K-REDEFINE study
-interim results-
Focused on *1 year Follow-UP*

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Samsung Medical Center
DEC-08-2018

SCD in Korea

Annual incidence of SCD (per 100,000)	
USA	53 (41-89)
Netherland	90-100
Japan (Okinawa)	39
China	41
West Ireland	51
Canada	56
Korea	**> 41 (~80)**

Circulation.2001 Oct 30;104(18):2158-63

Heart 2006;92:1873-1878

International Journal of Arrhythmia 2010;11(2): 13-16.

New KAMIR

New KAMIR
Korea Acute Myocardial Infarction Registry
한국인 급성 심근경색증의 현황에 대한 등록연구

New KAMIR | 연구내용 | 급성심근경색증정보 | 관련학회 / 연구회

KorMI.org

KorMI | 연구내용
KorMI소개 : 참여연구원 :

KorMI
Korea Working Group on Myocardial Infarction

KorMI 소개
Korea Working Group on Myocardial Infarction

AHJ
American Heart Journal

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< Previous Article

Short- and lo
dyssynchron
heart failure

Clinical implication of the first-degree atrioventricular block and QRS prolongation from the Korean Heart Failure registry   *(KorHF registry)*

Seung-Jung Park, MD, PhD[d], Young Keun On, MD, PhD[d], Kyeongmin Byeon, MD, PhD[d], June Soo Kim, MD, PhD[d], Jin-Oh Choi, MD, PhD[d], Dong-Ju Choi, MD, PhD[d], Kyu Hyung Ryu, MD, PhD[d], Eun-Seok Jeon, MD, PhD[d]

A multicentre cohort study of acute heart failure syndromes in Korea: rationale, design, and interim observations of the Korean Acute Heart Failure (KorAHF) registry

Sang Eun Lee[1], Hyun-Jai Cho[1], Hae-Young Lee[1], Han-Mo Yang[1], Jin-Oh Choi[2], Eun-Seok Jeon[2], Min-Seok Kim[3], Jae-Joong Kim[3], Kyung-Kuk Hwang[4], Shung Chull Chae[5], Suk Min Seo[6], Sang Hong Baek[6], Seok-Min Kang[7], Il-Young Oh[8], Dong-Ju Choi[8], Byung-Su Yoo[9], Youngkeun Ahn[10], Hyun-Young Park[11], Myeong-Chan Cho[4] and Byung-Hee Oh[1,*]

Issue

European Journal of Heart Failure

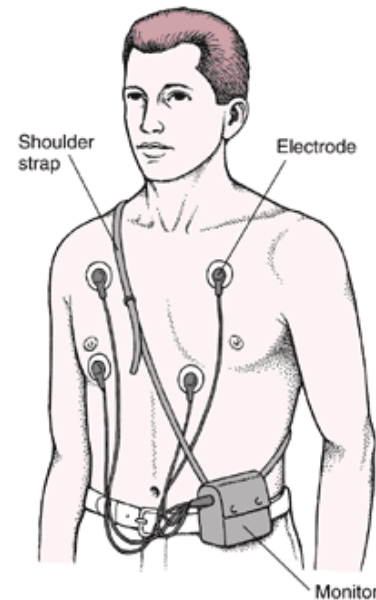**Volume 16, Issue 6, pages 700–708, June 2014**

However,....

Background

- 국내 HF/MI 환자에서 VT/VF/SCD의 발생률 또는 mode of death등에 대한 정확한 정보 없음.

- LV EF만으로는 위험도 평가 불충분
  → another risk assessment tool 이 필요
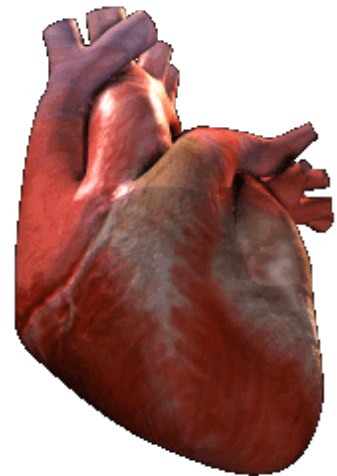
T-wave Alternans (TWA),

Heart Rate Turbulence (HRT),

Heart Rate Variability,

Late potential,

Fragmented QRS,

Early Repolarization, ...
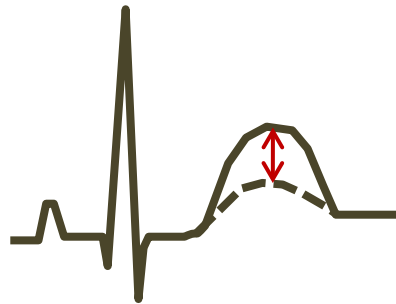
T-Wave Alternans
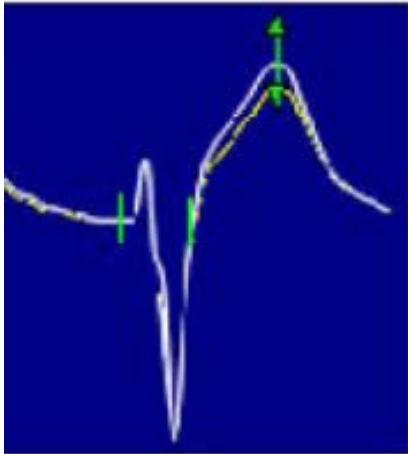
Cardiac electrical instability
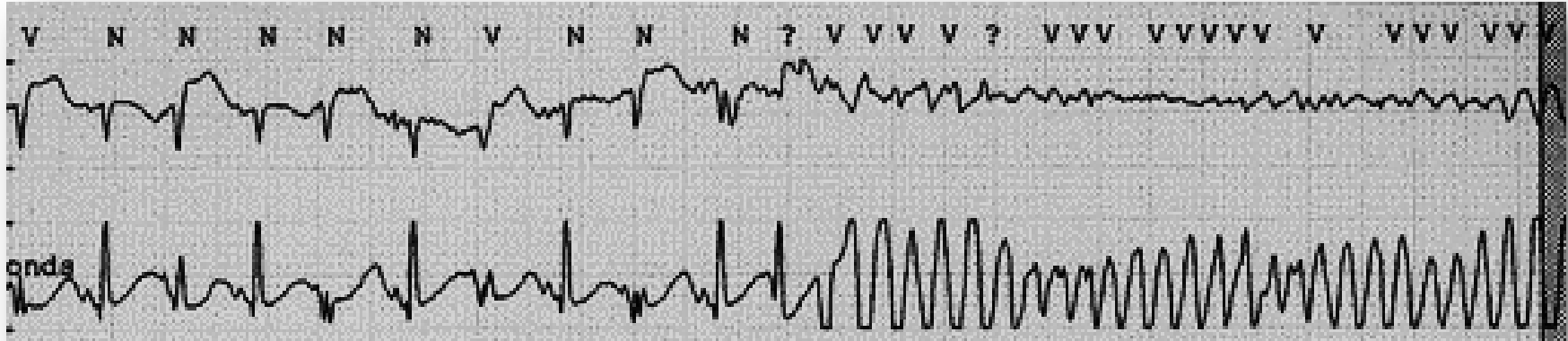
Post-Exercise TWA predict SCD

