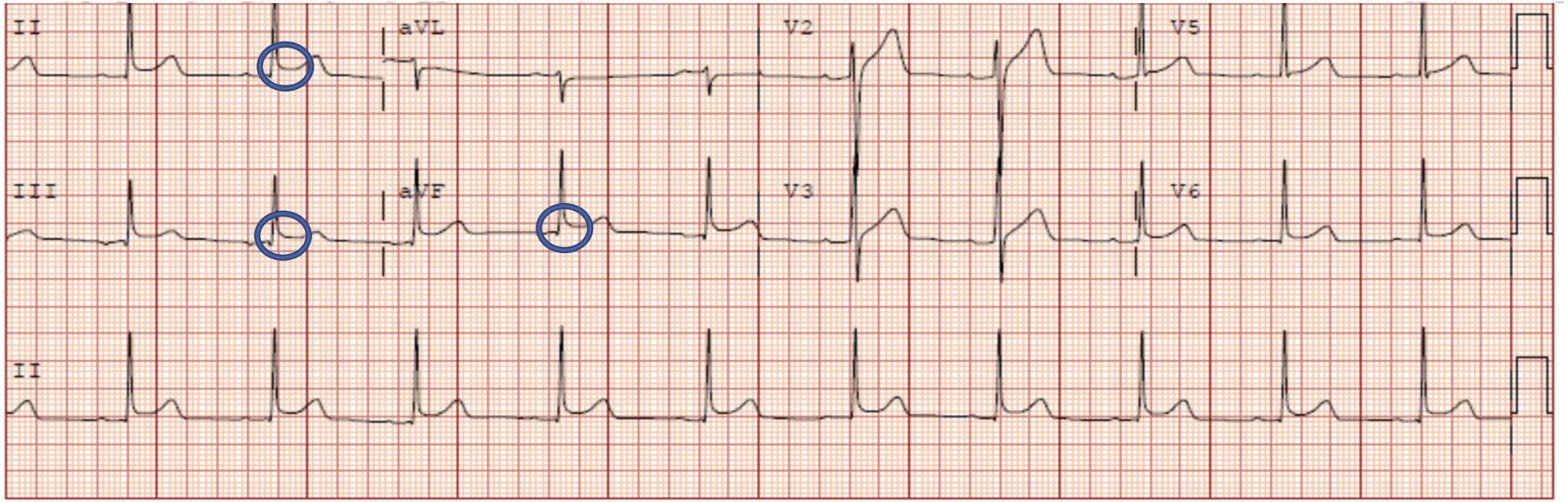
HR	63	.	Sinus rhythm
		.	Consider left ventricular hypertrophy
PR	183	.	ST elev, probable normal early repol pattern
QRSD	89	$.	Baseline wander in lead(s) V1
QT	413		
QTc	423		

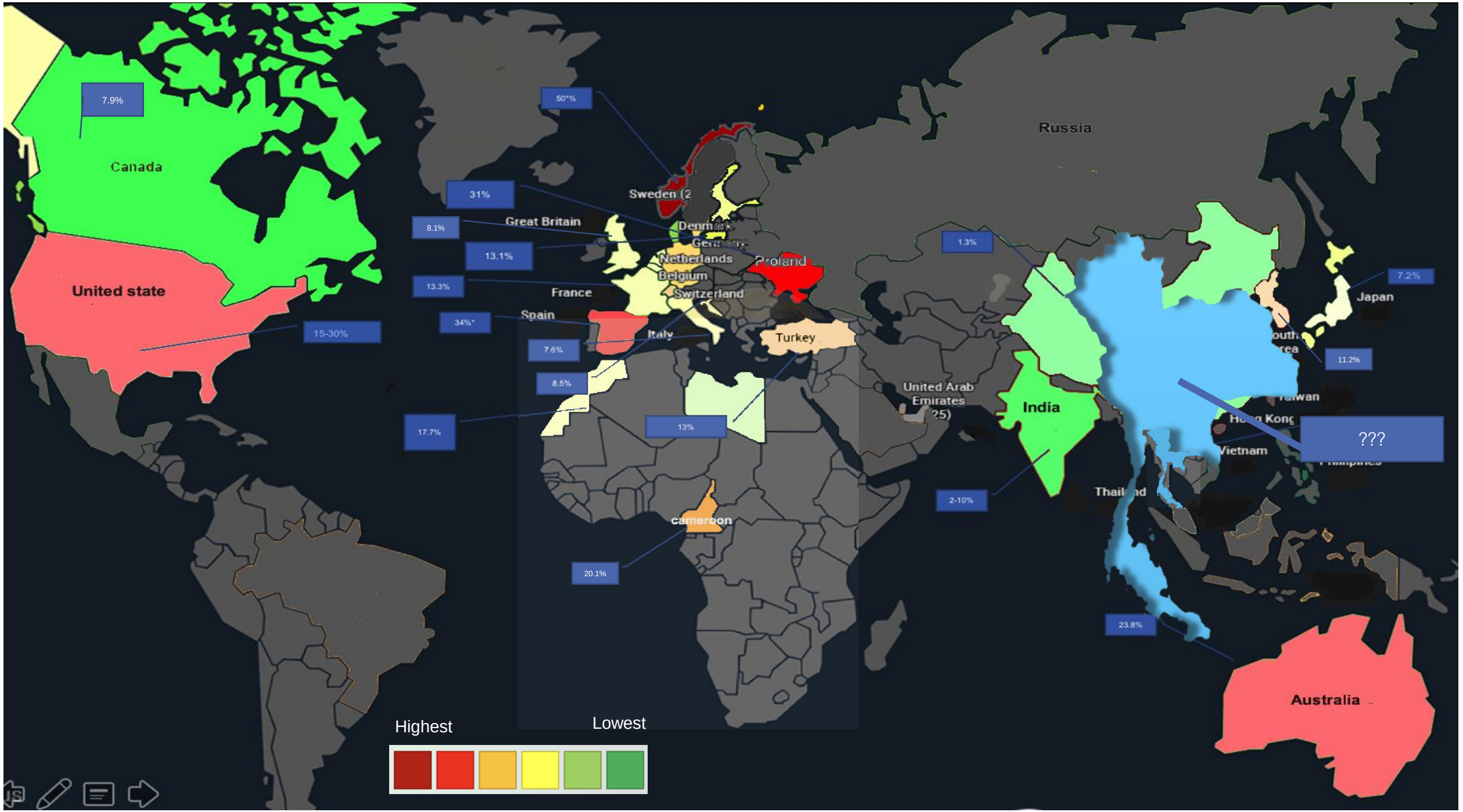
-- AXIS --

P	-16
QRS	71
T	62

- ABNORMAL ECG -

Previous Study:28-Sep-2018 10:24:07 - Abnormal Unconfirmed




7.9%
Canada
United state
15-30%
50*%
31%
Sweden (2
8.1%
Great Britain
13.1%
13.3%
France
34%*
Spain
7.6%
8.5%
17.7%
Netherlands
Belgium
Switzerland
Proland
Italy
Turkey
13%
cameroon
20.1%
Russia
1.3%
United Arab
Emirates
25)
India
2-10%
7.2%
Japan
11.2%
???
Vietnam
23.8%
Australia
Highest
Lowest

