

**ECG is mandatory
during exercise training
in cardiac rehabilitation
- PRO -**

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No

ECG is not mandatory
during exercise training in rehabilitation,
and this already is clinical practise
(i.e. terrain training and muscular strength
training)

BUT

ECG-monitoring may be helpful in
patients` guidance through
cardiac rehabilitation



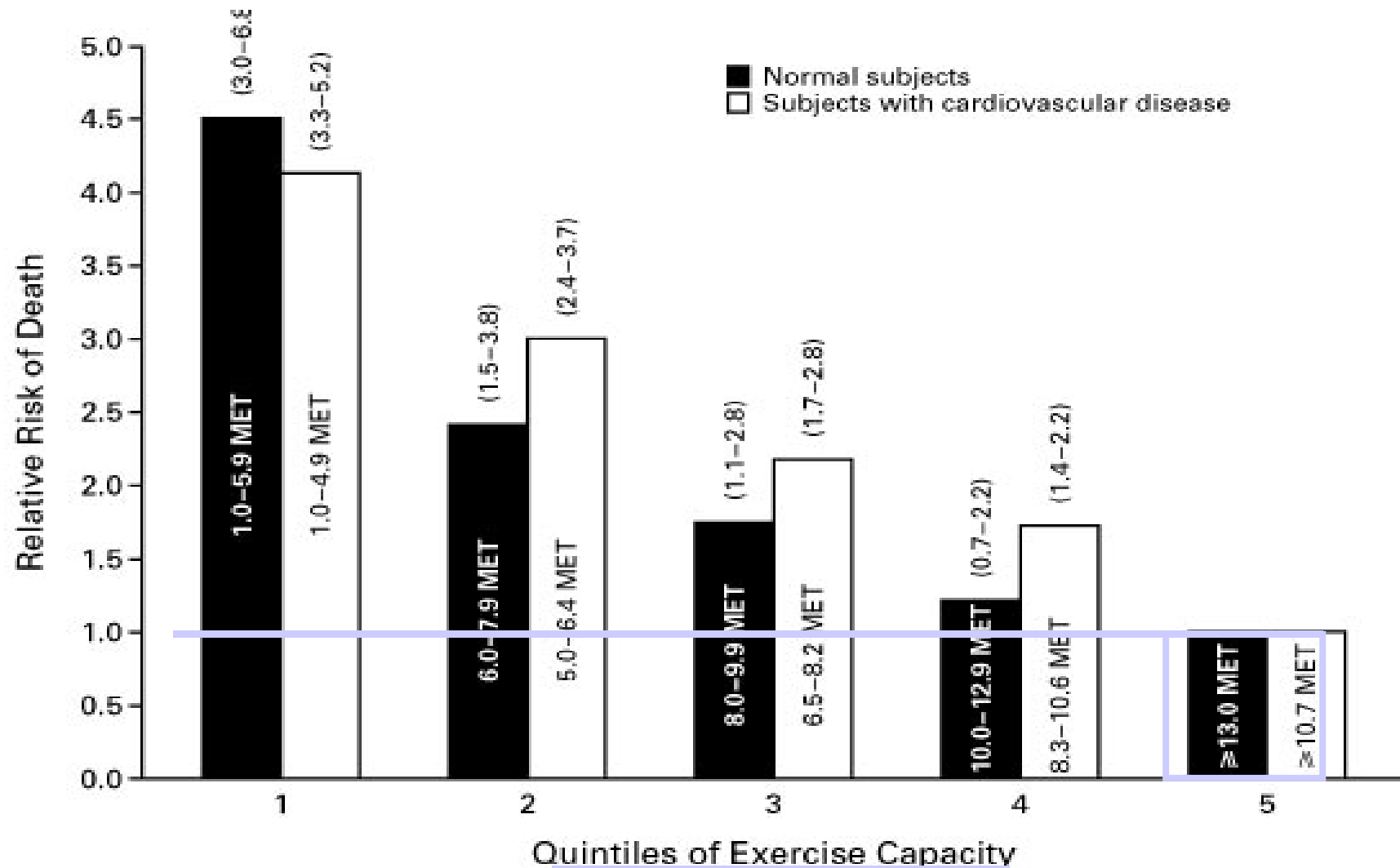
General aspects

Individual aspects

General aspects

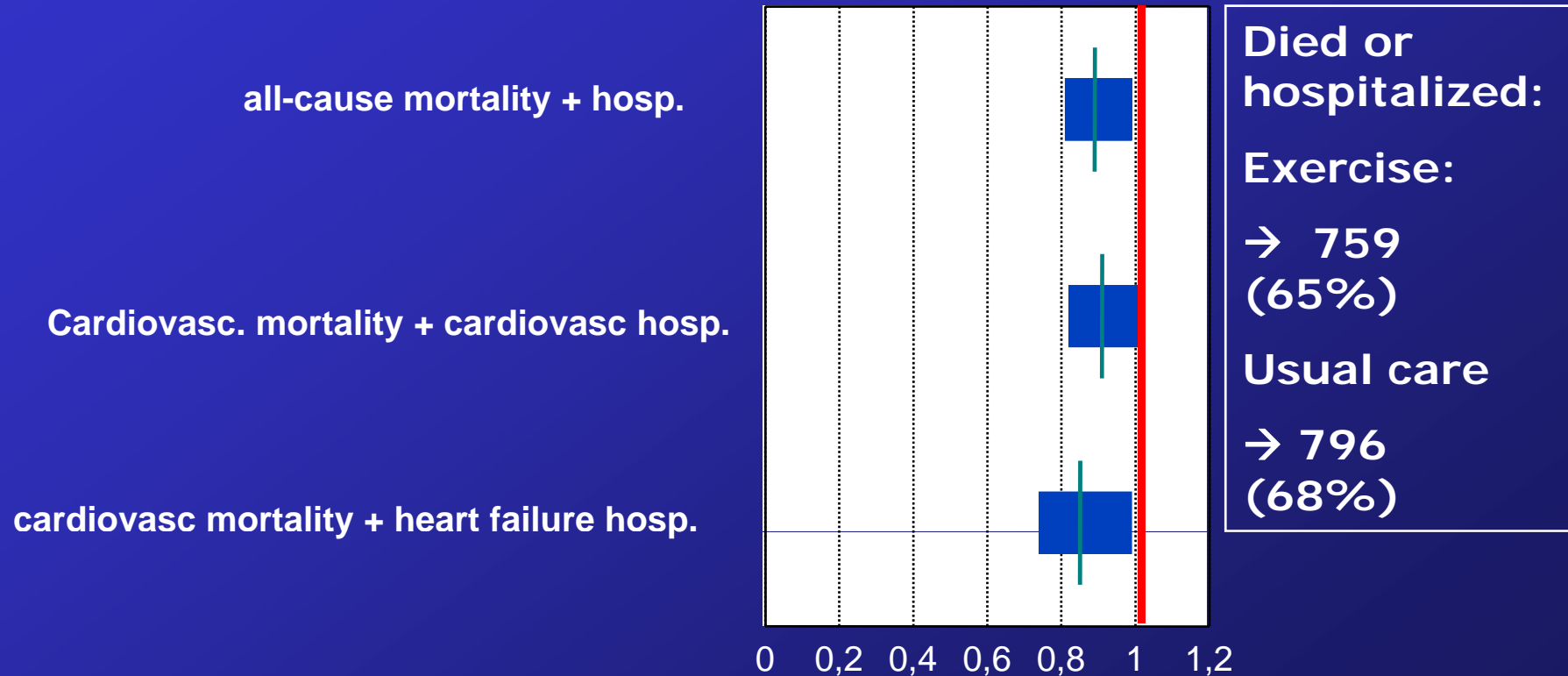
- **Exercise training and prognosis**
- **Safety of exercise training**
- **Incidence and clinical implications of arrhythmias recognized during exercise**

Age adjusted risk ratio for total mortality and exercise capacity in healthy persons and patients with cardiovascular disease



