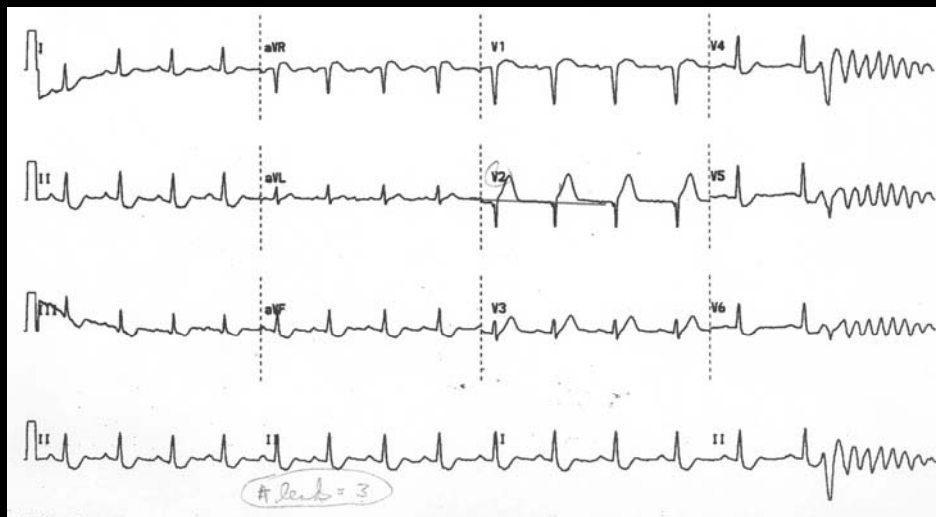


What does the ECG show before the Arrest ?

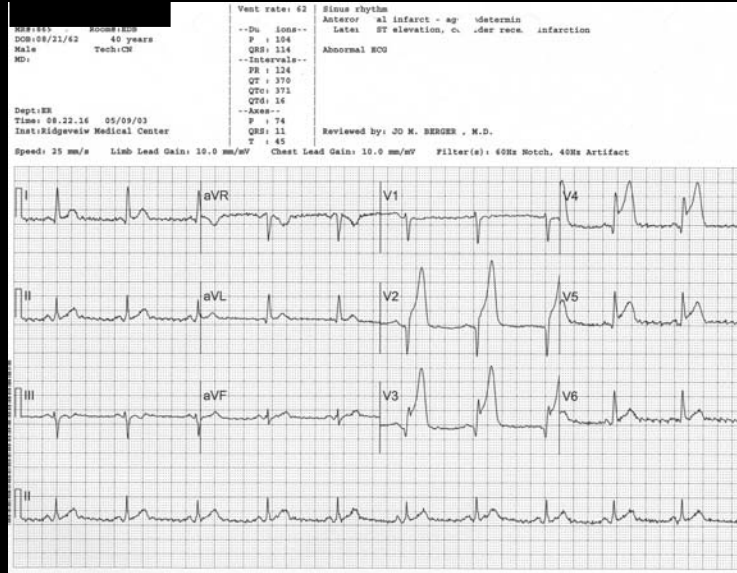
Scott W. Sharkey, MD
On behalf of the MHI Level 1 Program