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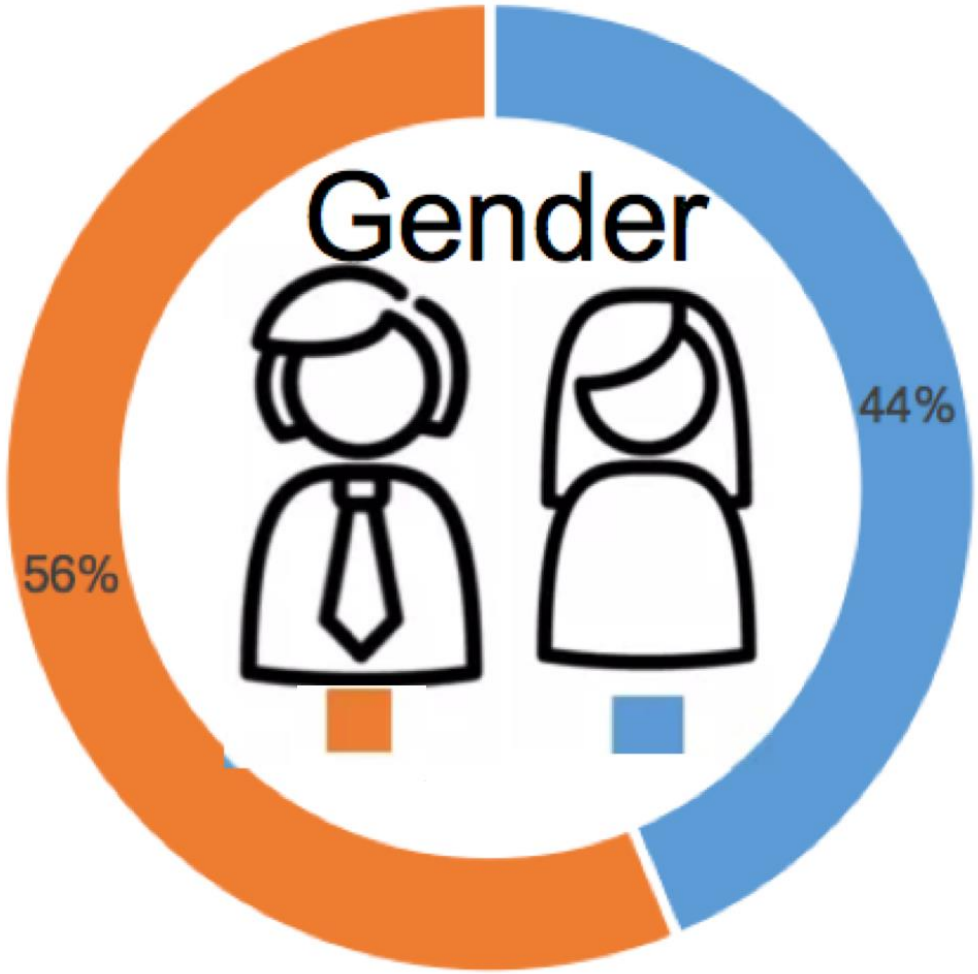
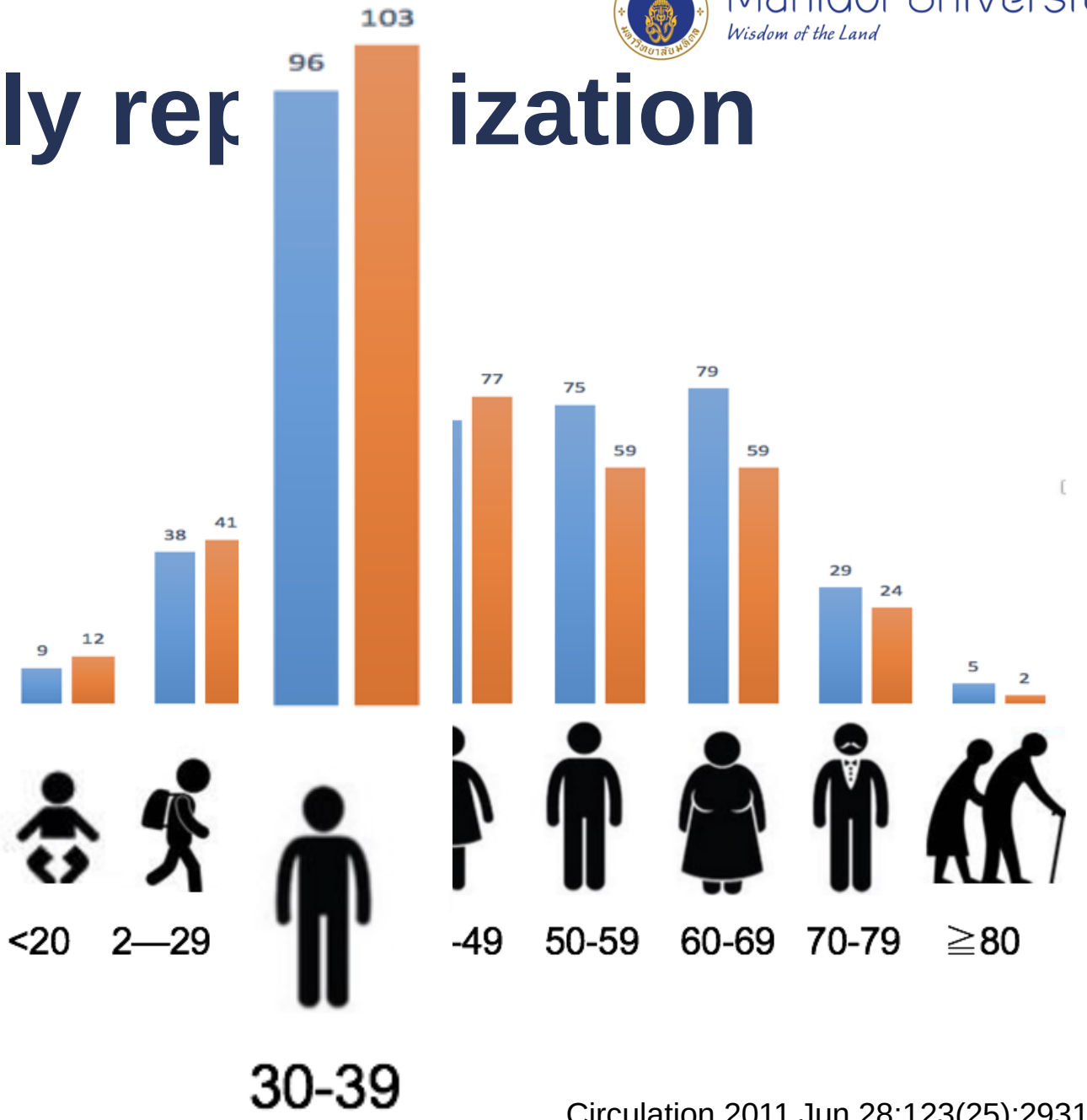
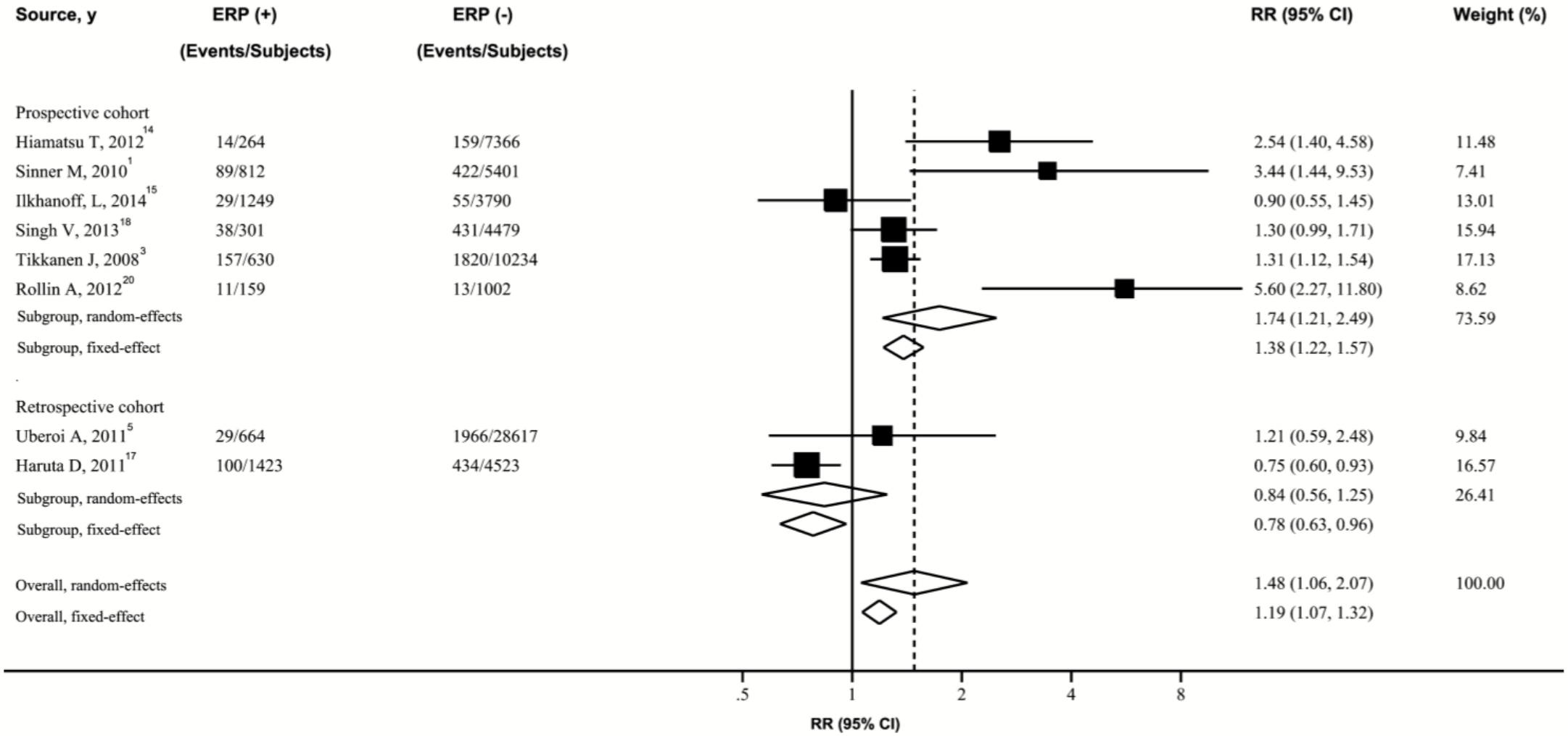
Prevalence of early rep ization