-Quantitative correlations-

Cardiovascular death in 1,003 CAD patients
(REFINE & FINCAVAS trials)

J Am Coll Cardiol 2009;53:1130-7
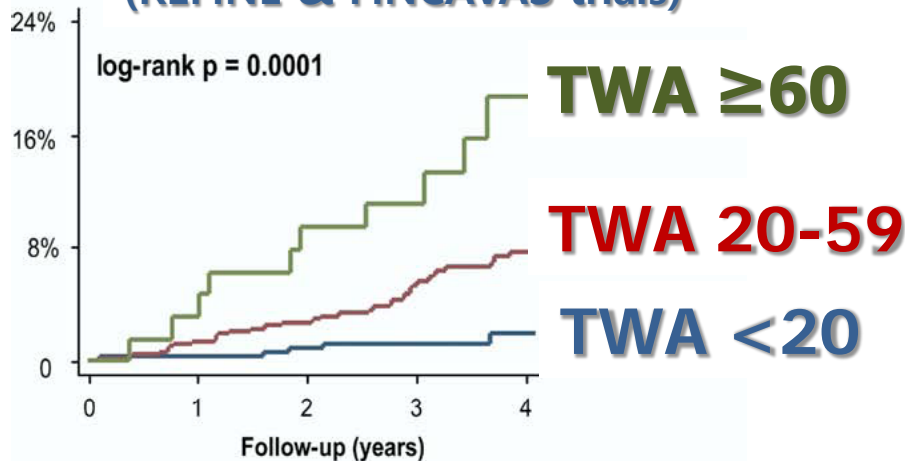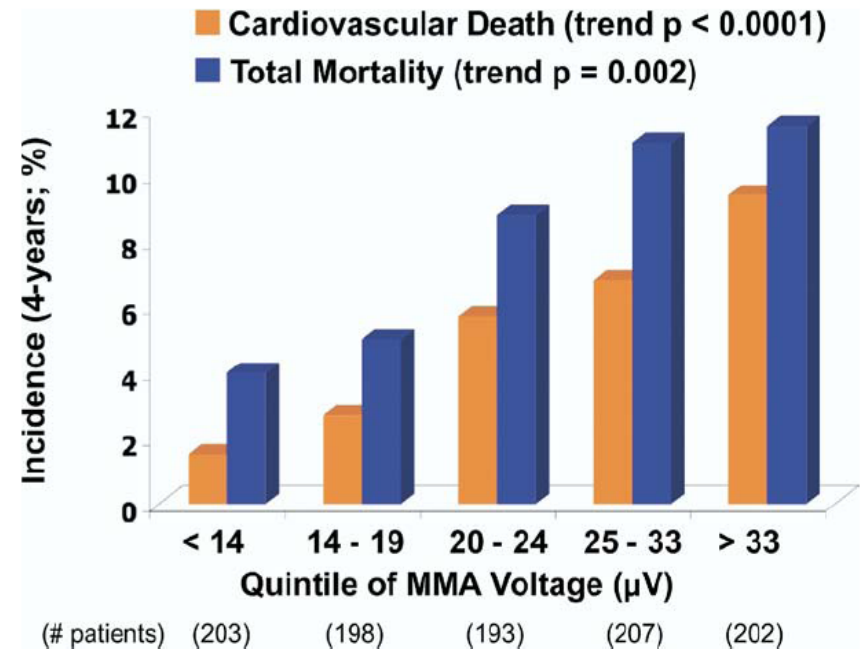
Normal HRT pattern

Turbulence Onset (TO)≤ 0 %
Turbulence Slope (TS) ≥ 2.5ms/RR
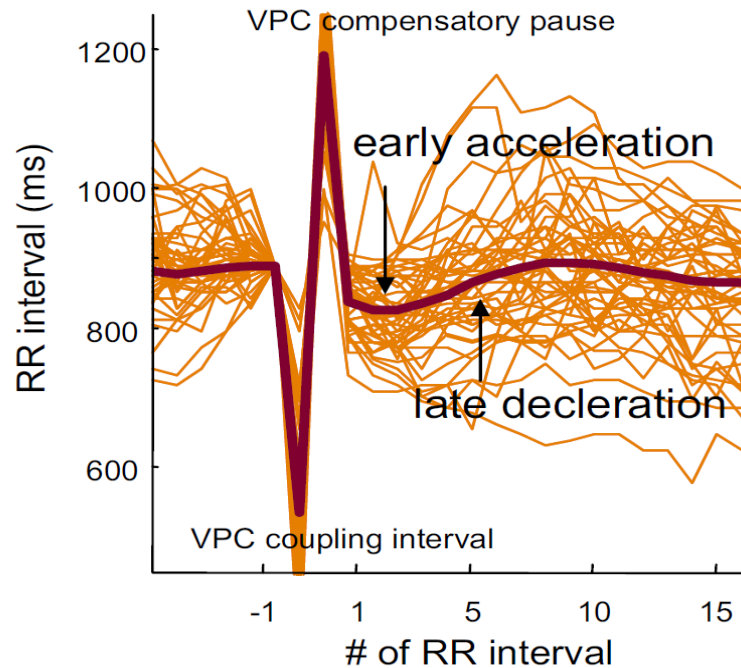
Abmormal HRT

Turbulence Onset (TO) > 0 %
Turbulence Slope (TS) < 2.5ms/RR
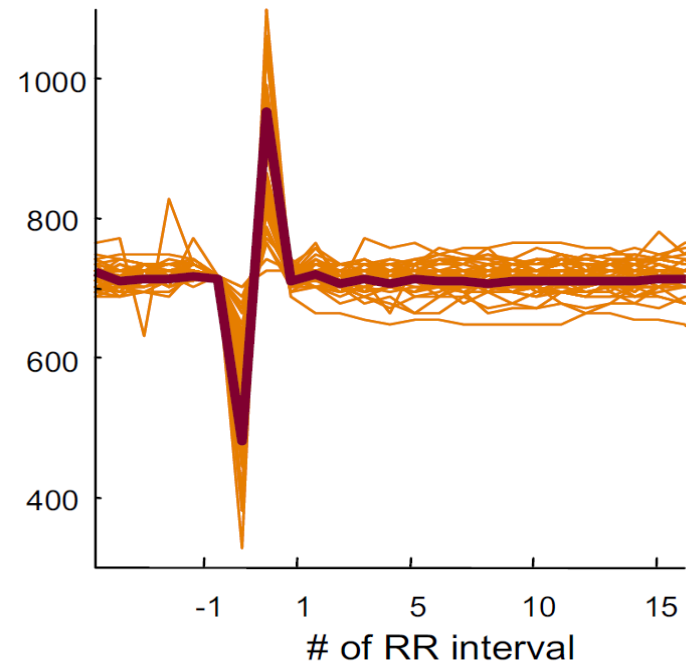
Disturbed HRT & Prognosis