Minneapolis Heart Institute Foundation
Minneapolis, Minnesota

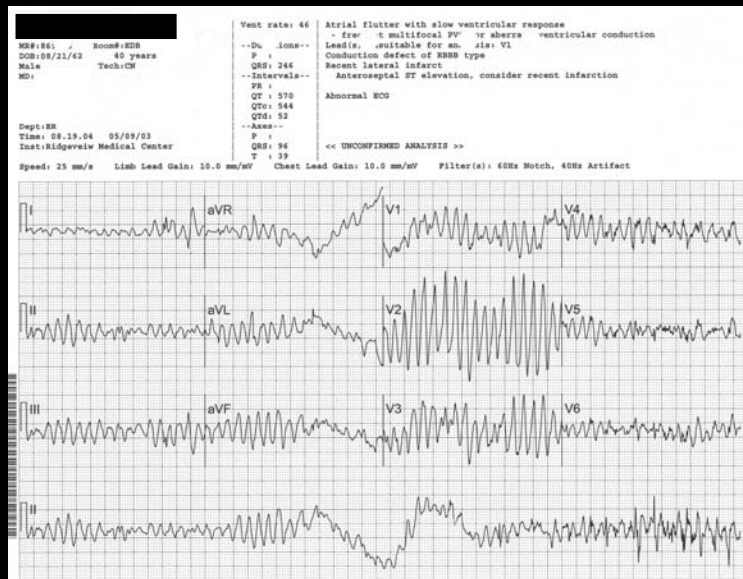
44 year old male with chest pain



40 year old male with chest pain

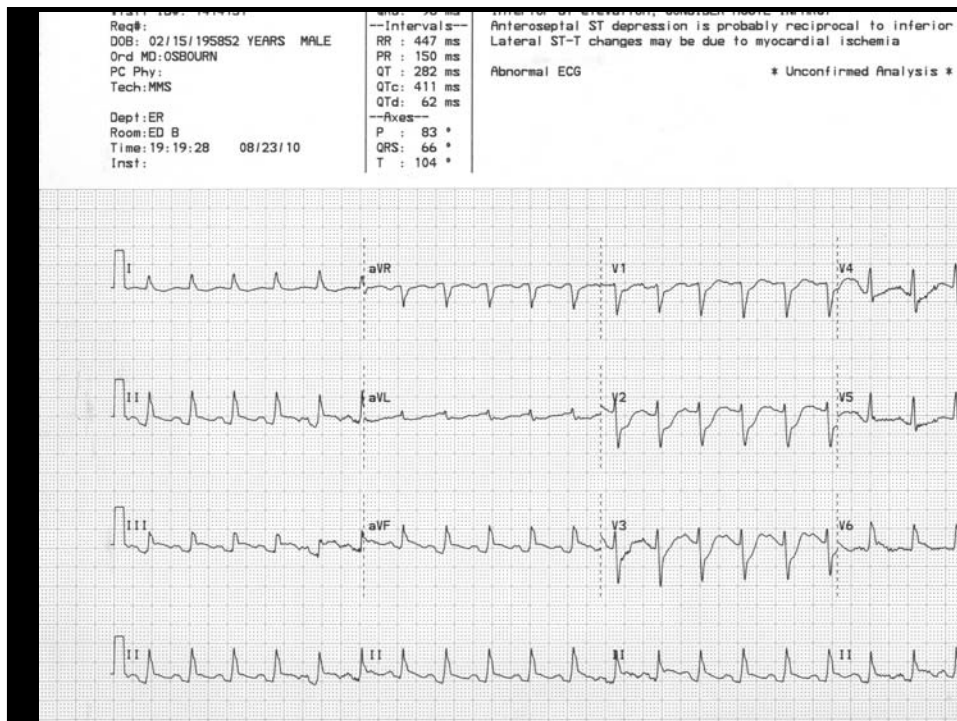


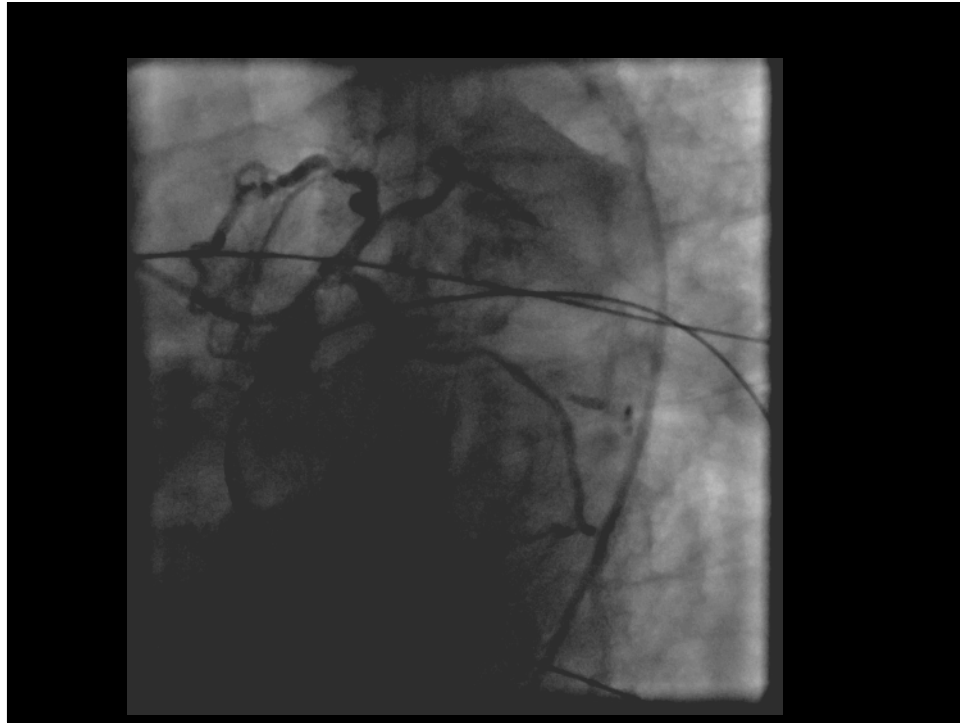
40 year old male with chest pain



52 year old male

- To Waconia ED unresponsive
- ECG shown
- Troponin T <0.01 ng/ml





52 year old male

- To Minneapolis Heart Institute @ Abbott Northwestern
- Level 1 and Cool It. D/C Sept 8
- LV ejection fraction 65-70%

Level 1 Acute Myocardial Infarction Database
@ Minneapolis Heart Institute

- March 2005-May 2010
- Acute ST-segment elevation MI (or LBBB)
- 2260 consecutive patients

Level 1 Acute Myocardial Infarction Database
@ Minneapolis Heart Institute