Efficacy and safety of exercise training in HF patients; HF-ACTION Trial

Adjusted for major prognostic risk factors



Multicenter RCT, n= 2,331; EF 25%; 2003-7; follow-up 30 months

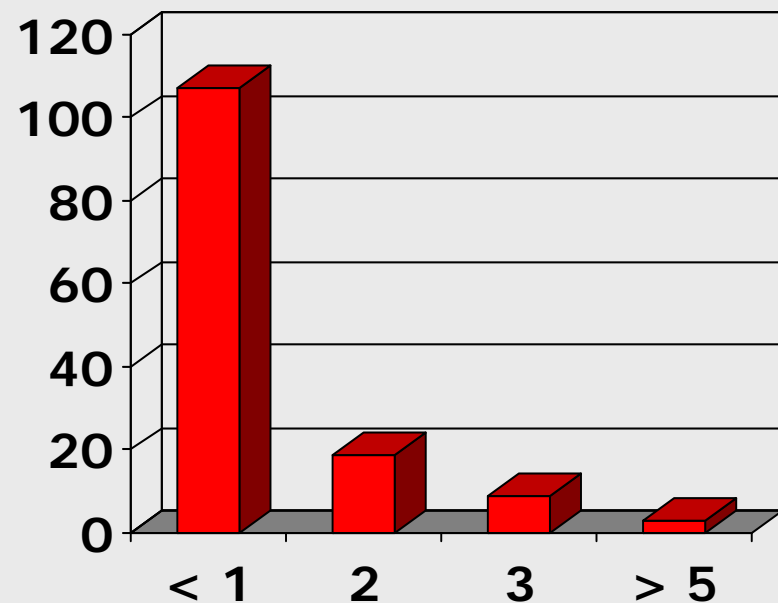
O` Connor CM et al, JAMA 2009

General aspects

- Exercise training and prognosis
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Vigorous exertion and cardiac risk

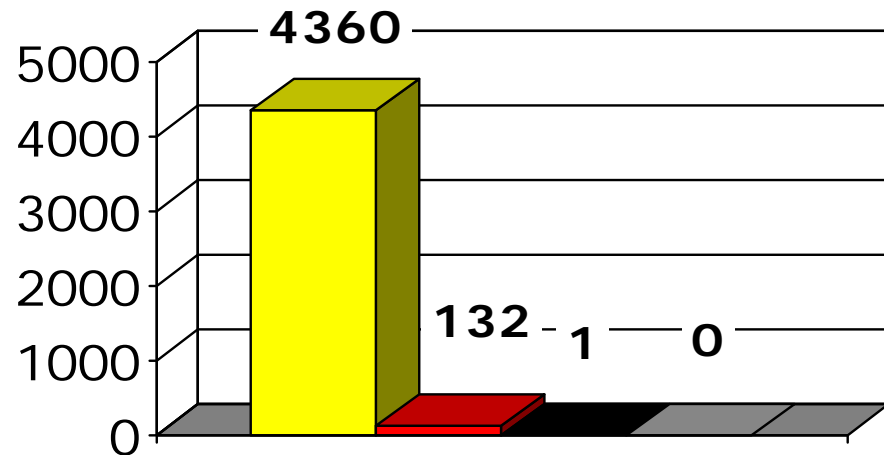
relative risk for acute myocardial infarction



Periods of training per week

- **Unusual exertion**
 - Blood pressure ↑ ↑
 - Heart rate ↑
 - Vascular wall stress ↑↑
 - *Plaque-Rupture ?*
- **Risk +:**
 - Diabetes
 - Age

Stent thrombosis and adverse events in association to exercise training



- patients with stenting
- patients with stent thrombosis within 1 mo
- stent thrombosis exercise testing related
- any adverse event when training was started 7 days after AMI

- Survey 1996-1998
 - 46 hospitals
 - 13,685 patients with AMI
 - 31.9% stenting

Cardiac risk in supervised training

- **Exercise related events in supervised training in patients with heart disease,**
 - SCD 1/784.000 hours of training
 - AMI 1/294.000 hours of training
 - CHF-patients and death: 0/60.000 patient-hours of training

- **Observation over the period of 16 years**
 - Serious cardiac complications
1/20-50.000 hours of training

Haskell WL, et al. Med Sci Sports Exerc 1994

Franklin BA et al. Chest 1998

Smart N, et al. Am J Med 2004

Van Camp SP et al. JAMA 1986

General aspects

- Exercise training and prognosis
- Safety of exercise training
- **Incidence and clinical implications of arrhythmias recognized during exercise**

Arrhythmias newly provoked by exercise training after cardiac surgery

Cardiac surgery

N = 1,293

arrhythmias:

12/13,646 training sessions (2 weeks after surgery)

incidence = 0.09%

5/12 = atrial fibrillation

Individual aspects

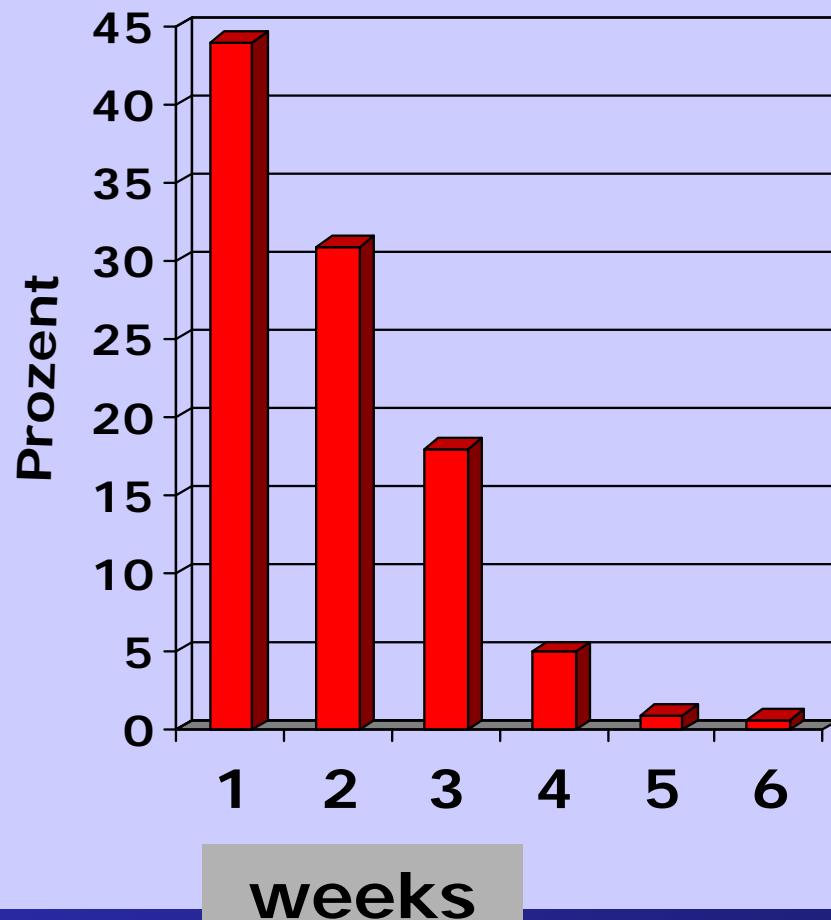
- **Characteristics of cardiac rehabilitation**
- **Individual therapeutic requirements**
 - Underlying disease
 - History of acute events
 - Level of fitness
- **Psychological aspects**
 - Anxiety
 - Self confidence
 - Self estimation

Characteristics of cardiac rehabilitation

- Individual approach
- Prevention as a basic requirement
- Responsibility for each single patient as a major impact
- One death in rehabilitation is too much
- One major complication in rehabilitation is too much
- A major characteristic of cardiac rehabilitation is **care** including monitoring

