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# Angio-Guided vs. FFR-Guided PCI in Stable CAD

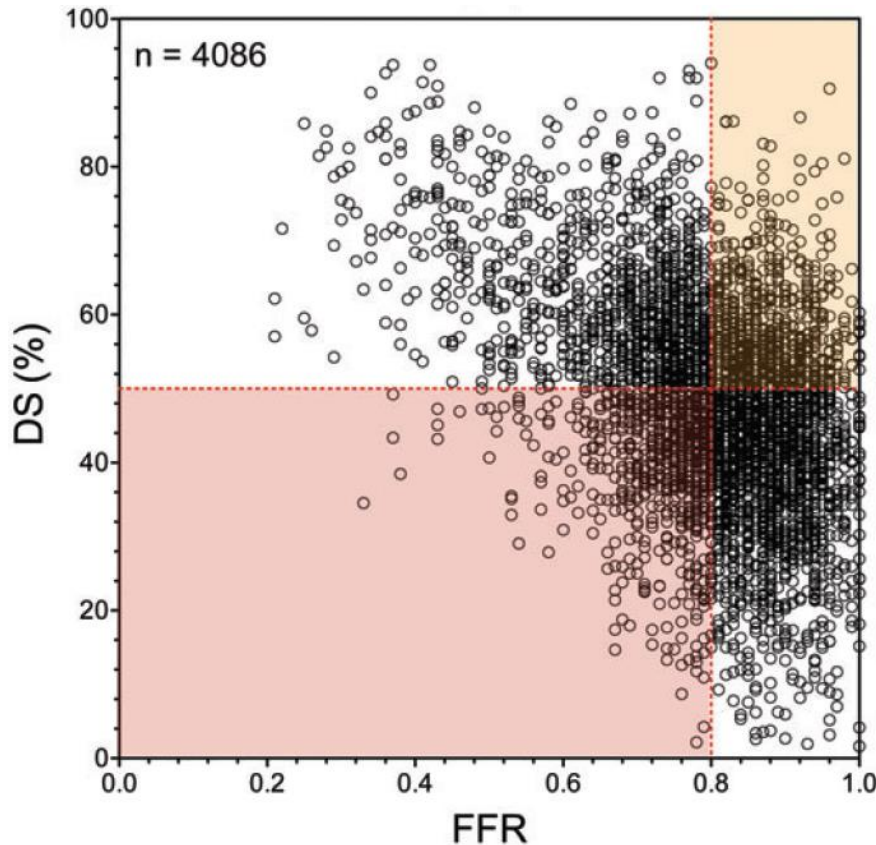
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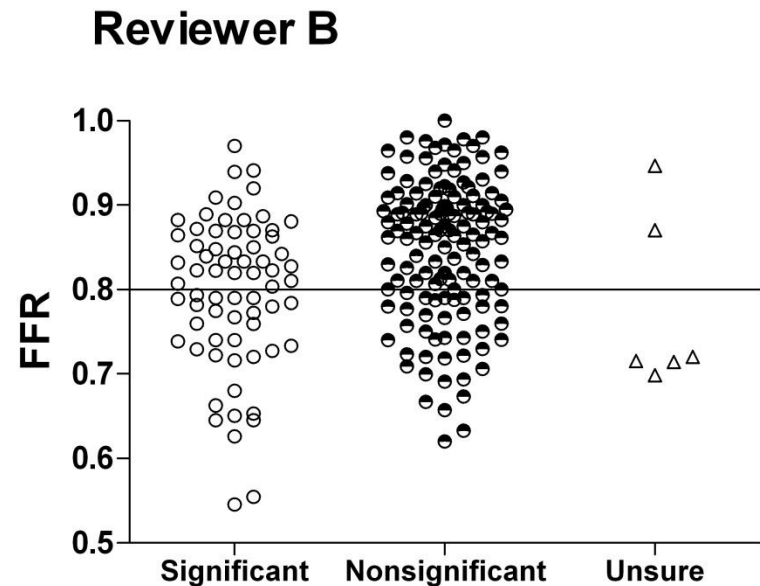
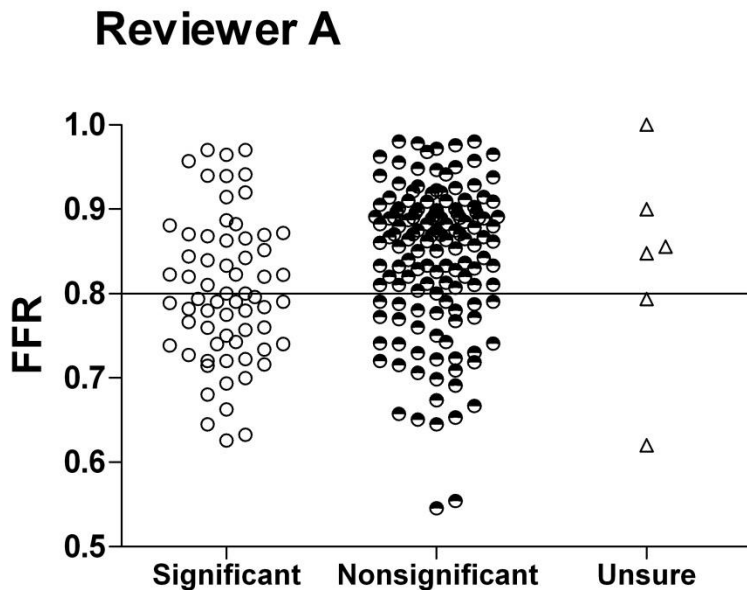
# Why should we perform coronary physiologic lesion assessment?