- Cardiac arrest: 254 (11.2%)
- “Level 1” for coronary occlusion: ~ 100%
- “Cool It” for cerebral anoxia: ~ 33%

Cardiac Arrest vs No Arrest (Clinical Characteristics)

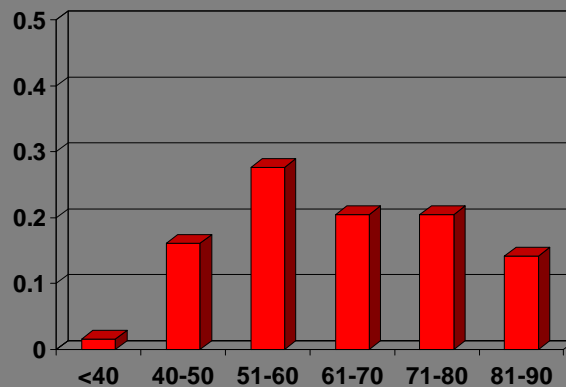
Arrest

- Age: 63 (53,75) years
- Age range: 33-87 years
- Female: 27.5%
- CP-ECG: 65 minutes
- Active smoker: 41%

No Arrest

- Age: 61 (52,74) years
- Age range: 33-99 years
- Female: 24%
- CP-ECG: 143 minutes
- Active smoker: 37.4%

Age Distribution of Cardiac Arrest Patients



Cardiac Arrest vs No Arrest (Impact of cigarettes on age at presentation)

Arrest

- All : 63 (53,75) years
- Active smoker: 55 years
- Never-smoked: 73 years

No Arrest

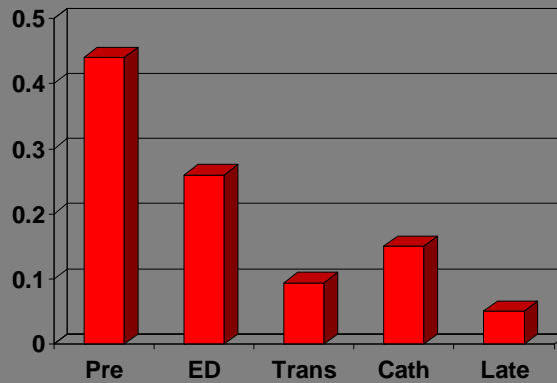
- All: 61 (52,74) years
- Active smoker: 54 years
- Never smoked: 67 years