Cardiac Rehabilitation

Clinical events

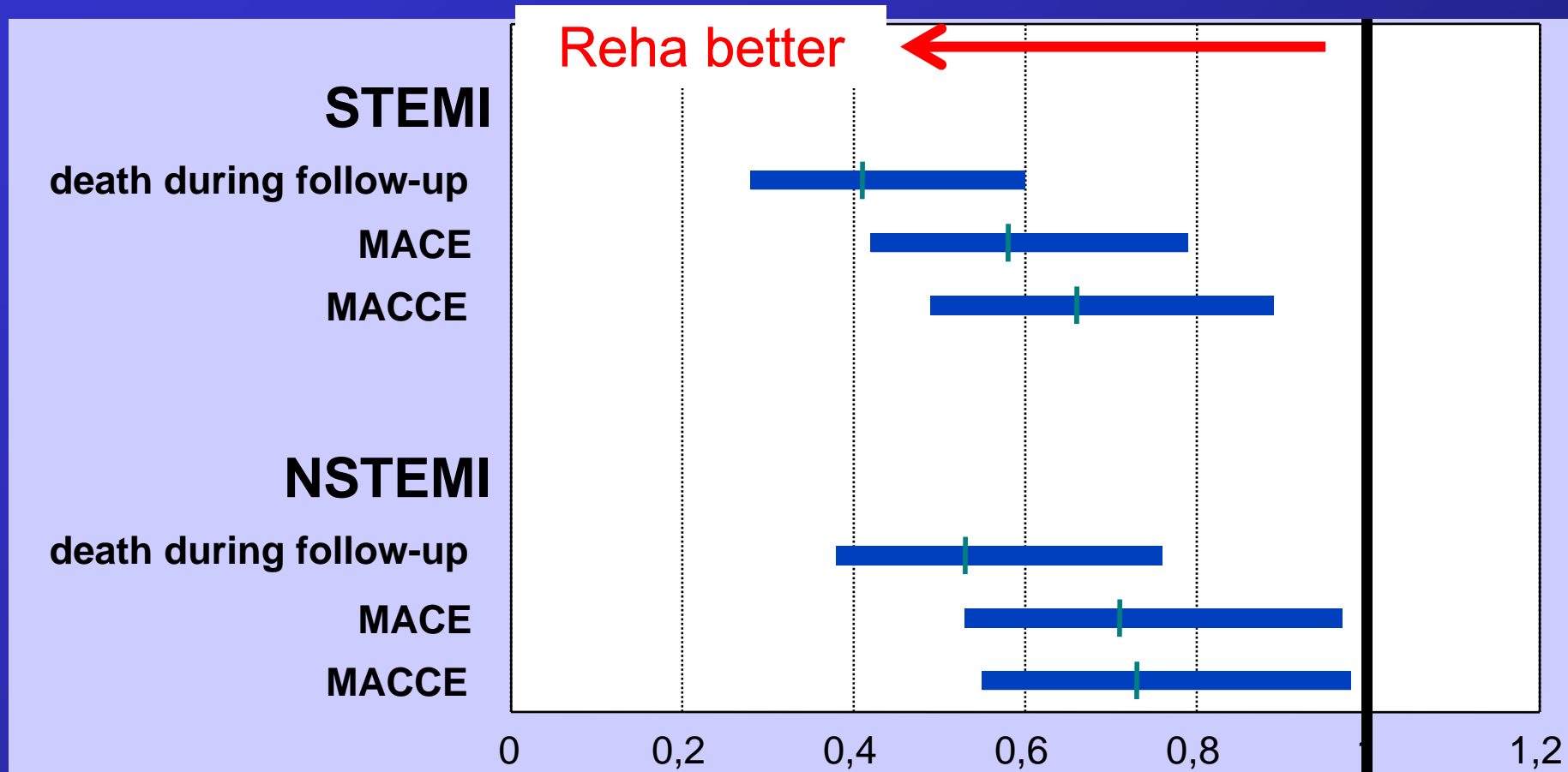


- Clinical events during rehabilitation (average 10 days after hospital discharge)

**Cardiac rehabilitation:
Prevention and early
treatment of adverse
clinical events**

Patients after acute myocardial infarction

Reha and 1-year prognosis



MACE = Major Adverse Cardiac Events (death + reinfarction)
MACCE = Major Cardiac and Cerebrovascular Events (death, reinfarction, stroke)

Jünger C et al., ACOS Survey 2008

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Individual aspects

- **Characteristic of cardiac rehabilitation**
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Utilization of **telemedicine** by heart disease patients following hospitalization

- spontaneous use of telemedicine service by patients: Independent positive predictors
 - Recent repeat PCI
 - Recent cardioversion for atrial fibrillation
 - Ejection fraction
 - Reciprocal of age

- N=540
- Various heart diseases
- Home-based telemedicine
- Follow-up 93 days

Patients use of ECG-monitoring is not rational

Patients` search for safety in cardiac rehabilitation appears to be individually determined primarily on a subjective basis

→ Anxiety ??