a promising **Risk Stratifier** of **CV death** or **SCD** after MI
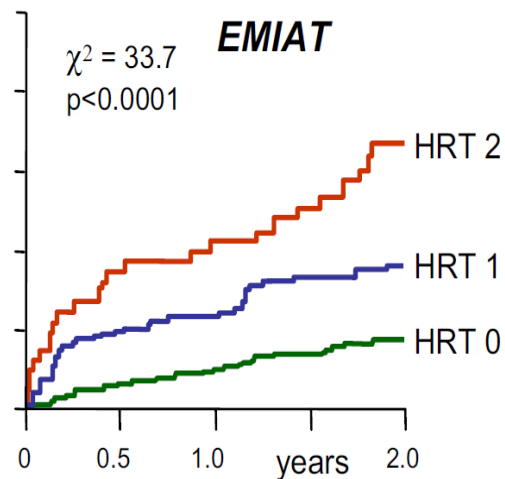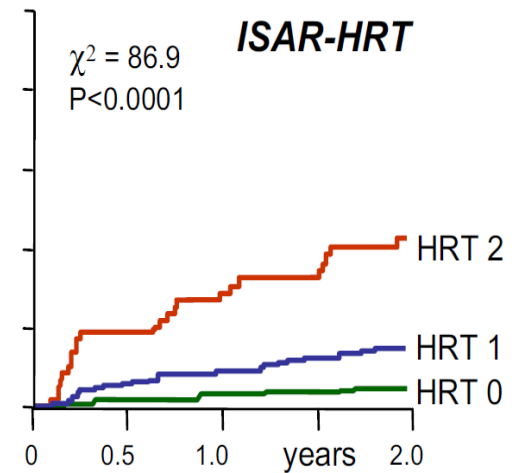
Korean noninvasive **R**isk **E**valuation study for sudden cardiac **DE**ath **F**rom **IN**farction or heart failur**E**.

*(**K-REDEFINE** study)*

Objectives of the **K-REDEFINE registry** study

- To investigate the **incidence of SCD/Life-threatening VTA in Korean** HF/MI patients

- To assess the association between risk of SCD/Life-threatening VTA and **non-invasive Holter-based parameters**

  The first multicenter, prospective, observational study in Korea

K-REDEFINE Study 지나온 자취

2014. 01 Off-line Non-invasive Study 사전 조사
전국 Holter 장비 보유 현황 파악

2014. 06 Non-invasive Study
부정맥 연구회 **연구비** 공모

2014. 09 Noninvasive Holter study
1차 steering committee 모임
서울역사 서울역 그릴

2014. 10 Noninvasive Holter study
2차 steering committee 모임
심장학회 회의실

2014. 12 **eCRF** 준비

Google

twa | 🔍

Gmail ▾

↩ | 🗄 | ⓘ | 🗑 | 받은편지함으로 이동 | 🏷 ▾ | 추가 작업 ▾

부정맥연구회 각 병원 보유 장비 현황 파악 요청의 건 📁 받은편지함 ✕

편지쓰기

중요편지함
보낸편지함
임시보관함 (168)
▸ 서클
[Imap]/Sent
개인
여행
Junk (118)
더보기 ▾

문제가 발생했습니다.

Google에 연결하는 데 문제가 있습니다. 계속 시도 중입니다.

네트워크 또는 프록시 문제일 수 있습니다. 자세히 알아보기

KHRS <khrs@k-hrs.org>   14. 1. 23. ☆ ↩ ▾
khrs2에게 ▾

부정맥연구회 회원선생님들께

부정맥분야의 Holter 및 MicroTWA등을 이용한 Noninvasive electrophysiology분야를 활성화하기 위한 방면으로 공동연구를 실행해 보고자 합니다.

우선 각 센터에서 보유중인 장비현황을 파악하고자 합니다.
바쁘시겠지만 잠시 짬을 내시어 아래 표에 따라 작성해주시면 감사하겠습니다.

		제조사	version
microTWA	1)Platform	(예시)Cambridge Heart Inc	(예시)HearTwave II MTWA system
Holter장비	1)Platform	(예시)GE Marquette	(예시)MARS 7.1
	2)내장 softwaresΦ	Research utilities*	†있음, †없음
		TWA**	†있음, †없음
		Heart rate turbulence(HRT)**	†있음, †없음

ΦHolter장비 중 2)내장 softwares는 GE Marquette장비를 사용하고 계시는 센터만 답해주시면 됩니다.
*2) 내장 softwares중 "research utilities"는 Holter분석화면의 상단에 "system"을 보시면 "research utilities"란 것이 보이고 이것을 선택하시면 "RawData"라는 것이 보입니다
**2) 내장 softwares중 HRT 및 TWA분석 소프트웨어는 Holter분석화면에서 "system"을 열어보시면 "Analysis option setup"이란게 나오고 거기에 'shape merge', Miscellaneous', 'QT', 'TWA'
및 'HRT'라는 것이 보일 것입니다.

신동구/부정맥연구회 김준수 올림

Dong-Gu Shin, MD, PhD
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Internal Medicine, College of Medicine, Yeungnam University
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Fax+82-53-654-8386

orthoxics@gmail.com   14. 1. 23 ☆ ↩ ▾

2014.01.23

K-REDEFINE Study

2015. 01 TWA 다기관 연구 TFT 구성

2015. 08 **3차 steering committee 모임**
　　　　　K-REDEFINE **Study** 연구 명칭 변경

2015. 09 Study Protocoal
　　　　　eCRF
　　　　　첫 환자 등록

2015. 10 **4차 K-REDEFINE study 모임**
　　　　　순환기 학회 기간

5 2016-02-27 연구자 모임

❖ 2016년 2월 27일 진행된 연구자 모임에 참여하여 자리를 빛내주신 모든 분들에게 감사 드리며 회의록 및 발표자료 첨부 드립니다.

6 첨부문서

K-REDEFINE 제 3 차 실무회의

선영입니다.

의에 대해 재알림 전달 드립니다.

K-REDEFINE
제 7차 실무 회의 일정

❖ 일시 : 2016년 3월 15일 화요일 오후
❖ 장소 : 본관 5층 중회의실
❖ 안건 : 연구 진행 현황 및 기타 논의

K-REDEFINE
제 9차 실무 회의 일정

수요일 오후 4:00~

★

연구 진행 현황

리입니다.
드립니다.
행 될 예정입니다.
부탁 드립니다.
랍니다.

한국인 심근경색 환자 및 심부전환자에서 비침습적
방법을 이용한 급성심장사 발생의 위험도 평가 연구
(*K-REDEFINE* study)

제 33차 실무회의

- 일 시 : 2018년 12월 06일 목요일, 08:30AM ~

- 장 소 : 삼성서울병원 본관 3층 심혈관조영실 내 회의실

SAMSUNG 삼성서울병원

Letter from

K**orean noninvasive **R**isk **E**valuation study for sudden cardiac **DE**ath From **IN**farction or heart failur**E**.*   (K-REDEFINE** study*)

2015-08-17

지속되는 무더위에도

우선 바쁘신 와중에도

Holter study

말씀을 드립

들께 그간의

이번 multi

도까지 전국

상황을 잘 변

인제

연세대

K-REDEFINE Newsletter

15 April 2016

MAY 2016

3 2016-07-09 연구자모임 (KHRS 2016)

미팅명: K-Redefine Stud

위치: 킨텍스 제 2전시장 4

일시: 2016년 7월 9일(토)

❖ KHRS Symposium이 개

❖ 참여대상 : 각 기관 PI 외

❖ 도시락이 제공될 예정이

❖ 많은 분들이 참여하여 7

4 공지사항

2018-10-04

K-REDEFINE Newsletter No.29

한국인 심근경색 환자 및 심부전환자에서 비침습적 방법을
이용한 급성심장사 발생의 위험도 평가 연구
(*K-REDEFINE* study)

K-REDEFINE 연구자분들께

안녕하십니까

삼성서울병원 K-REDEFINE 연구 담당 CRA 정지환 입니다.