*Poor correlation between angiographic diameter stenosis and FFR in 4,086 lesions*



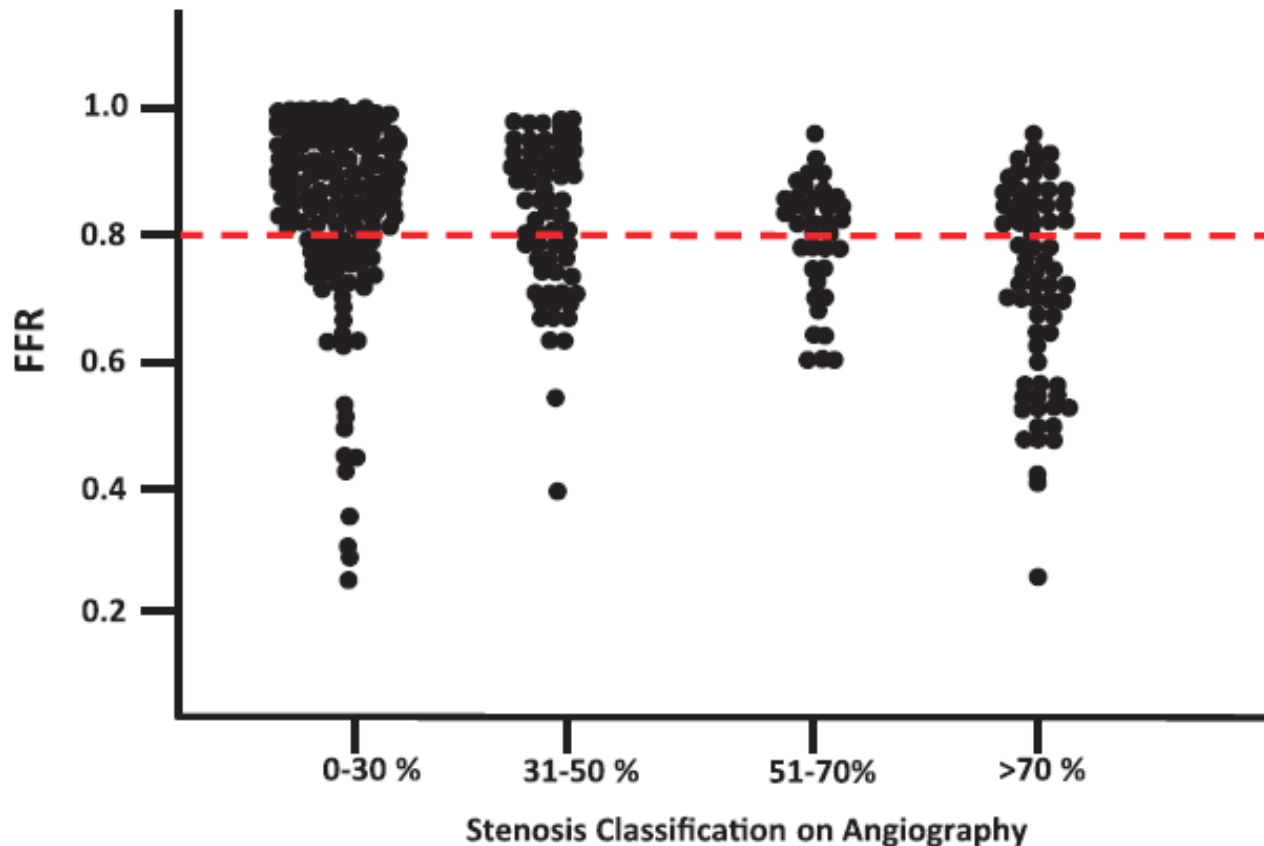
# Assessing Left Main Significance

*Poor correlation between “expert angiographer” and FFR*



# Angiography can be Misleading

*200 stable patients referred for coronary angiography underwent routine FFR in all patent vessels.*



# Frequency of Stress Testing to Document Ischemia Prior to Elective Percutaneous Coronary Intervention

Grace A. Lin, MD, MAS

**Context** Guidelines call for documenting ischemia in patients with stable coronary

In the United States, 44.5% (n=10,629) of patients underwent stress testing within the 90 days prior to elective PCI...

**I**N THE UNITED STATES, PERCUTANEOUS coronary intervention (PCI) has become a common treatment strategy for patients with stable coronary artery disease (CAD) and such patients now account for the majority of PCIs performed.<sup>1,2</sup> However, multiple studies have established that some important outcomes for patients with stable CAD (death and risk of future myocardial infarction) do not differ between patients treated with PCI plus optimal medical therapy and patients treated with optimal medical therapy alone.<sup>3-10</sup> The addition of PCI does offer quicker relief of angina than medical therapy alone but also carries an increased risk of repeat revascularization, late-stent thrombosis, and a decreased

**Objective** To determine the frequency and predictors of stress testing prior to elective PCI in a Medicare population.