depression

anxiety

social
retirement

negative affection

inadequate
behaviour

autonomus -
neuroendocrine
imbalance

general
complaints ↑
quality of life ↓

Adherence ↓
Activity ↓
risk factor
control ↓

heart rate
variability ↓

blood pressure ↑

clotting factors ↑

inflammation ↑

demands
on health care
services ↑

arrythmias, ischemia

social
reintegration ↓

death

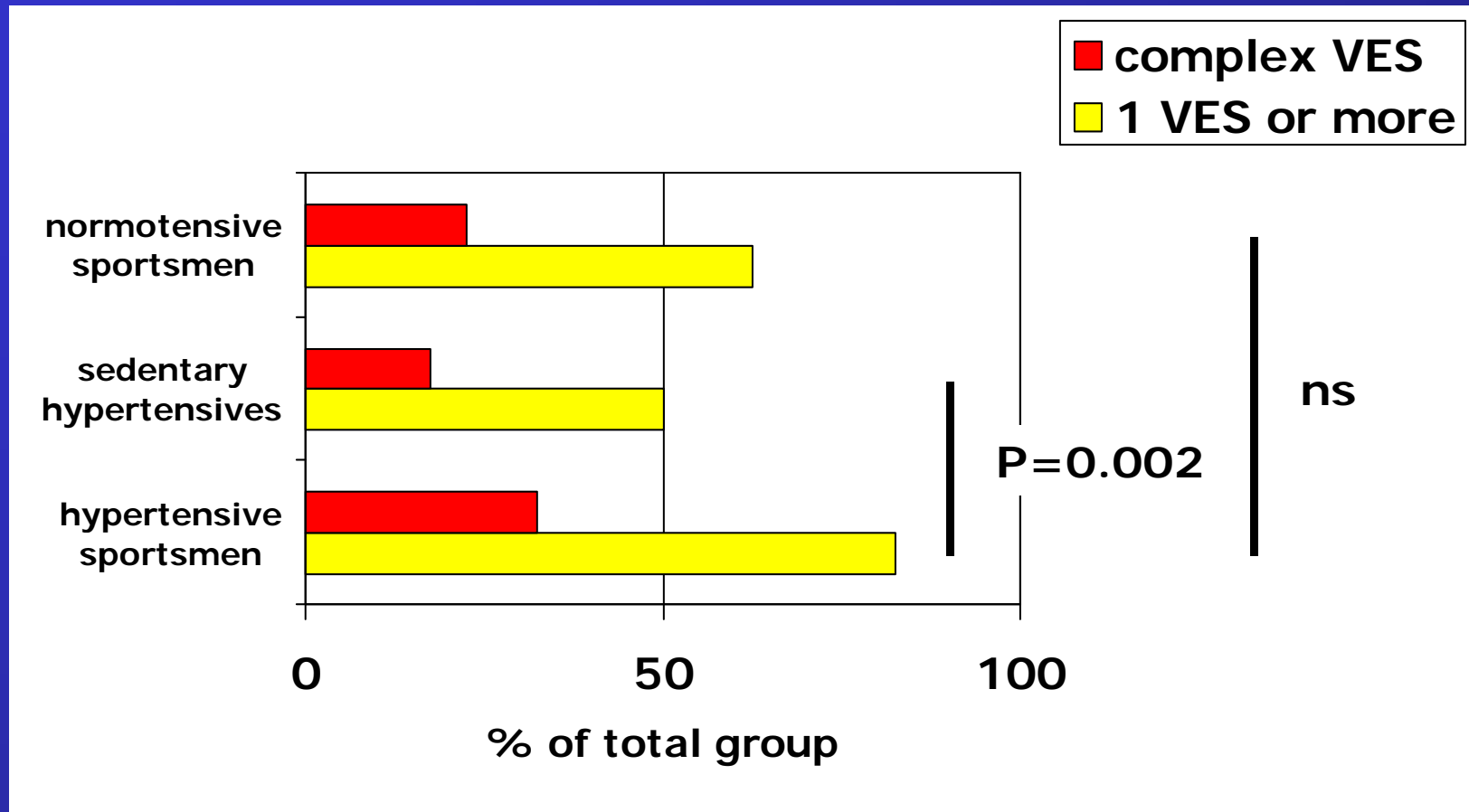
Conclusion I

- ECG-monitoring may improve self-confidence and reduce anxiety of patients

Conclusion II