현재, 대상자 등록 수는 증가되고 있으나 eCRF상 **FU data 작성도가 낮습니다.**

25 Tertiary Center

인제대학교 일산백병원
인하대학교 병원
카톨릭관동대학교 국제성모병원
가천대학교 길병원
부천 세종병원

연세대학교 세브란스병원
성균관대학교 삼성서울병원
연세대학교 강남세브란스병원
중앙대학교 병원
고려대학교 안암병원
고려대학교 안산병원

아주대학교 병원

원광대학교 병원
조선대학교 병원
전남대학교 병원

제주대학교 병원

울산대학교 서울아산병원

연세대학교 원주세브란스기독병원

충북대학교 병원
충남대학교 병원

대구가톨릭대학교 병원
계명대학교 동산의료원
영남대학교 병원

인제대학교 부산백병원
고신대학교 복음병원

Patient Subgroups

K-REDEFINE Registry

Heart Failure

N=1000

Myocardial Infarction

N=1000
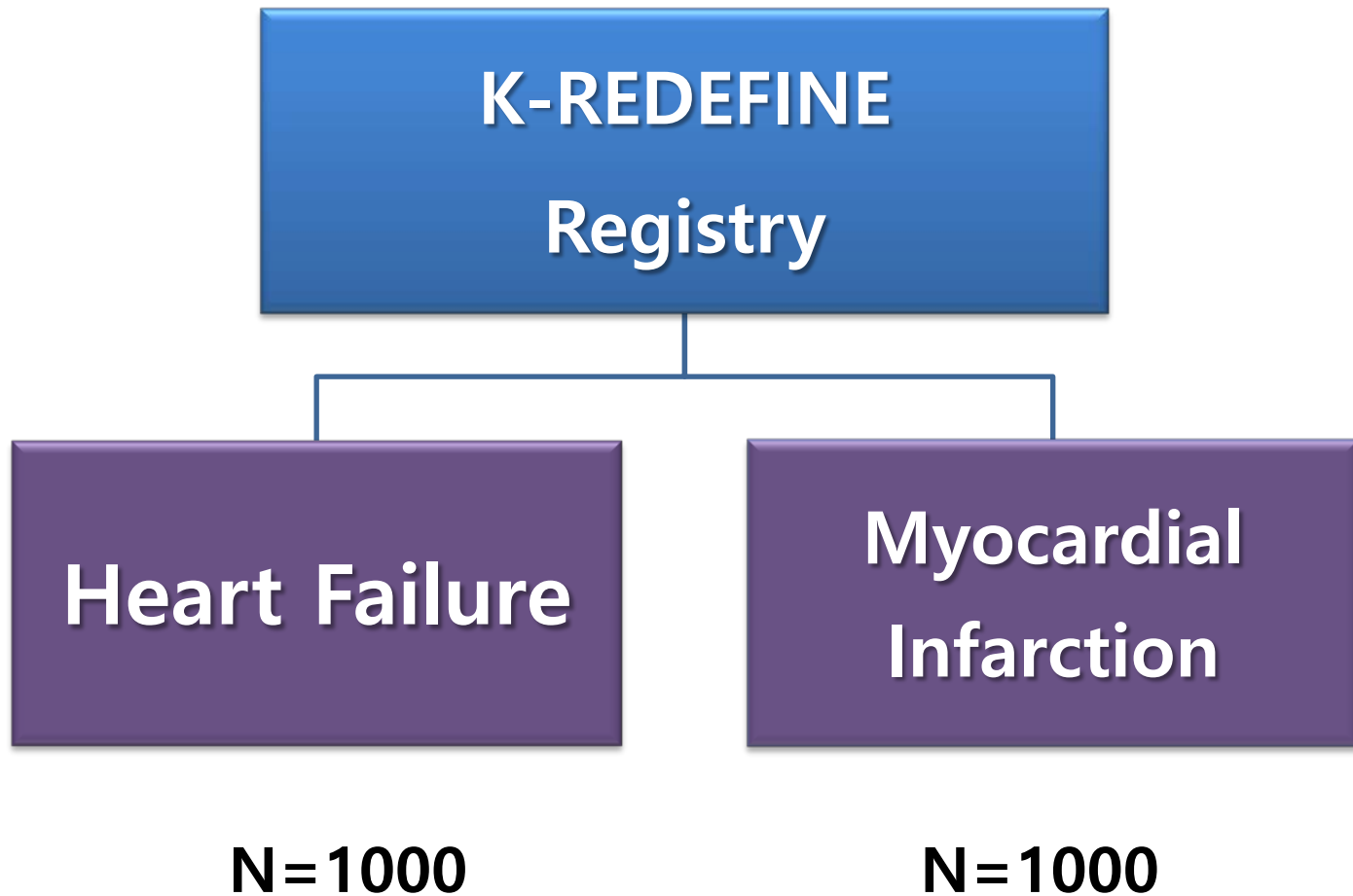
Current status of Registry

	16.11	16.12	17.01	17.02	17.03	17.04	17.05	17.06	17.07	17.08	17.09	17.10	17.11	17.12	18.01	18.02	18.03	18.04	18.05	18.06	18.07	18.08	18.09	18.10	18.11
월별 등록수	40	42	34	40	55	45	41	48	34	57	39	31	10	10	56	24	16	14	30	25	21	23	21	9	25
총 등록수	616	658	692	732	787	832	873	921	955	1012	1051	1082	1092	1102	1158	1182	1198	1212	1242	1267	1288	1311	1332	1341	1366
목표 등록수	578	616	655	693	732	770	809	847	886	924	963	1001	1040	1078	1117	1155	1194	1232	1271	1309	1348	1386	1425	1463	1502

1 Year Outcomes,....

1년 f/u

- **Total   807/982(82.1%)**
- MI group   619/763(81.1%)
- HF group   188/219(85.8%)