Circulation.2011 Jun 28;123(25):2931-7

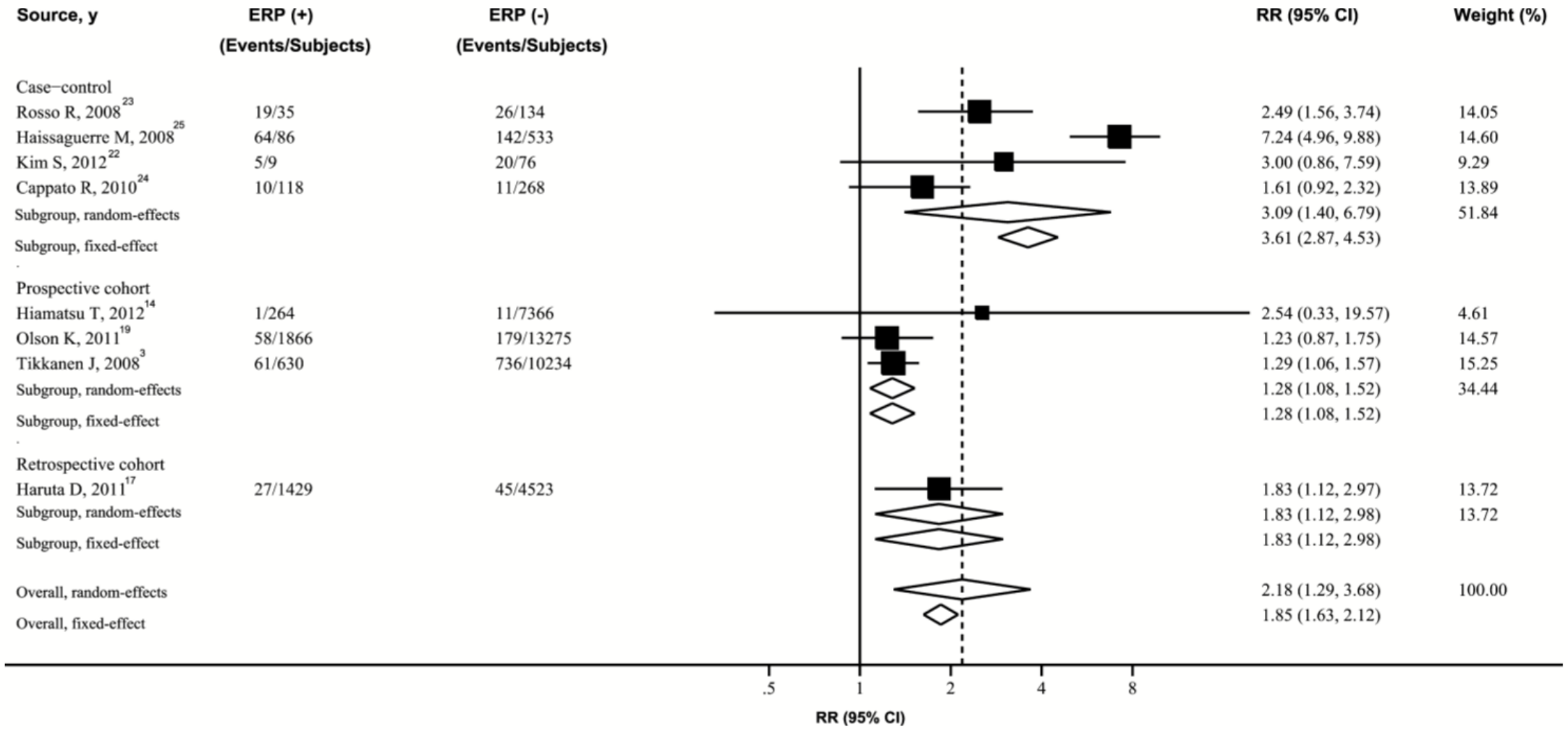
ERP and cardiac mortality



Forest plot showing relative risk for cardiac death associated with ERP

J Am Heart Assoc. 2016 Sep; 5(9): e003375.