Level 1 Acute Myocardial Infarction Database @ Minneapolis Heart Institute

- **Not current smoker with cardiac arrest:**

Median age: 71.5 years

Frequency of Cardiac Arrest by Location

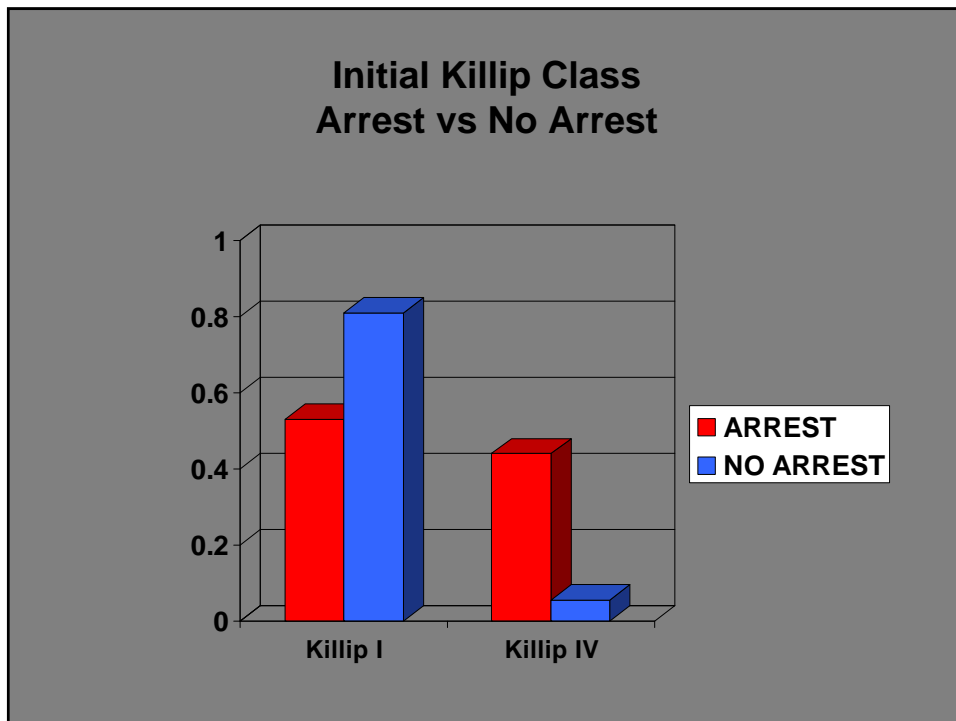


Level 1 Acute Myocardial Infarction Database @ Minneapolis Heart Institute

- Pre-hospital cardiac arrest: 111 (44%)
- Not pre-hospital cardiac arrest: 143 (56%)

Cardiac Arrest Initial Killip Class

Arrest	No Arrest
• I: 53%	• I: 81%
• II: 1.5%	• II: 1.6%
• III: 1.5%	• III: 1%
• IV: 44% (Cardiogenic shock)	• IV: 5.5% (Cardiogenic shock)



Cardiac Arrest vs No Arrest (Clinical Characteristics)