- Missing data: about 18%

group	MI (N=619)	HF (N=188)	p
Male	**495 (80.0%)**	103 (54.8%)	**< 0.001**
Age	60.2 ± 12.1	62.1 ± 16.0	0.123
BMI	25.2 ± 18.1	24.2 ± 4.6	0.196
Diabetes	148 (23.9%)	58 (30.9%)	0.069
Hypertension	313 (50.6%)	98 (52.1%)	0.770
Heart Failure	23 (3.7%)	**112 (59.6%)**	**< 0.001**
Paroxysmal AF	3 (0.5%)	**15 (8.0%)**	**< 0.001**
SCA	11 (1.8%)	4 (2.1%)	0.997
Family History of SCD	5 (0.8%)	2 (1.1%)	1.000
Vascular_disease	28 (4.5%)	**32 (17.0%)**	**< 0.001**
MI	16 (2.6%)	17 (9.0%)	< 0.001
PCI/CABG	25 (4.0%)	23 (12.2%)	< 0.001
PAD	1 (0.2%)	3 (1.6%)	0.063
Previous Valvular Surgery	2 (0.3%)	7 (3.7%)	< 0.001
Chronic_Kidney_Disease	25 (4.0%)	**33 (17.6%)**	**< 0.001**
Cerebrovascular_Disease	21 (3.4%)	13 (6.9%)	0.060
Chronic_Lung_Disease	2 (0.3%)	8 (4.3%)	< 0.001
CHA2DS2VASc_score	1.6 ± 1.5	**3.1 ± 1.8**	**< 0.001**

group	MI (N=619)	HF (N=188)	p
Hemoglobin	14.1 ± 1.9	**12.8 ± 2.3**	**< 0.001**
Total Cholesterol	**188.9 ± 47.7**	154.0 ± 44.8	**< 0.001**
HDL Cholesterol	45.8 ± 17.2	44.6 ± 21.6	0.624
LDL Cholesterol	**120.1 ± 40.6**	101.8 ± 47.9	**0.002**
BUN	16.7 ± 8.6	23.9 ± 14.9	< 0.001
Creatinine	1.0 ± 0.6	1.2 ± 0.8	< 0.001
Creatinine Clearance	78.6 ± 29.5	**59.5 ± 32.7**	**< 0.001**
Na	139.1 ± 3.2	**138.1 ± 5.2**	**0.016**
K	4.3 ± 5.5	5.0 ± 10.0	0.341
NT_proBNP	1566 ± 4293	**10419 ± 32182**	**0.036**
BNP	184 ± 450	**1526 ± 1537**	**< 0.001**
hs_CRP	2.8 ± 8.3	4.1 ± 14.9	0.396
HbA1c	6.5 ± 1.6	6.8 ± 1.3	0.209
CKMB	101.0 ± 189.5	-	
Troponin I	1954.4 ± 9208.3	-	

group	MI (N=619)	HF (N=188)	p
Average_HR_Value	72.6 ± 10.9	**78.4 ± 13.0**	**< 0.001**
PR Interval (msec)	168.6 ± 38.0	168.3 ± 41.8	0.917
QTc Interval (msec)	443.6 ± 39.4	**464.9 ± 56.0**	**< 0.001**
QRS_Duration (msec)	97.9 ± 17.2	**106.3 ± 25.4**	**< 0.001**
LV_EDD(mm)	51.5 ± 13.6	**57.7 ± 11.0**	**< 0.001**
LV_ESD(mm)	35.0 ± 11.8	**47.0 ± 13.2**	**< 0.001**
LV_Ejection_Fraction (%)	51.5 ± 10.8	**34.8 ± 15.7**	**< 0.001**
LV_EDV (ml)	101.1 ± 33.2	**170.8 ± 93.5**	**< 0.001**
LV_ESV (ml)	50.5 ± 25.1	**121.8 ± 84.6**	**< 0.001**
LAD(mm)	38.0 ± 7.1	**46.1 ± 6.6**	**< 0.001**
LAVI(ml/m2)	39.7 ± 99.4	49.8 ± 22.3	0.068

group	MI (N=619)	HF (N=188)	p
Average HR	72.6 ± 10.9	**78.4 ± 13.0**	**< 0.001**
PVC (%)	1.9 ± 8.2	3.2 ± 6.4	0.088
PVC	555 ± 3129	**2434 ± 6170**	**< 0.001**
Total heart beats	96524 ± 17293	**105090 ± 19769**	**< 0.001**
Channel 1 max TWA	53.5 ± 18.4	**60.6 ± 20.7**	**< 0.001**
Channel 2 max TWA	49.7 ± 16.2	**53.0 ± 16.1**	**0.020**
Channel 3 max TWA	51.9 ± 17.5	**57.1 ± 19.4**	**0.001**
TWA max	59.8 ± 20.6	**66.9 ± 22.6**	**< 0.001**
TWA average	51.7 ± 14.7	**56.8 ± 15.4**	**< 0.001**
HRT Onset TO	-0.6 ± 2.0	**0.0 ± 1.1**	**< 0.001**
HRT Slope TS Value	4.8 ± 6.3	**1.9 ± 2.8**	**< 0.001**

group	MI (N=619)	HF (N=188)	p
Very_Low_Frequency_	31.3 ± 83.2	**18.8 ± 11.9**	**< 0.001**
Low_Frequency_	15.8 ± 25.1	**11.5 ± 11.3**	**0.001**
High_Frequency	9.9 ± 8.0	9.6 ± 7.7	0.575
LF/HF_ratio	1.6 ± 0.6	**1.2 ± 0.5**	**< 0.001**
Mean_NN	845.5 ± 123.5	792.0 ± 137.0	< 0.001
SDNN	91.5 ± 32.3	**73.1 ± 30.5**	**< 0.001**
SDANN	77.4 ± 35.9	**60.4 ± 25.7**	**< 0.001**
ASDNN	44.4 ± 17.7	**35.4 ± 20.9**	**< 0.001**
rMSSD	25.8 ± 12.2	25.4 ± 14.6	0.742
pNN50	6.7 ± 8.1	7.4 ± 9.8	0.392

group	MI (N=619)	HF (N=188)	pC
Composite Event	34 (5.5%)	**48 (25.5%)**	**< 0.001**
SCD	0 (0.0%)	2 (1.1%)	0.083
VF	0 (0.0%)	1 (0.5%)	0.527
VT	0 (0.0%)	1 (0.5%)	0.527
Cardiac death	4 (0.6%)	**11 (5.9%)**	**< 0.001**
All cause death	6 (1.0%)	**18 (9.6%)**	**< 0.001**
AF	3 (0.5%)	**5 (2.7%)**	**0.027**
HF admission	7 (1.1%)	**22 (11.7%)**	**< 0.001**
Embolic events	6 (1.0%)	5 (2.7%)	0.164
Recurrent MI	5 (0.8%)	0 (0.0%)	0.480
PCI/C/ABG_	15 (2.4%)	2 (1.1%)	0.397

Non-invasive markers

All cause death (MI + HF)

all..death	Total (N=807)	Death(-) (N=783)	Death(+) (N=24)	p
Channel.1.max.TWA	55.1 ± 19.1	54.9 ± 19.1	61.9 ± 19.6	0.101
Channel.2.max.TWA	50.4 ± 16.2	50.2 ± 16.1	57.0 ± 20.2	0.058
Channel.3.max.TWA	53.0 ± 18.1	52.9 ± 17.9	**57.8 ± 22.9**	0.224
TWA.max	61.4 ± 21.3	61.2 ± 21.2	**68.6 ± 24.4**	**0.115**
TWA.average	52.8 ± 15.0	52.7 ± 14.9	**58.9 ± 18.3**	**0.061**
HRT.Onset..TO	-0.4 ± 1.8	-0.4 ± 1.8	**0.1 ± 0.9**	**0.008**
HRT.Slope..TS	4.2 ± 5.8	4.2 ± 5.8	**1.1 ± 1.3**	**0.000**