**Design, Setting, and Patients** Retrospective, observational cohort study using claims data from a 20% random sample of 2004 Medicare fee-for-service beneficiaries aged 65 years or older who had an elective PCI (N=23 887).

**Main Outcome Measures** Percentage of patients who underwent stress testing within 90 days prior to elective PCI; variation in stress testing prior to PCI across 306 hospital referral regions; patient, physician, and hospital characteristics that predicted the appropriate use of stress testing prior to elective PCI.

**Results** In the United States, 44.5% (n=10 629) of patients underwent stress testing within the 90 days prior to elective PCI. There was wide regional variation among the hospital referral regions with stress test rates ranging from 22.1% to 70.6% (national mean, 44.5%; interquartile range, 39.0%-50.9%). Female sex (adjusted odds ratio [AOR], 0.91; 95% confidence interval [CI], 0.86-0.97), age of 85 years or older (AOR, 0.83; 95% CI, 0.72-0.95), a history of congestive heart failure (AOR, 0.85; 95% CI, 0.79-0.92), and prior cardiac catheterization (AOR, 0.45; 95% CI, 0.38-0.54) were associated with a decreased likelihood of prior stress testing. A history of chest pain (AOR, 1.28; 95% CI, 1.09-1.54) and black race (AOR, 1.26; 95% CI, 1.09-1.46) increased the likelihood of stress testing prior to PCI. Patients treated by physicians performing 150 or more PCIs per year were less likely to have stress testing prior to PCI (AOR, 0.84; 95% CI, 0.77-0.93). No hospital characteristics were associated with receipt of stress testing.

**Conclusion** The majority of Medicare patients with stable coronary artery disease do not have documentation of ischemia by noninvasive testing prior to elective PCI.