ERP and cardiac mortality



Forest plot showing relative risk for SCA associated with ERP

J Am Heart Assoc. 2016 Sep; 5(9): e003375.

Primary outcome

- Prevalence of early repolarization in Thai population
- Long term risk of cardiac mortality in Thai population

Secondary outcome

- Determine the characteristics and potential predictors of malignant ERP in a resting electrocardiogram that increases the cardiac mortality risk a in Thai general population

Research methodology

- Prospective cohort study

Inclusion criteria

- Participants of the secondary survey EGAT 1 consists 2,756 age 35–65 years olds who underwent 12 leads standard EKGs

Exclusion criteria

- Unreadable EKG
- Incomplete baseline characteristic
- Participants who established prior Cardiovascular disease before underwent the EKG

Material and methods

- All subjects underwent 12 leads standard EKGs with digital filters in supine position and paper speed is 25mm/s
- ECG of each participant was interpreted blindly (without clinical information of the participant and with an anonymous identifier) and random confirmed by Cardiac electrophysiology

Measurements

Baseline assessment were record

History; age, sex, educational level, occupation, tobacco smoking, alcohol drinking

Physical examination; BP, HR, weight, height and waist and hip circumference

Laboratory tests; BS, total cholesterol, LDL, HDL, TG and creatinine

Material and methods

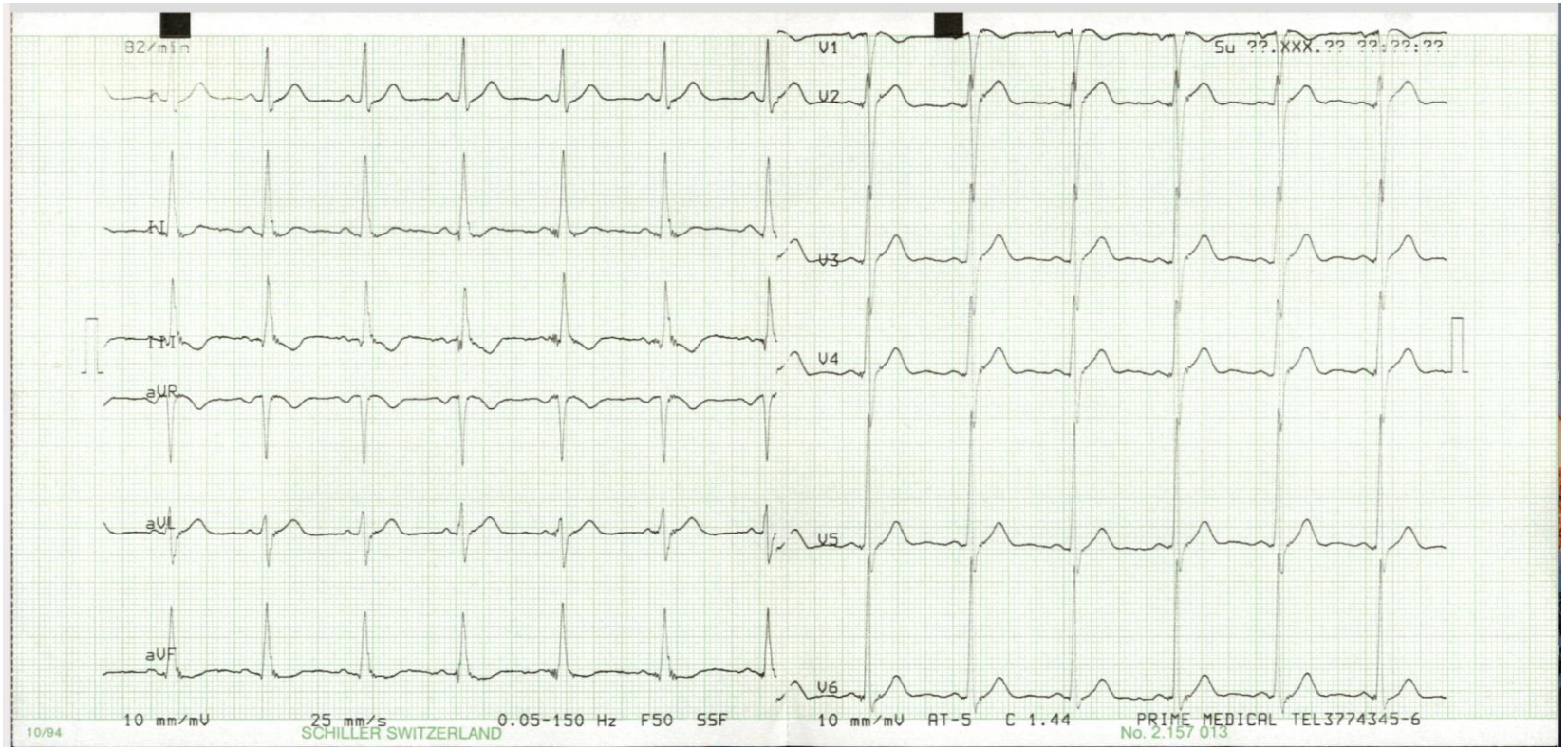
- Primary endpoints are composed of all-caused of death, 3P-MACE (CV death, nonfatal MI and nonfatal stroke) and sudden cardiac death

Material and methods

- Vital status of all participants using national registration system. We collected all of the death certificates from 1997 to 2015.

Measurements

- Electrocardiography
- A standard resting 12-lead electrocardiogram was obtained for each participant with a digital electrocardiograph witch paper speed is 25mm/sec.