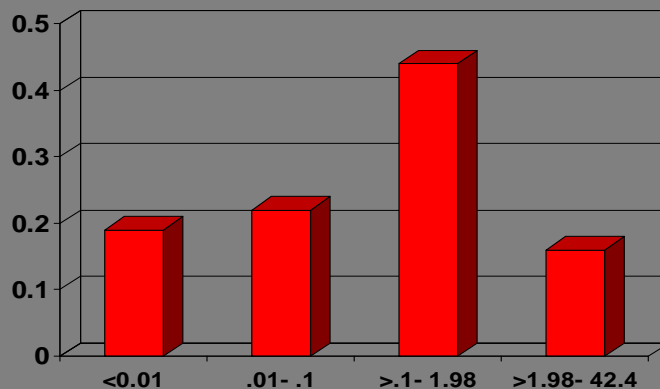
Arrest

- Inotropic drug: 35%
- Intra-aortic balloon: 28%
- Ventilator: 67%

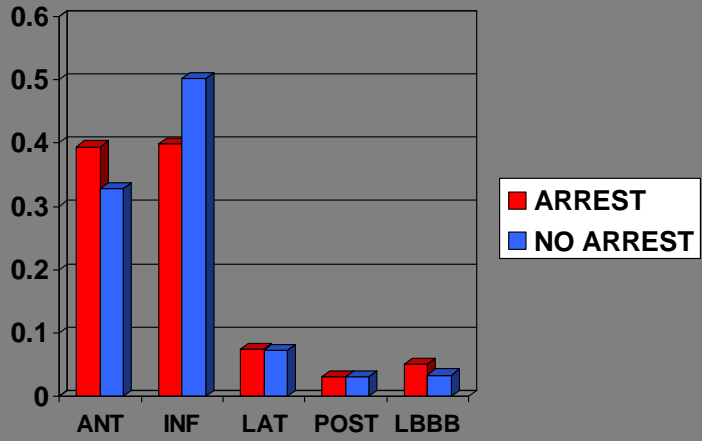
No Arrest

- Inotropic drug: 6%
- Intra-aortic balloon: 5%
- Ventilator: unknown

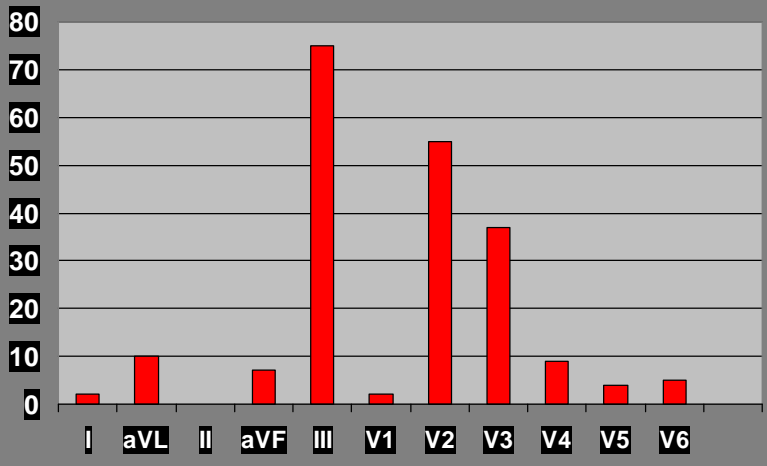
Cardiac Arrest Patients Distribution of Initial Troponin T (ng/ml)



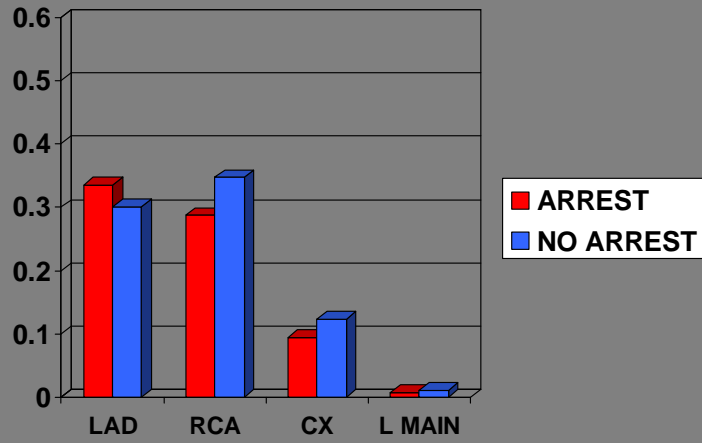
Initial ECG Infarct Location



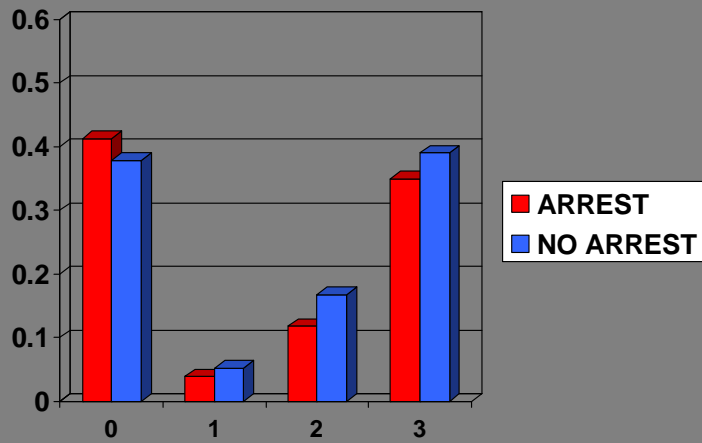
Maximum ST-Segment Elevation "The Hot Leads"