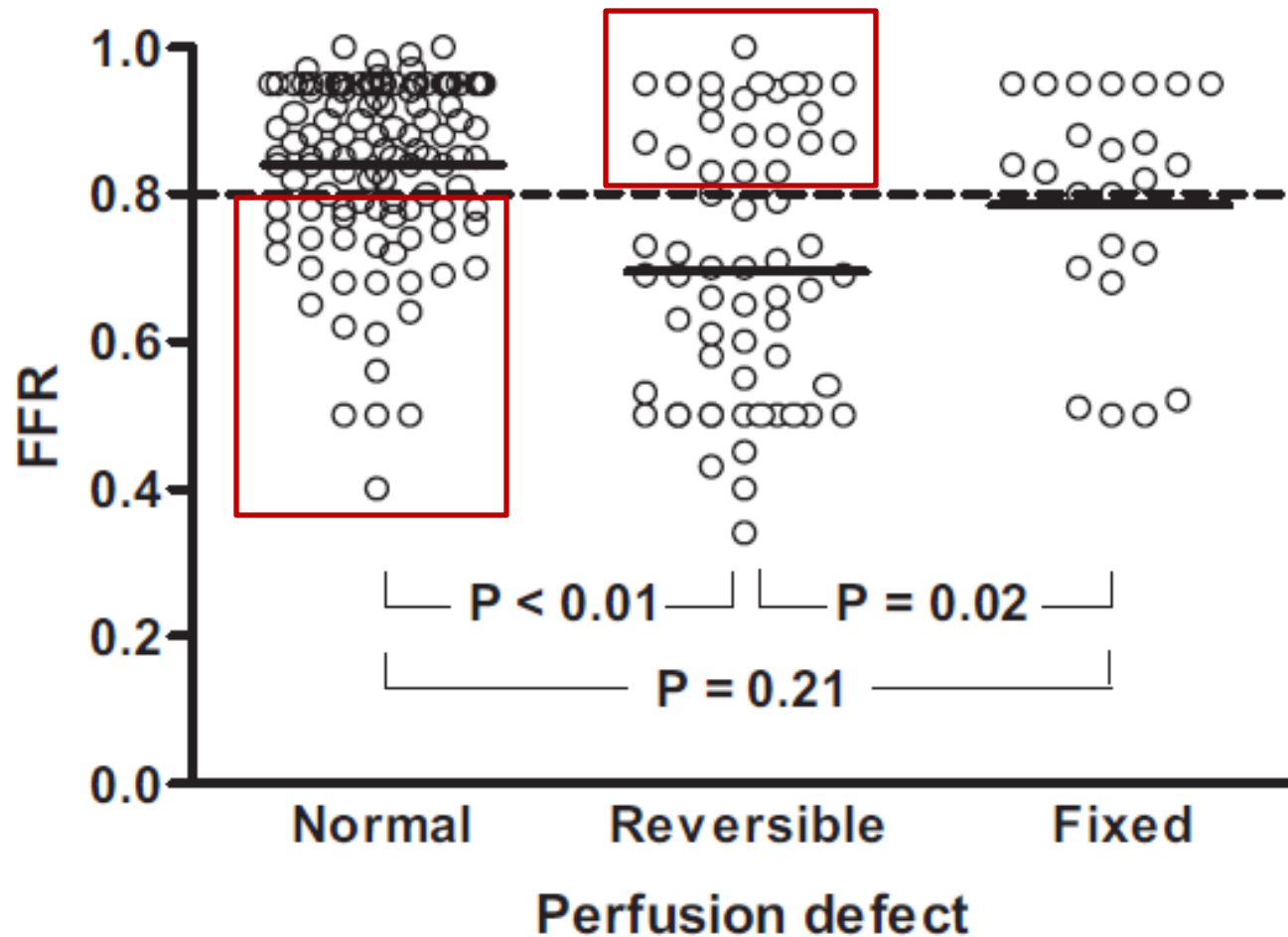
*JAMA*. 2008;300(15):1765-1773

[www.jama.com](http://www.jama.com)