All cause death (MI)

all..death	Total (N=619)	Death(-) (N=613)	Death(+) (N=6)	p
Channel.1.max.TWA	53.5 ± 18.4	53.5 ± 18.4	61.2 ± 19.8	0.350
Channel.2.max.TWA	49.7 ± 16.2	49.6 ± 16.1	58.4 ± 23.0	0.228
Channel.3.max.TWA	51.9 ± 17.5	51.9 ± 17.5	52.4 ± 17.8	0.948
TWA.max	59.8 ± 20.6	59.8 ± 20.7	**64.8 ± 18.6**	0.590
TWA.average	51.7 ± 14.7	51.7 ± 14.7	**57.3 ± 19.2**	0.391
HRT.Onset..TO	-0.6 ± 2.0	-0.6 ± 2.0	-0.1 ± 1.4	0.517
HRT.Slope..TS	4.8 ± 6.3	4.9 ± 6.3	**1.8 ± 2.1**	**0.014**

All cause death (HF)

all..death	Total (N=188)	Death(-) (N=170)	Death(+) (N=18)	p
Channel.1.max.TWA.	60.6 ± 20.7	60.4 ± 20.8	62.1 ± 20.2	0.767
Channel.2.max.TWA.	53.0 ± 16.1	52.6 ± 15.7	56.6 ± 20.1	0.342
Channel.3..max.TWA.	57.1 ± 19.4	56.9 ± 18.9	59.4 ± 24.5	0.615
TWA.max	66.9 ± 22.6	66.5 ± 22.3	**69.8 ± 26.4**	0.584
TWA.average	56.8 ± 15.4	56.6 ± 15.1	**59.4 ± 18.6**	0.492
HRT.Onset..TO..Value	0.0 ± 1.1	0.0 ± 1.1	0.1 ± 0.7	0.584
HRT.Slope..TS..Value	1.9 ± 2.8	2.1 ± 2.9	**0.9 ± 1.0**	**0.000**

Cardiac death (MI + HF)

cardiac.death	Total (N=807)	Cardiac death(-) (N=792)	Cardiac death(+) (N=15)	p
Channel.1.max.TWA	55.1 ± 19.1	55.0 ± 19.1	63.0 ± 20.0	0.119
Channel.2.max.TWA	50.4 ± 16.2	50.2 ± 16.1	61.1 ± 21.7	0.012
Channel.3..max.TWA	53.0 ± 18.1	53.0 ± 18.1	56.6 ± 16.9	0.451
TWA.max	61.4 ± 21.3	61.3 ± 21.3	**68.9 ± 21.1**	**0.185**
TWA.average	52.8 ± 15.0	52.7 ± 14.9	**60.3 ± 17.3**	**0.062**
HRT.Onset..TO.	-0.4 ± 1.8	-0.4 ± 1.8	**0.1 ± 0.6**	**0.013**
HRT.Slope..TS	4.2 ± 5.8	4.2 ± 5.8	**0.6 ± 0.8**	**0.000**

Cardiac death (MI)

cardiac.death	Total (N=619)	Cardiac death(-) (N=615)	Cardiac death(+) (N=4)	p
Channel.1.max.TWA.Value	53.5 ± 18.4	53.5 ± 18.4	61.2 ± 22.9	0.401
Channel.2.max.TWA.Value	49.7 ± 16.2	49.6 ± 16.1	63.2 ± 23.4	0.093
Channel.3.max.TWA.Value	51.9 ± 17.5	51.9 ± 17.5	56.0 ± 18.4	0.638
TWA.max	59.8 ± 20.6	59.8 ± 20.7	**65.8 ± 21.3**	0.567
TWA.average	51.7 ± 14.7	51.7 ± 14.6	**60.2 ± 21.0**	0.248
HRT.Onset..TO..Value	-0.6 ± 2.0	-0.6 ± 2.0	**-0.3 ± 0.7**	0.745
HRT.Slope..TS..Value	4.8 ± 6.3	4.9 ± 6.3	**0.7 ± 0.8**	0.000

Cardiac death (HF)

cardiac.death	Total (N=188)	Cardiac death(-) (N=177)	Cardiac death(+) (N=11)	p
Channel.1.max.TWA.Value	60.6 ± 20.7	60.4 ± 20.8	63.7 ± 20.1	0.627
Channel.2.max.TWA.Value	53.0 ± 16.1	52.5 ± 15.6	60.3 ± 22.3	0.139
Channel.3.max.TWA.Value	57.1 ± 19.4	57.1 ± 19.6	56.9 ± 17.3	0.973
TWA.max	66.9 ± 22.6	66.7 ± 22.7	**70.1 ± 22.0**	0.641
TWA.average	56.8 ± 15.4	56.6 ± 15.3	**60.3 ± 16.8**	0.467
HRT.Onset..TO..Value	0.0 ± 1.1	0.0 ± 1.1	**0.2 ± 0.6**	0.545
HRT.Slope..TS..Value	1.9 ± 2.8	2.0 ± 2.9	**0.6 ± 0.8**	0.000

HF-admission (MI + HF)

HF.adm	Total (N=807)	HF adm(-) (N=778)	HF adm(+) (N=29)	p
Channel.1.max.TWA.Value	55.1 ± 19.1	55.0 ± 19.2	57.4 ± 15.6	0.536
Channel.2.max.TWA.Value	50.4 ± 16.2	50.3 ± 16.2	54.2 ± 17.1	0.224
Channel.3..max.TWA.Value	53.0 ± 18.1	52.9 ± 18.2	56.5 ± 14.4	0.325
TWA.max	61.4 ± 21.3	61.3 ± 21.4	63.1 ± 16.7	0.681
TWA.average	52.8 ± 15.0	52.7 ± 15.0	56.0 ± 13.3	0.271
HRT.Onset..TO..Value	-0.4 ± 1.8	-0.5 ± 1.8	**0.1 ± 1.2**	**0.026**
HRT.Slope..TS..Value	4.2 ± 5.8	4.2 ± 5.8	**1.5 ± 2.8**	**0.000**

HF-admission (MI)

HF.adm	Total (N=619)	HF adm(-) (N=612)	HF adm(+) (N=7)	p
Channel.1.max.TWA.Value	53.5 ± 18.4	53.6 ± 18.5	50.9 ± 9.7	0.698
Channel.2.max.TWA.Value	49.7 ± 16.2	49.7 ± 16.2	50.6 ± 11.6	0.887
Channel.3.max.TWA.Value	51.9 ± 17.5	51.9 ± 17.6	53.3 ± 10.7	0.832
TWA.max	59.8 ± 20.6	59.9 ± 20.7	56.9 ± 8.8	0.408
TWA.average	51.7 ± 14.7	51.7 ± 14.7	51.6 ± 9.4	0.980
HRT.Onset..TO..Value	-0.6 ± 2.0	-0.6 ± 2.0	**-0.1 ± 0.6**	**0.112**
HRT.Slope..TS..Value	4.8 ± 6.3	4.9 ± 6.3	**1.1 ± 2.6**	**0.008**