“Culprit” Coronary Artery



Initial TIMI Flow in “Culprit” Coronary Artery



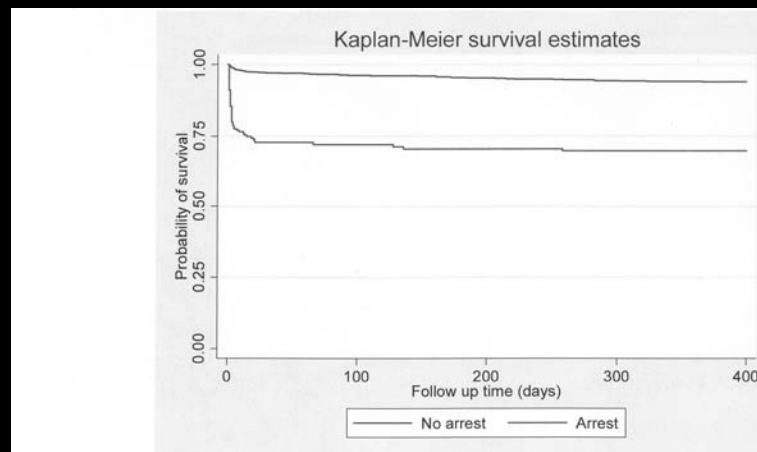
Cardiac Arrest Outcome

Arrest

- Hosp death: 31.9%
- 30 day death: 32%
- 1 year death: 39.8%
- Hosp LOS: 6.5 days

No Arrest

- Hosp death: 2.5%
- 30 day death: 3.0%
- 1 year death: 6.1%
- Hosp LOS: 3 days



Level 1 Acute Myocardial Infarction Database
@ Minneapolis Heart Institute

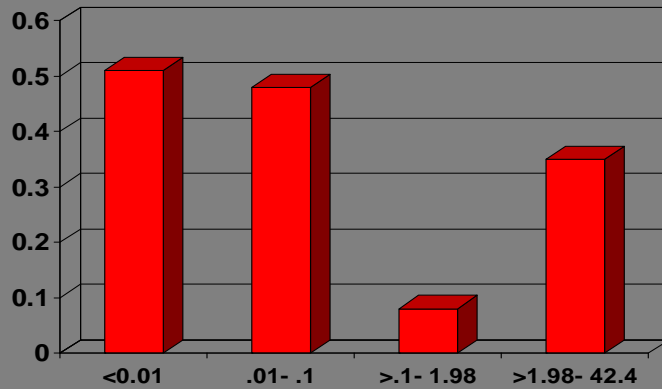
Hospital mortality

- Pre-hospital cardiac arrest: 36 (32%)
- Not pre-hospital cardiac arrest: 45 (31.5%)

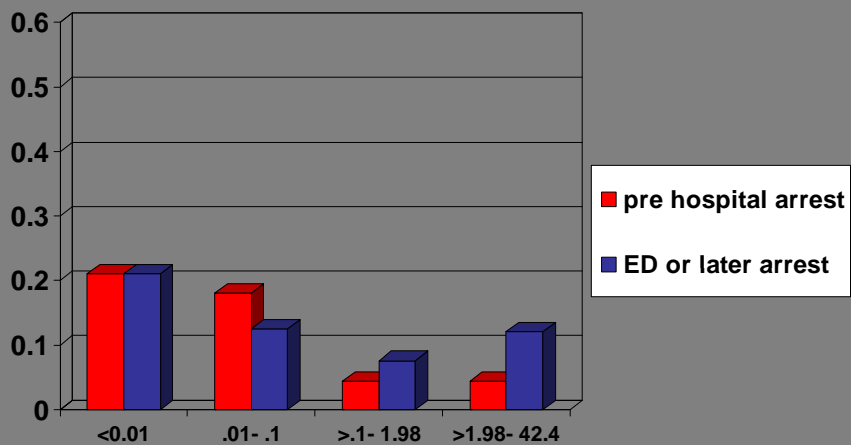
**Hospital Mortality vs Killip Class
Cardiac Arrest Patients**

- Killip Class I Hospital Mortality: 9.9%
- Killip Class 4 Hospital Mortality: 65.4%