Definition Early repolarization

- ERP was diagnosed if there was J-point elevation of ≥ 0.1mV in ≥ 2 leads in the inferior (II, III, aVF) or lateral (I, aVL, V4-6) territory, or both.(11)
- Terminology

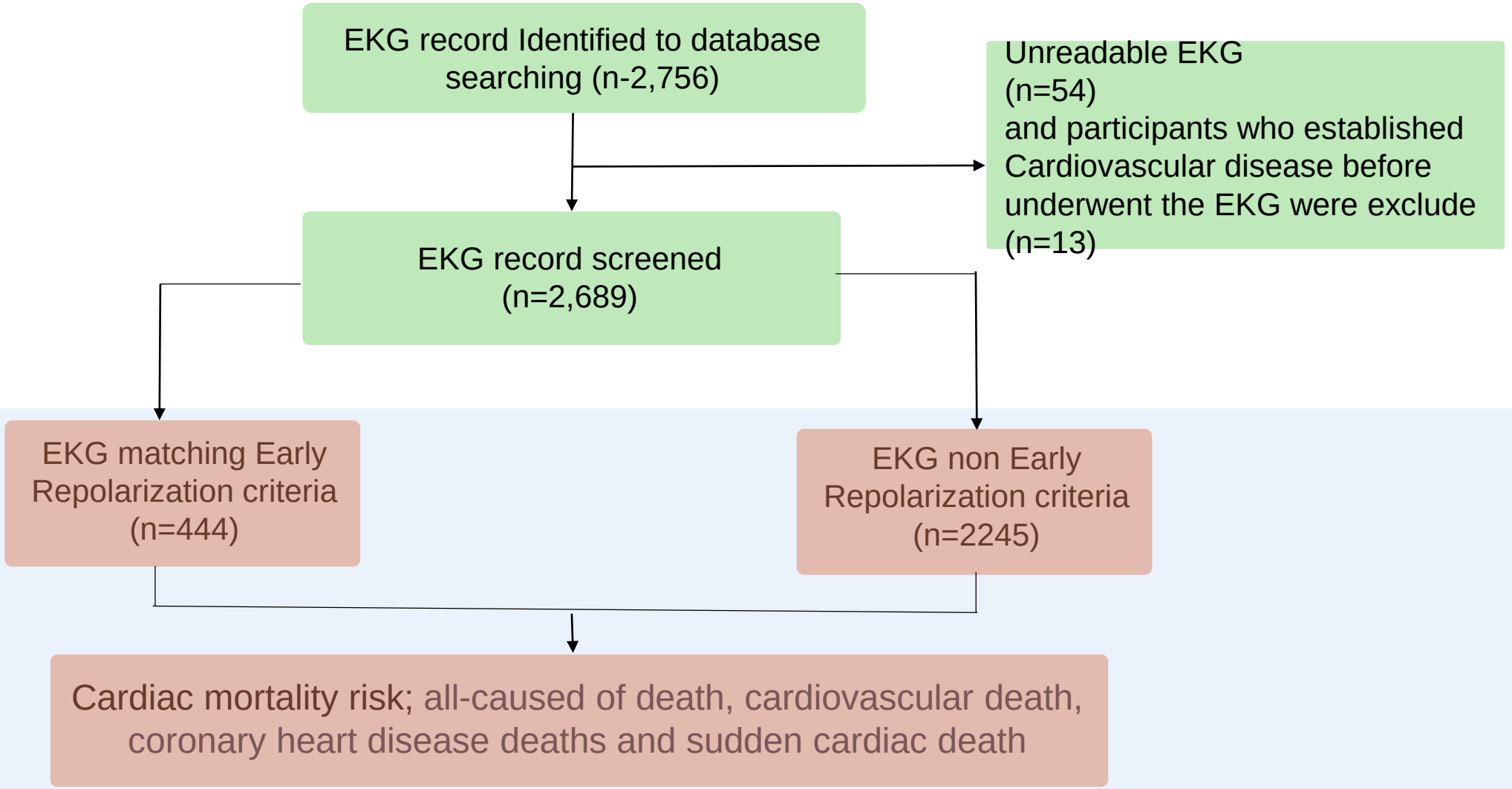
Pattern	Descriptionn
J point	The point where the QRS ends and the ST segment begins.
J-point elevation	An elevation of the J point ≥1 mm above the isoelectric baseline.
Terminal QRS Slurring	An abrupt change in the slope of the last deflection at the end of the QRS.
Terminal QRS notching	Low frequency deflection at the end QRS

Patton et al. Heart Rhythm. 2013;10(12):1932-63.

Statistic

- Continuous variables : Mean ± SD , t-test
- Chi-square test.
- Cox-regression hazards models.

Result


EKG record Identified to database searching (n-2,756)
Unreadable EKG (n=54)
and participants who established Cardiovascular disease before underwent the EKG were exclude (n=13)
EKG record screened (n=2,689)
EKG matching Early Repolarization criteria (n=444)
EKG non Early Repolarization criteria (n=2245)
Cardiac mortality risk; all-caused of death, cardiovascular death, coronary heart disease deaths and sudden cardiac death

Results : Baseline characteristic

Characteristic	All patients (N=2,689)	Early repolarization (N=444)	Non Early repolarization (N= 2,245)	P-value
Age-years Mean±SD	55±5.1	54±5.0	54±4.8	0.156
Sex– no (%) male	2,120 (78.8)	355 (80.0)	1,765 (78.6)	0.498
Weight – kg Mean±SD	65±10	65±11	66±16	0.081
Height – cm Mean±SD	162±8	163±7	163±8	0.127
BMI – kg/m^2 Mean±SD	24.7±3.4	24.2±3.3	24.8±3.4	0.001
Waist circumference – cm Mean±SD	87.5±23.6	87.3±9.8	87.8±26.5	0.700
Hip circumference – cm Mean±SD	97.4±23.2	98.0±39.3	97.3±19.7	0.568
Pulse rate – beat/min Mean±SD	79±12	78.7±11	79.2±11	0.382

Results : Baseline characteristic

Characteristic	All patients (N=2,689)	Early repolarization (N=444)	Non Early repolarization (N= 2,245)	P-value
Systolic blood pressure — mm Hg Mean±SD	135.8±21.5	132.4±20.4	136.8±21.6	<0.001
Diastolic blood pressure — mm Hg Mean±SD	81.6±13.2	79.4√12.3	82.2±13.3	<0.001
Mean arterial blood pressure — mm Hg Mean±SD	99.7±15.0	97.1±14.0	100.4±15.0	<0.001
Hypertension – no (%)	1250 (48.3)	174 (39.5)	1076 (50.1)	<0.001
Hypertension on treatment – no (%)*	421 (16.3)	52(11.8)	369 (17.2)	0.004
Diabetes – no (%)	414 (16.4)	64 (14.6)	350 (16.8)	0.287
Diabetes with Hypertension – no (%)	274 (10.2)	39 (8.8)	235 (10.5)	0.344
Dyslipidemia – no (%)*	963 (35.8)	782 (36.5)	181 (33.2)	0.184