HF-admission (HF)

HF.adm	Total (N=188)	HF adm(-) (N=166)	HF adm(+) (N=22)	p
Channel.1.max.TWA.Value	60.6 ± 20.7	60.7 ± 21.2	59.8 ± 16.9	0.858
Channel.2.max.TWA.Value	53.0 ± 16.1	52.6 ± 15.8	55.6 ± 18.8	0.455
Channel.3.max.TWA.Value	57.1 ± 19.4	57.0 ± 19.9	57.6 ± 15.7	0.900
TWA.max	66.9 ± 22.6	67.0 ± 23.1	65.4 ± 18.5	0.762
TWA.average	56.8 ± 15.4	56.7 ± 15.6	57.7 ± 14.3	0.806
HRT.Onset..TO..Value	0.0 ± 1.1	0.0 ± 1.0	0.2 ± 1.3	0.595
HRT.Slope..TS..Value	1.9 ± 2.8	2.0 ± 2.8	1.7 ± 2.9	0.618

New-onset AF (MI + HF)

AF	Total (N=807)	AF(-) (N=799)	AF(+) (N=8)	p
Channel.1.max.TWA.Value	55.1 ± 19.1	55.1 ± 19.1	56.8 ± 20.6	0.806
Channel.2.max.TWA.Value	50.4 ± 16.2	50.5 ± 16.2	47.2 ± 14.8	0.579
Channel.3.max.TWA.Value	53.0 ± 18.1	53.1 ± 18.1	51.2 ± 18.9	0.779
TWA.max	61.4 ± 21.3	61.4 ± 21.3	58.1 ± 20.7	0.663
TWA.average	52.8 ± 15.0	52.9 ± 15.0	51.8 ± 17.3	0.836
HRT.Onset..TO..Value	-0.4 ± 1.8	-0.4 ± 1.8	-0.2 ± 1.0	0.760
HRT.Slope..TS..Value	4.2 ± 5.8	4.2 ± 5.8	**1.5 ± 2.4**	**0.015**

Patient subgroups depending on HRT disturbance

HRT 0	HRT 1	HRT 2
Normal TO Normal TS	Either abnormal (TO or TS)	Both TO and TS abnormal

N=249   N=159   N=363

Event rates depending on HRT

TO/TS abnormality	HRT 0 (n=249)	HRT 1 (n=159)	HRT 2 (n=363)	p value
All death	1/249(0.3%)	8/195(4.1%)	15/363(4.1%)	0.016
Cardiac death	1/249(0.4%)	2/195(1.0%)	12/363(3.3%)	0.020
HF admission	3/249(1.2%)	8/195(4.1%)	18/363(5.0%)	0.045
AF	2/249(0.8%)	0	6/363(1.7%)	0.160
Embolism	2/249(0.8%)	3/195(1.5%)	6/363(1.7%)	0.653
Composite	**8/249(3.2%)**	**15/195(7.7%)**	**36/363(9.9%)**	**0.007**

Event rates according to HRT abnormality

(%)

P=0.016

P=0.020

P=0.045

P=0.160

P=0.653

P=0.007

Overall Death | Cardiac Death | HF admission | AF | Embolism | Composite Events
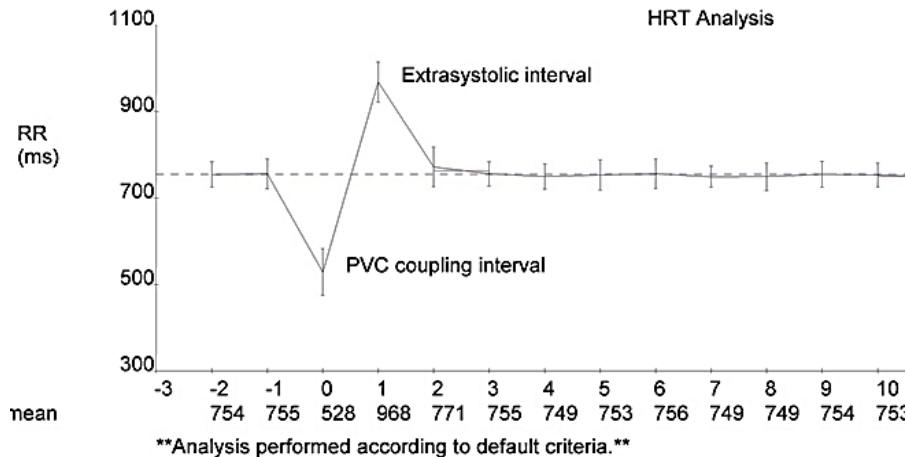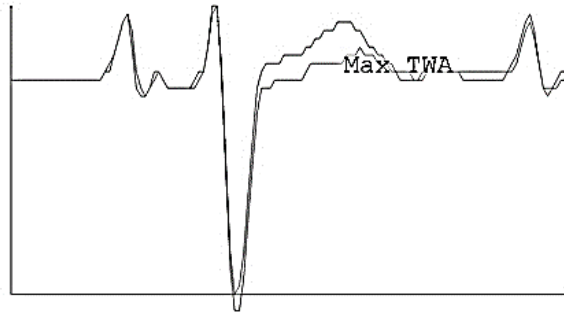
■ HRT 0   ■ HRT 1   ■ HRT 2
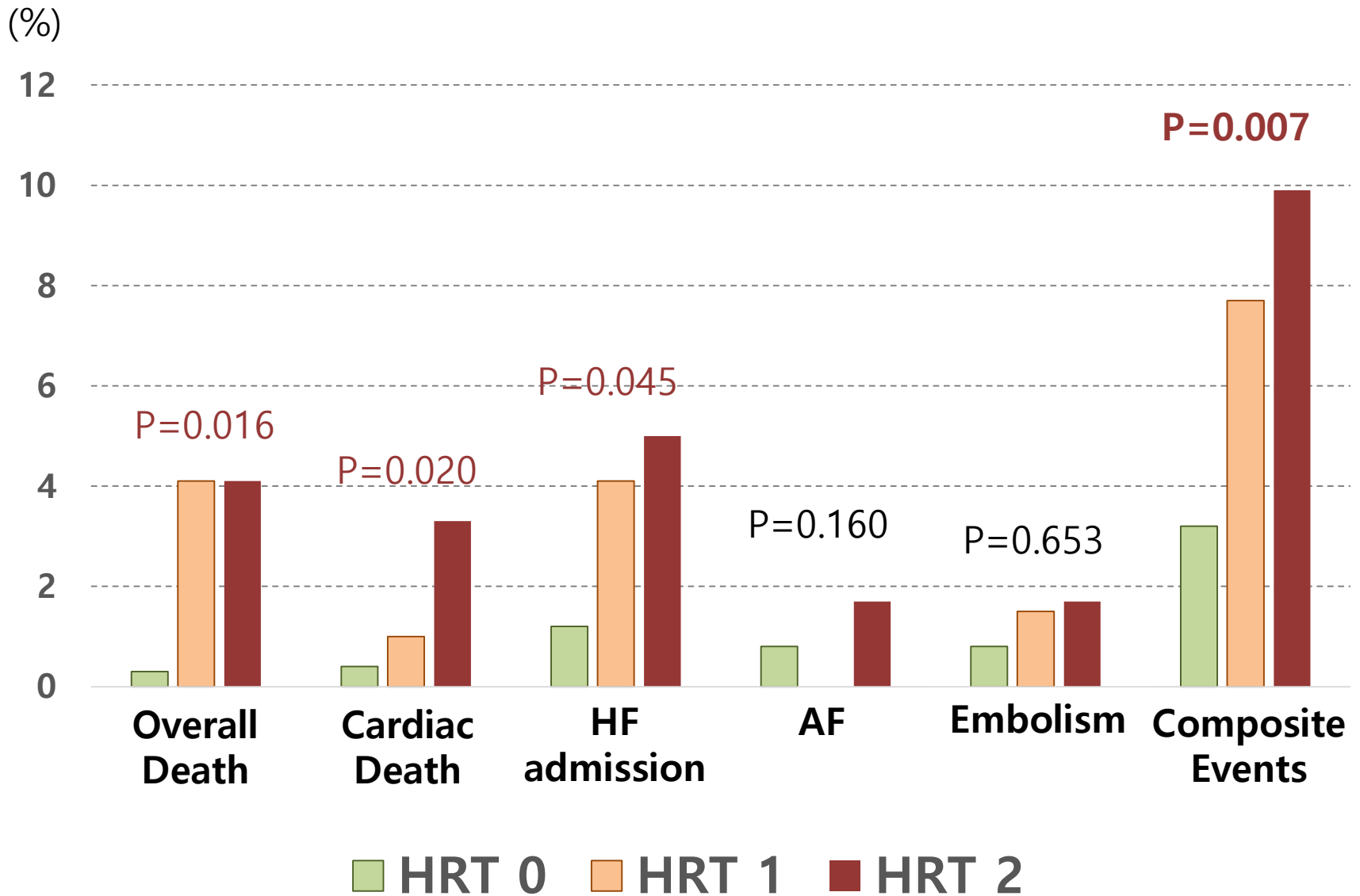
75/Female