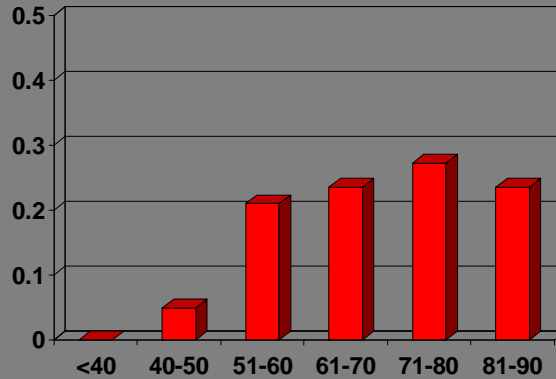
Cardiac Arrest Patients Hospital mortality vs Initial Troponin T (ng/ml)



Cardiac Arrest Patients Arrest Location vs Initial Troponin T



Age Distribution of Cardiac Arrest Patients who died in Hospital



THE NEW ENGLAND JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Long-Term Outcome Associated with Early Repolarization on Electrocardiography

Jani T. Tikkanen, B.S., Olli Anttonen, M.D., M. Juhani Junttila, M.D., Aapo L. Aro, M.D., Tuomas Kerola, M.D., Harri A. Rissanen, M.Sc., Antti Reunanen, M.D., and Heikki V. Huikuri, M.D.

ABSTRACT

BACKGROUND
Early repolarization, which is characterized by an elevation of the QRS–ST junction (J point) in leads other than V₁ through V₃ on 12-lead electrocardiography, has been associated with vulnerability to ventricular fibrillation, but little is known about the prognostic significance of this pattern in the general population.

METHODS
We assessed the prevalence and prognostic significance of early repolarization on 12-lead electrocardiography in a community-based general population of 10,864 middle-aged subjects (mean [±SD] age, 44±8 years). The primary end point was death from cardiac causes, and secondary end points were death from any cause and death from arrhythmia during a mean follow-up of 30±11 years. Early repolarization was stratified according to the degree of J-point elevation (≥0.1 mV or >0.2 mV) in either inferior or lateral leads.

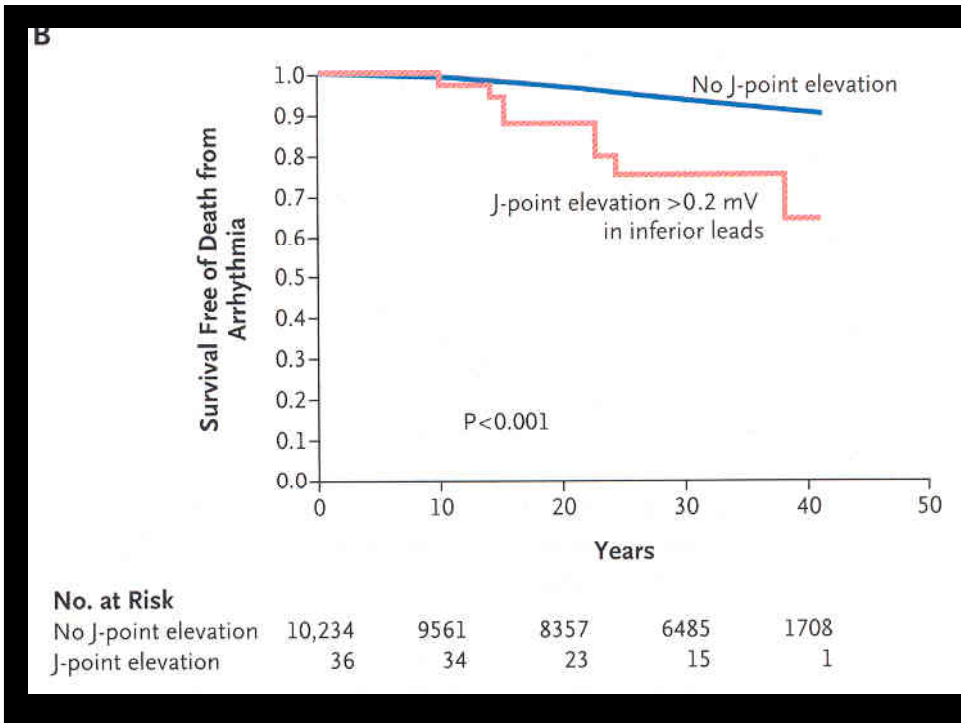
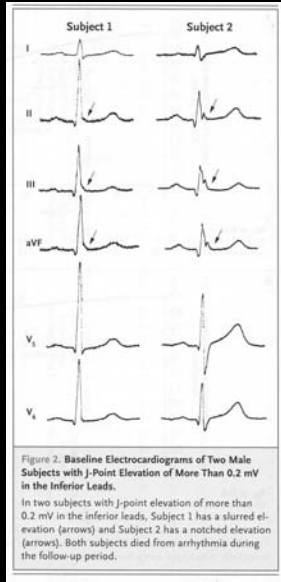
RESULTS
The early-repolarization pattern of 0.1 mV or more was present in 630 subjects (5.8%; 384 [3.5%] in inferior leads and 262 [2.4%] in lateral leads, with elevations in both leads in 16 subjects [0.1%]). J-point elevation of at least 0.1 mV in inferior leads was associated with an increased risk of death from cardiac causes (adjusted relative risk, 1.28; 95% confidence interval [CI], 1.04 to 1.59; P=0.03); 36 subjects (0.3%) with J-point elevation of more than 0.2 mV in inferior leads had a markedly elevated risk of death from cardiac causes (adjusted relative risk, 2.58; 95% CI, 1.85 to 4.92; P<0.001) and from arrhythmia (adjusted relative risk, 2.92; 95% CI, 1.45 to 5.89; P=0.01). Other electrocardiographic risk markers, such as a prolonged QT interval corrected for heart rate (P=0.03) and left ventricular hypertrophy (P=0.004), were weaker predictors of the primary end point.