Results : Baseline characteristic

Characteristic	All patients (N=2,689)	Early repolarization (N=444)	Non Early repolarization (N= 2,245)	P-value
Fasting plasma glucose – mg/dL Mean±SD	96. 0 ± 29.4	96.5±30.1	96.1±29.6	0.769
Postprandial Plasma glucose – mg/dL Mean±SD	120.2±48.4	117.2±59.8	120.9±48.7	0.165
Total Cholesterol – mg/dL Mean±SD	239.0±41.2	234.2±39.6	239.3±41.5	0.017
HDL- Cholesterol – mg/dL Mean±SD	52.75±11.1	53.3±10.8	52.4±11.1	0.133
LDL- Cholesterol – mg/dL Mean±SD	155.3±40.1	150.6±39.9	155.4±40.1	0.023
Triglyceride – mg/dL Mean±SD	162.37±106.4	159.0±92.3	165.3±111.7	0.270
Creatinine – mg/dL Mean±SD	1.07±0.3	1.07±0.4	1.08±0.4	0.541

Results : Baseline characteristic

Characteristic	All patients (N=2,689)	Early repolarization (N=444)	Non Early repolarization (N= 2,245)	P-value
GFR1997:CKD-EPI equation – ml/min*1.73m^2 * Median Normal or increase GFR≥90 no(%) Mildly decreased 60-89 no(%) Moderately decreased 30-59 no(%) Severely decreased 15-29 no(%) Renal failure <15 no(%)	574 (16.5) 1728 (49.6) 339 (9.7) 8 (0.2) 3 (0.1)	101 (23.9) 270 (64.0) 50 (11.8) 0 (0.0) 1 (0.2)	410 (20.7) 1296 (65.4) 269 (13.6) 6 (0.3) 1 (0.3)	0.049
Smoking – no (%)	622 (23.5)	122 (28.5)	496 (22.5)	0.080
Alcohol 1997 – no 735()(%)	945 (35.9)	171 (39.0)	774 (35.3)	0.156

Results : Pattern ERP EKG and sudden cardiac death

- **Prevalence of early repolarization according to J-wave morphology**

	Any morphology (n=2,689)		Slurring (n=444)		Notching (n=444)		Slurring and notching (n=444)	
	subject	percent	subject	percent	subject	percent	subject	percent
ERP	444	16.5	241	54.3	170	38.3	33	7.4

- **Prevalence of early repolarization according to ER localization**

	Any localization (n=2,689)		Inferior (n=444)		Lateral (n=444)		Inferior and Lateral (n=444)	
	subject	percent	subject	percent	subject	percent	subject	percent
ERP	444	16.5	221	49.8	158	35.6	65	14.6

Results : Baseline characteristic

Causes of death	Early repolarization (N=91)	Non-early repolarization (N= 475)
Sepsis	3 (3.3%)	25 (5.3%)
Traffic accident	5 (5.5%)	33 (6.9%)
Malignancy	37 (40.7%)	143 (30.1%)
cardiac events		
Acute myocardial infarction	16 (17.6%)	96 (20.2%)
Cardiomyopathy	0 (0%)	2 (0.2%)
Arrhythmias	0 (0%)	1 (0.3%)
Heart failure	1 (1.0%)	17 (3.5%)
Sudden cardiac death	6 (6.6%)	27 (5.7%)
Metabolic/Renal failure	3 (3.3%)	7 (1.5%)
Neurovascular	4 (4.4%)	33 (6.9%)
COPD/Lung disease	6 (6.6%)	35 (7.4%)
GI bleeding/Cirrhosis	2 (2.2%)	27 (5.7%)
Unknown	8 (8.8%)	29 (6.1%)

Results : Sudden cardiac death and ERP

Cause of death	**Early repolarization**		**total**	**P-value**
	No	Yes		
Sudden cardiac death	27(1.2)	6 (1.4)	33	0.813
total	2248	441	2689	

Results : Univariate analyses of potential newly observed cardiac events

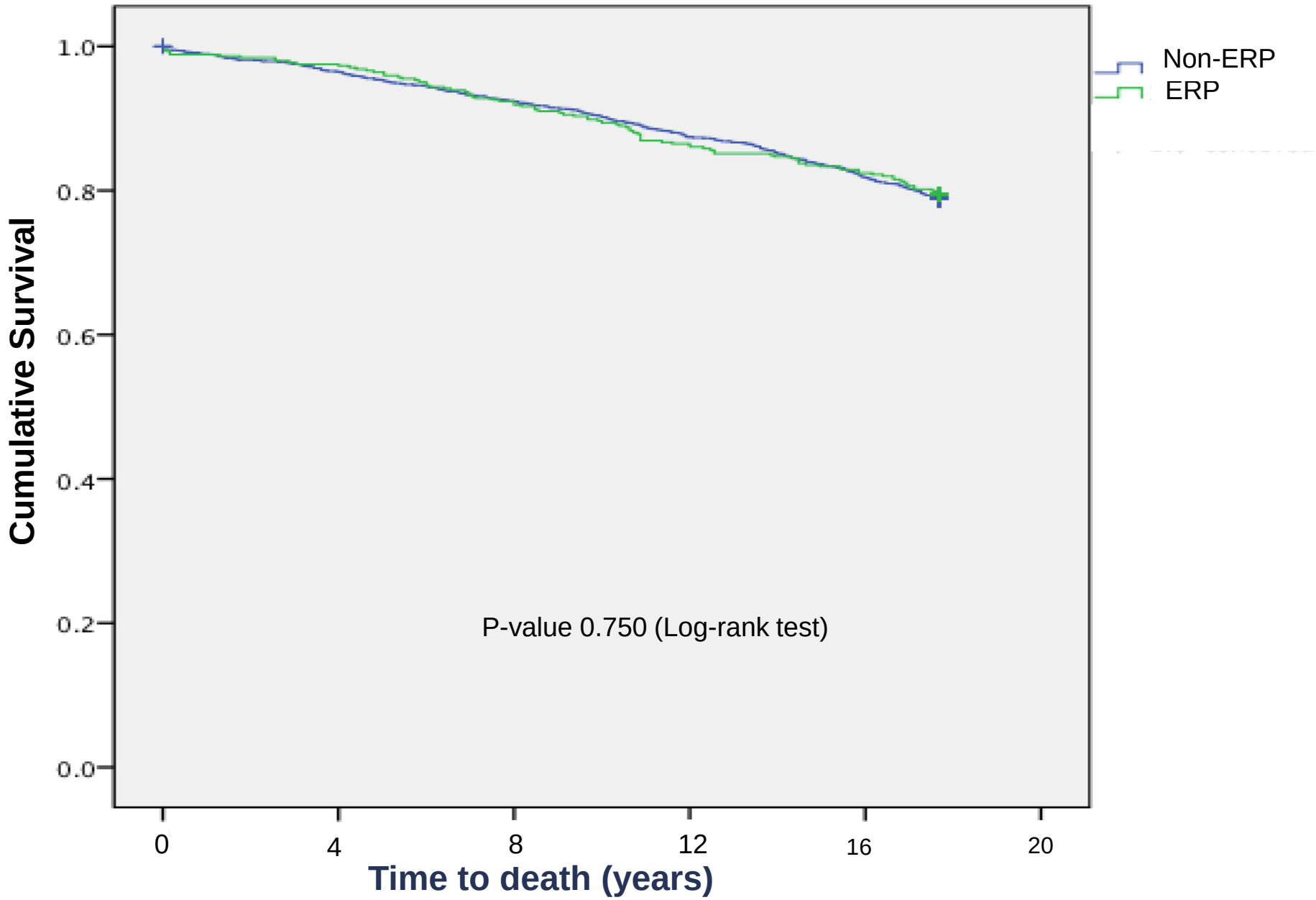
Variable	Hazard ratio	95% confidence interval	*P* value
Early repolarization and All-cause mortality	1.04	0.81-1.34	0.750
Early repolarization and CHD	1.06	0.71-1.56	0.790
Early repolarization and CVS	1.03	0.75-1.41	0.872
Early repolarization and sudden cardiac death	1.05	0.40-2.78	0.915