FEB 2016 **STEMI**,
PCI for LAD total occlusion
LV EF 40%

Holter 2 weeks later:
Max TWA 82 µV
TO 1.19 %
TS 0.55 ms/RR
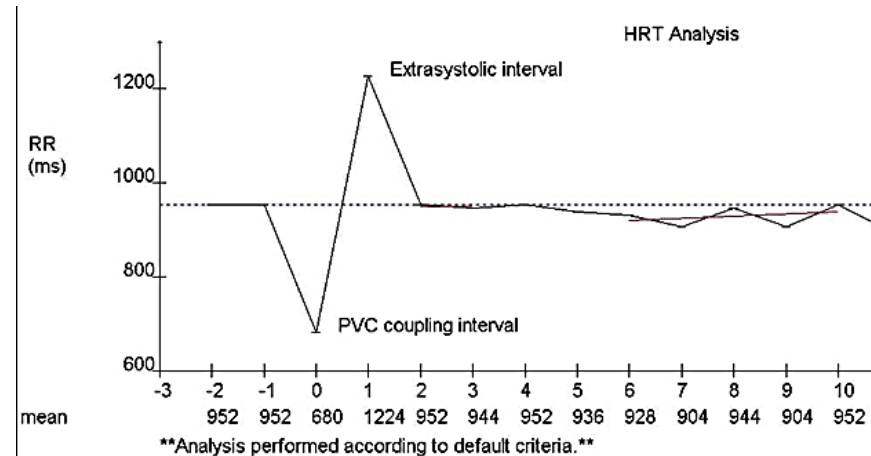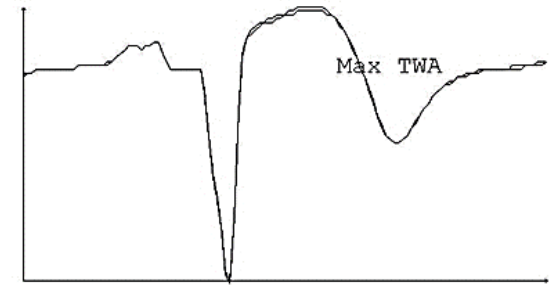
SCD 2 weeks after the Holter

67/Male

NOV 2015 **STEMI**,
PCI for prox. LAD lesion
LV EF 39%

Holter 1 day later:
Max TWA 19 µV
TO -0.42 %
TS 4.80 ms/RR

May 2018 Doing well

Summary

- **K-REDEFINE study**
  First Non-invasive, multicenter, prospective registry

- **About 60%** of the target number (n=2000)

- 1 Year follow-up data: 80%
  Missing values; 20%

- Trend toward for **higher TWA levels**
  in patients with CV events
- Significantly **higher event rates**
  in patients with **abnormal HRT**

Thank you for your attention!!

Guard **Your Heart**
above all else
For it **determines** the
course of **your life** .

--Proverbs 4: 23--

(HF) embolic 여부에 따른 TWA/HO,HS

embolic	Embolic(-)(N=183)	Embolic(+) (N=5)	Total (N=188)	p
Channel.1.max.TWA.Value	59.7 ± 19.5	96.8 ± 38.6	60.6 ± 20.7	0.151
Channel.2.max.TWA.Value	52.7 ± 15.9	64.5 ± 24.7	53.0 ± 16.1	0.148
Channel.3..max.TWA.Value	56.9 ± 19.5	65.0 ± 14.5	57.1 ± 19.4	0.412
TWA.max	66.1 ± 21.8	96.8 ± 38.6	66.9 ± 22.6	0.007
TWA.average	56.4 ± 15.0	75.4 ± 22.3	56.8 ± 15.4	0.014
HRT.Onset..TO..Value	0.0 ± 1.1	0.3 ± 0.4	0.0 ± 1.1	0.174
HRT.Slope..TS..Value	2.0 ± 2.9	1.3 ± 1.8	1.9 ± 2.8	0.618

Event rate depending on HRT

TO/TS abnormality	HRT 0	HRT 1	HRT 2	p value
Composite	8/249(3.21%)	15/195(7.69%)	36/363(9.91%)	0.007
All death	1/249(0.37%)	8/195(4.1%)	15/363(4.1%)	0.016
Cardiac death	1/249(0.37%)	2/195(1.0%)	12/363(3.3%)	0.020
AF	2/249(0.80%)	0	6/363(1.65%)	0.160
Embolism	2/249(0.80%)	3/195(1.53%)	6/363(1.65%)	0.653
HF admission	3/249(1.20%)	8/195(4.10%)	18/363(4.95%)	0.045
Recurrent MI	2/249(0.80%)	1/195(0.51%)	2/363(0.55%)	0.904
Revascularization	6/249(2.40%)	4/195(2.05%)	7/363(1.92%)	0.919