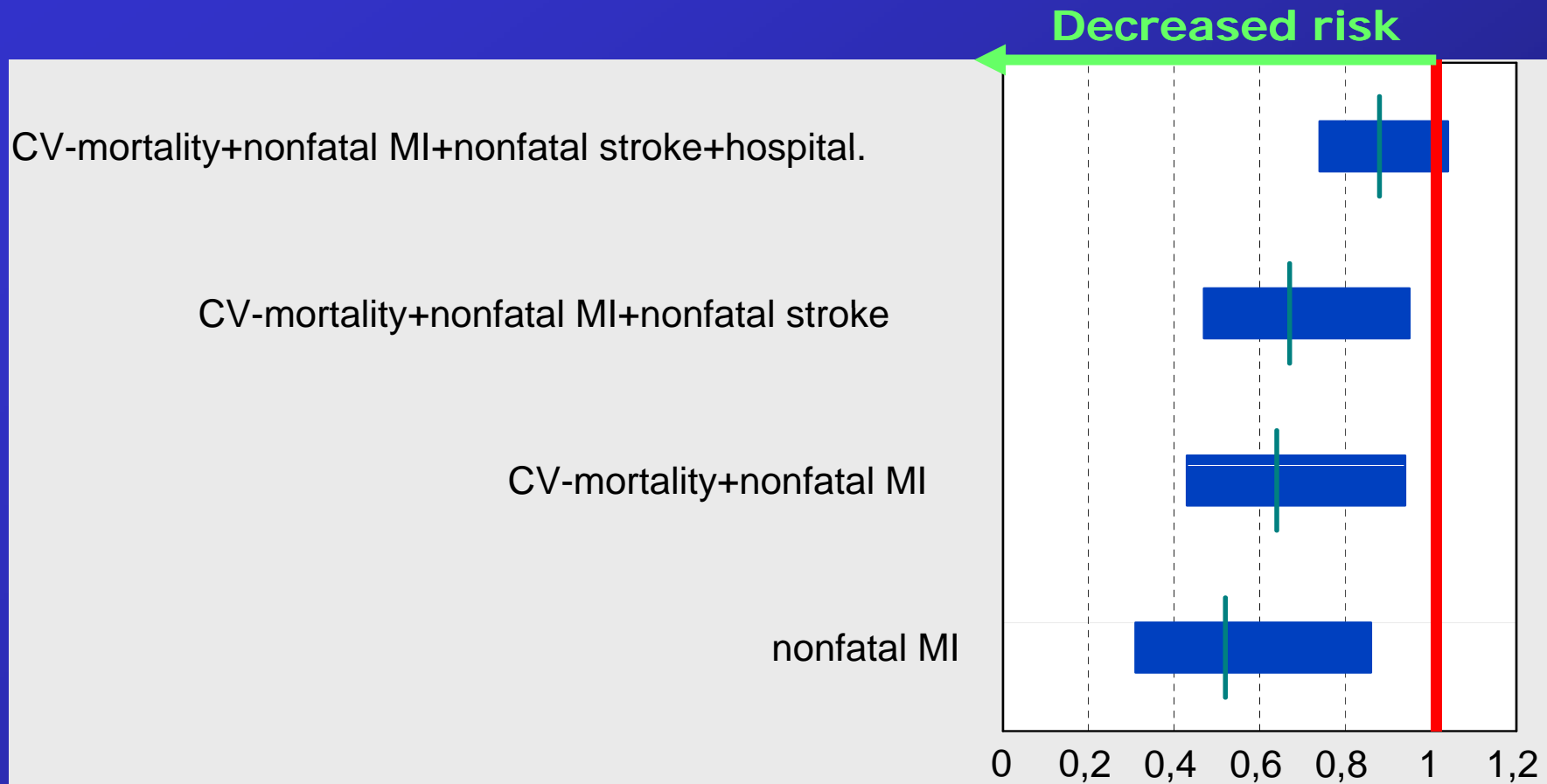
- Lower anxiety and higher self-confidence of the patient may help to improve the adherence to regular exercise training after rehabilitation and thereby
- improve the clinical course by lowering long-term cardiovascular risk
- **Randomized studies are encouraged**

Ventricular ectopic activity in hypertensive subjects



n= 40 for each group

Long-term rehabilitation after AMI



**3-years multifactorial educational/behavioral program, RCT, intervention
n=1.620, control n=1.621; end point events n= 556 (17.2%)**