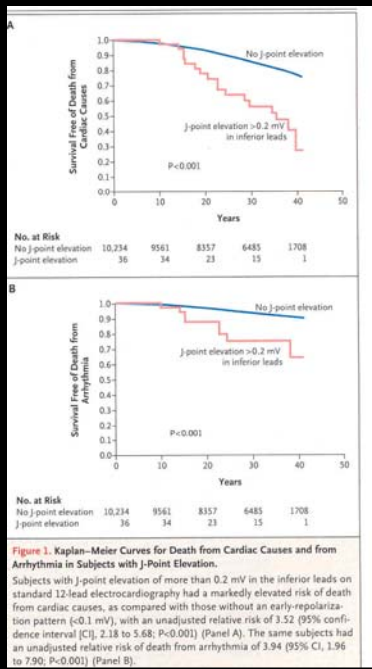
CONCLUSIONS
An early-repolarization pattern in the inferior leads of a standard electrocardiogram is associated with an increased risk of death from cardiac causes in middle-aged subjects.

From the Institute of Clinical Medicine, Department of Internal Medicine, University of Oulu, Oulu (J.T.T., M.J.J., H.V.H.); the Department of Internal Medicine, Pajulahti Central Hospital, Lahti (O.A., A.L.A., T.K.); and the National Institute for Health and Welfare, Helsinki (H.A.R., A.R.) — all in Finland. Address reprint requests to Dr. Huikuri at the Institute of Clinical Medicine, Department of Internal Medicine, Center of Excellence in Research, University of Oulu, P.O. Box 5000, 90014 Oulu, Finland, or at heikki.huikuri@oulu.fi.

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Conclusions

- Acute ST-elevation MI is a frequent cause of cardiac arrest (ventricular fibrillation)
- Ventricular fibrillation is a time dependent and early event

Conclusions

- Acute coronary artery occlusion creates an electrically unstable heart
- With the exception of cardiogenic shock, no single clinical feature (age, ecg, infarct artery) identifies the patient at risk for cardiac arrest

Conclusions

- Hospital mortality is substantial (over 30%) and usually due to cardiogenic shock

Conclusions

- Nearly one half of patients are ≤ 60 years old (& active smokers)
- Cigarette smoking promotes premature coronary artery thrombosis

Conclusions

- The post-hospital 1 year outcome of patients with ST-elevation MI and cardiac arrest is no different than those without cardiac arrest
- Long term cardiac and neurologic outcome is under active study