Results : Multivariate age and sex-Adjusted analyses of potential newly observed cardiac events

Variable	Hazard ratio	95% confidence interval	*P* value
Early repolarization and All-cause mortality	1.09	0.83-1.43	0.536
Early repolarization and CHD	1.13	0.75-1.71	0.563
Early repolarization and CVS	1.12	0.80-1.57	0.516
Early repolarization and sudden cardiac death	1.42	0.57-3.56	0.452

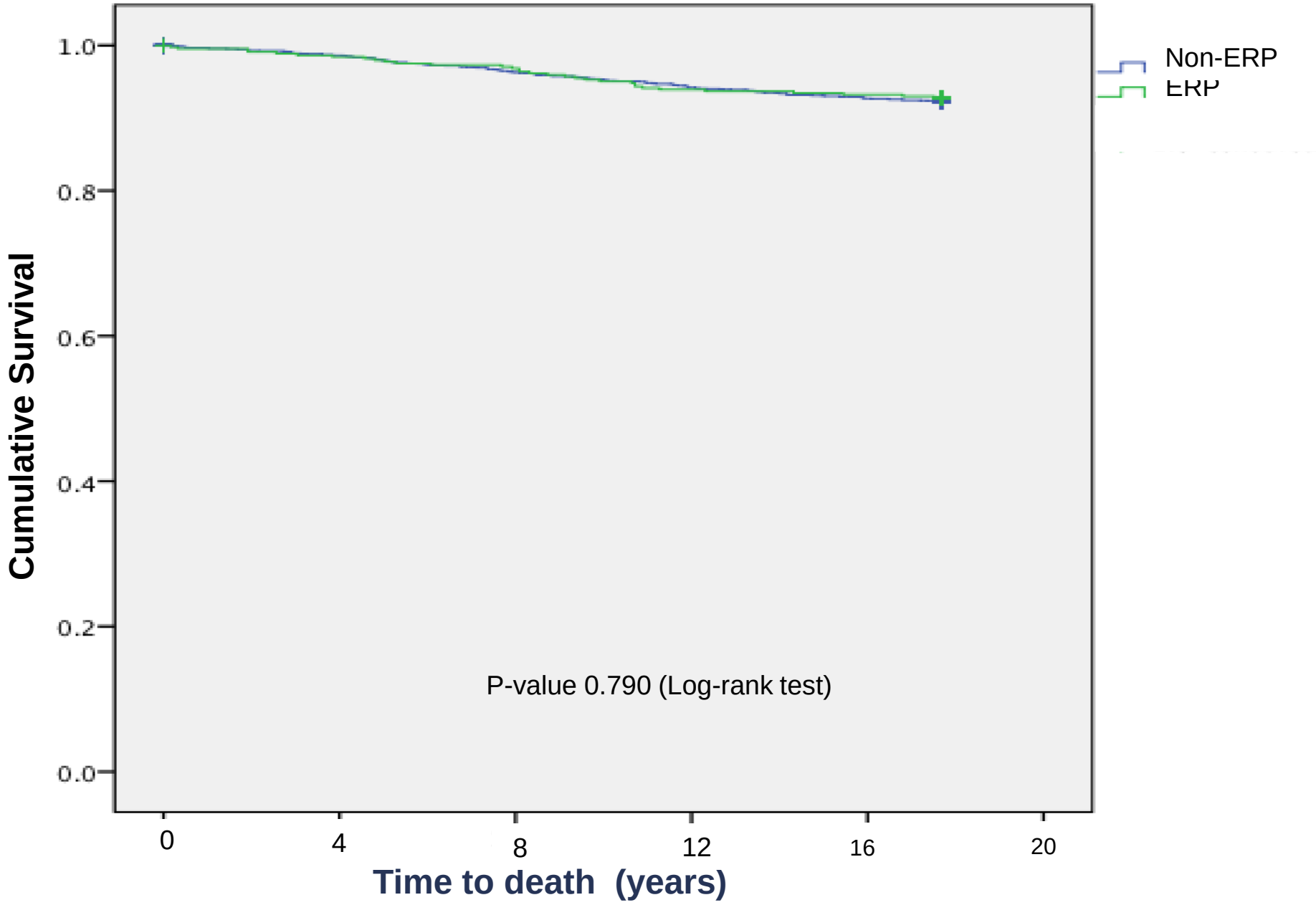
Results all-caused

Graph are the estimated rates of survival at specific follow-up time points



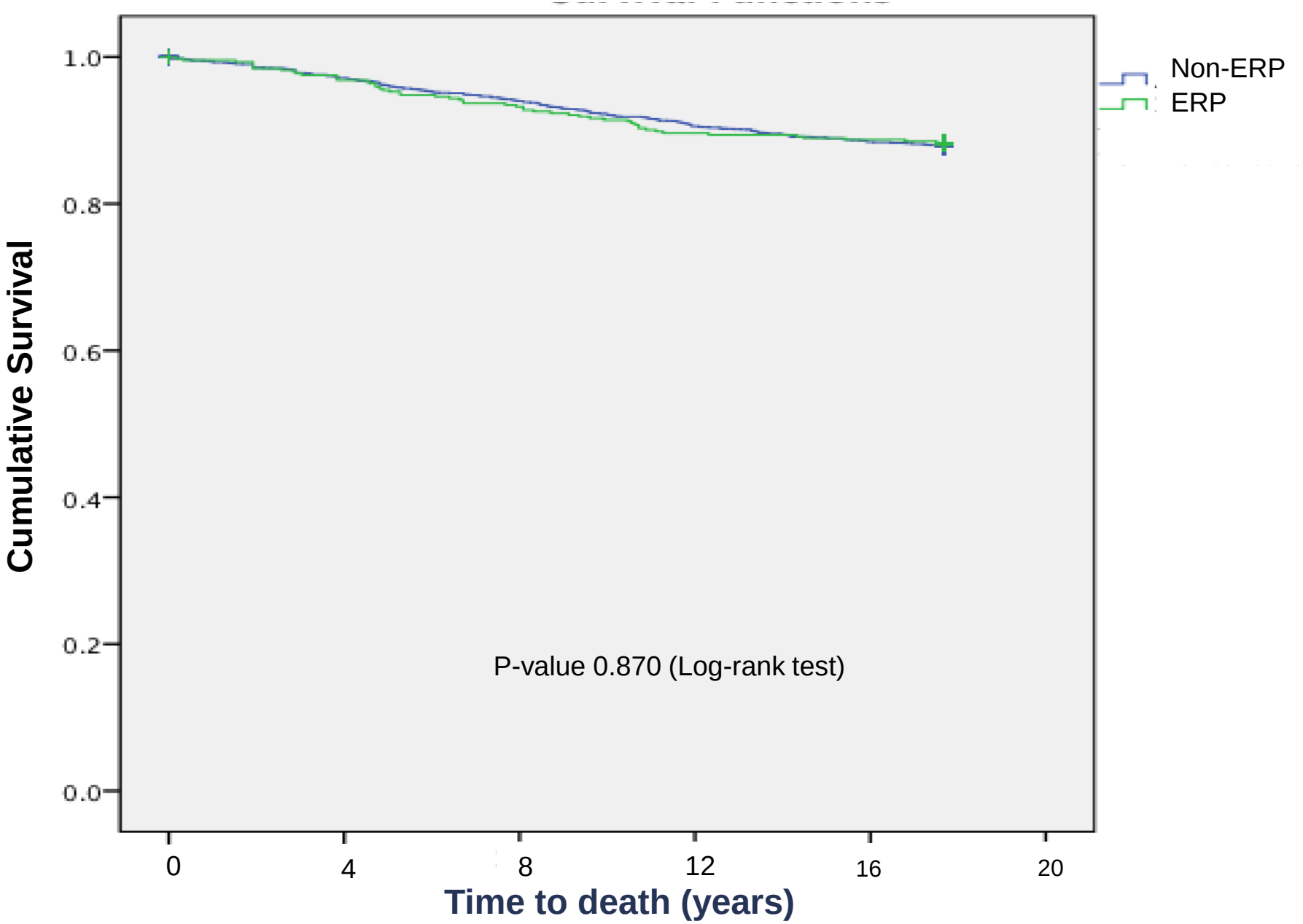
Results CHD

Graph are the estimated rates of survival at specific follow-up time points



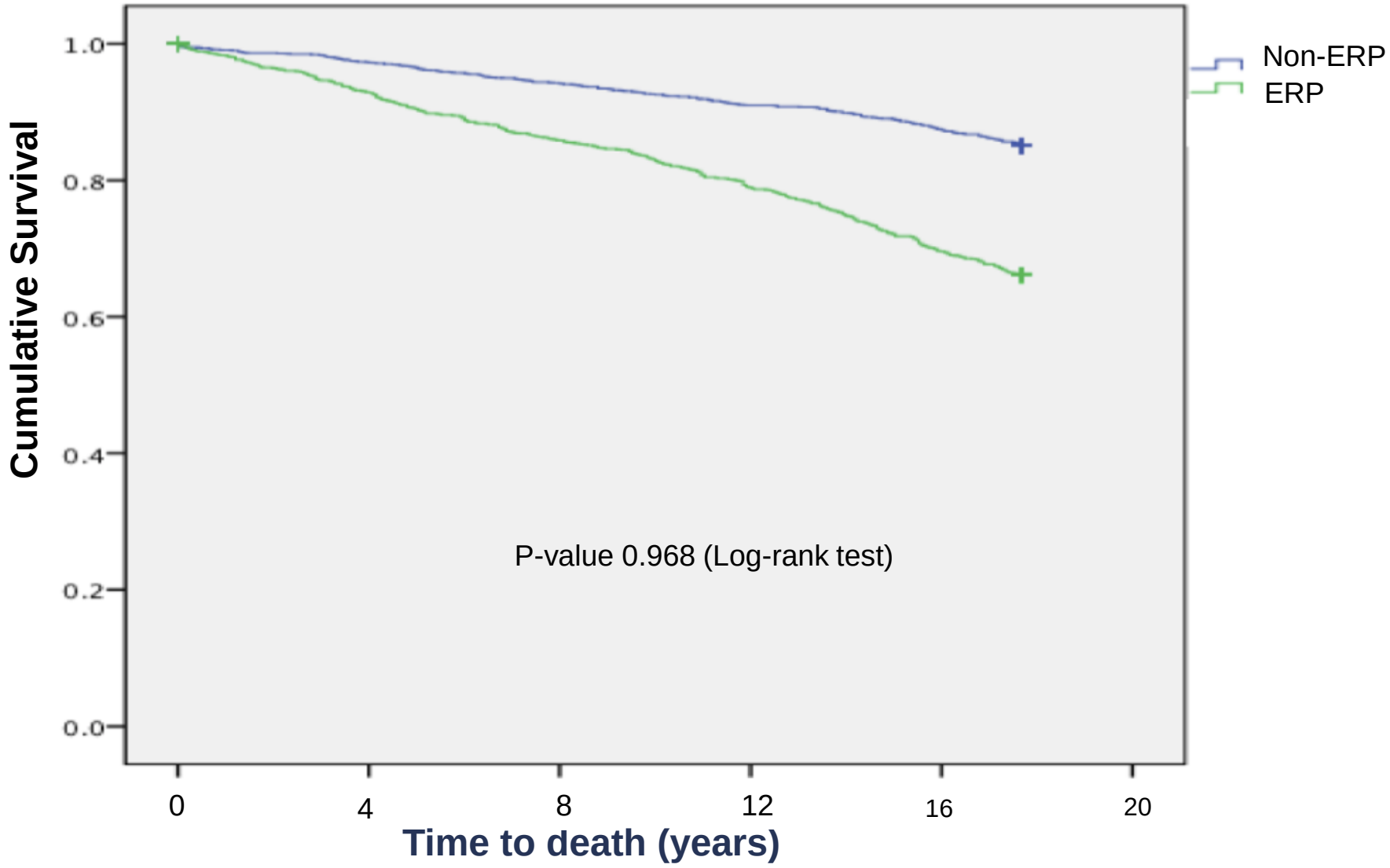
Results CVS

Graph are the estimated rates of survival at specific follow-up time points



Results all-caused mortality in population ≤55 years old

Kaplan–Meier curves showed non-significant trend of decreased survival from all-cause mortality in population ≤55 years old with early repolarization pattern compared with non-early repolarization pattern.



Conclusion

- The prevalence of ERP in Thai population was higher when compared to other countries in Asia.
- ERP in middle aged populations do not predict the occurrence of cardiac death
- Our study supports previous reports that ERP was significantly associated with an increased risk of all-causes mortality in the young population. ERP in the younger population may increased risk of coronary heart disease, cardiovascular disease, and SCD.

Strength

- Long term follow up 18 years cohort study collected resting surface EKG 97 % and nearly 100% in vital status and disease adjuration

Limitation

- Population worker cohort may not represent entire general population due to healthy worker effect.
- We will not be able to note the influence of ERP outside the age range of 47 to 66 years and more studies will be required to clear up the impact of ERP in younger individuals.

Thank you

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