# FFR vs. Nuclear Perfusion Scan in MVD

*67 patients with angiographic 2 or 3 vessel CAD*



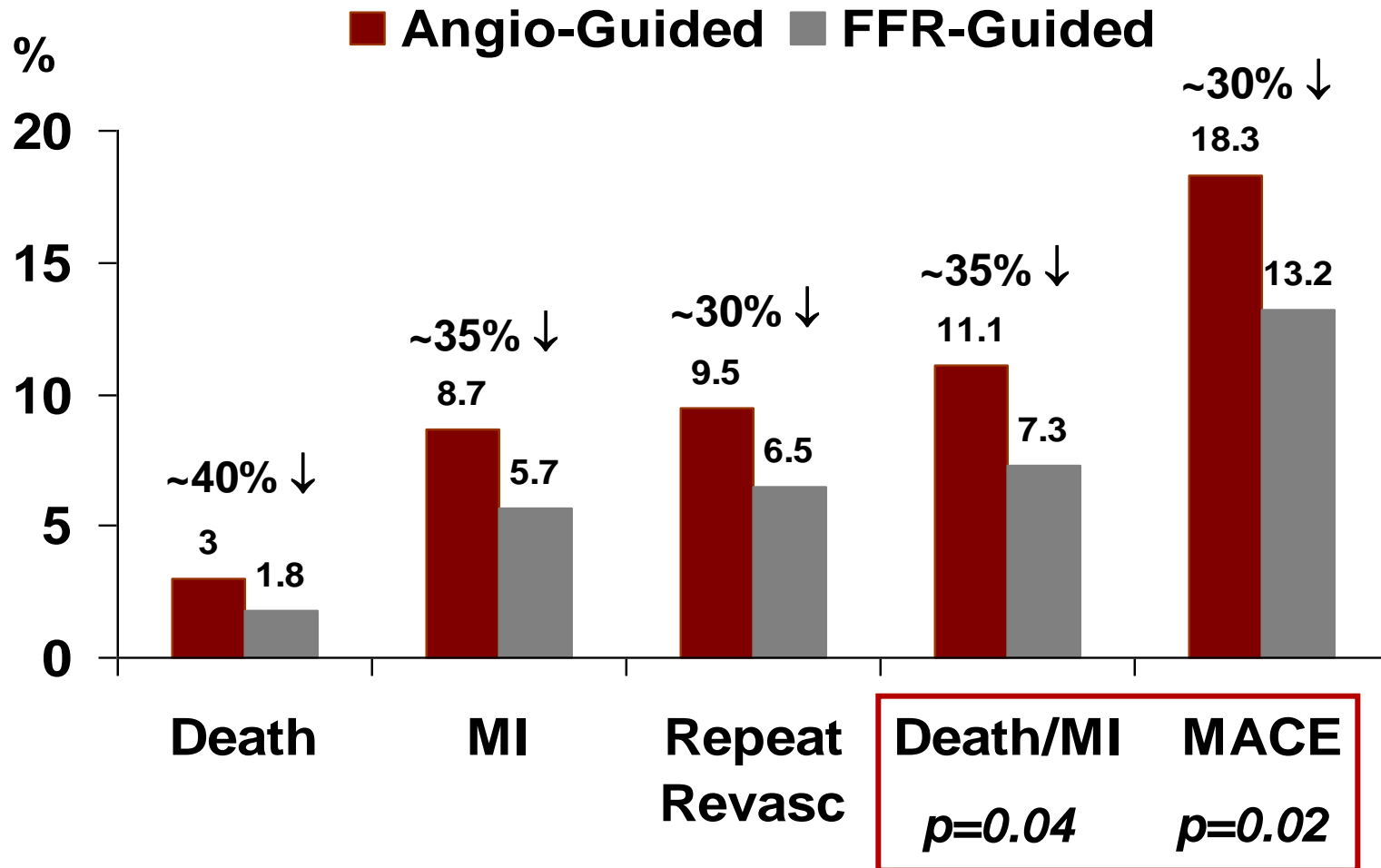
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# Routine Coronary Physiologic Lesion Assessment Improves Outcomes



# FAME 1 Study: One Year Outcomes

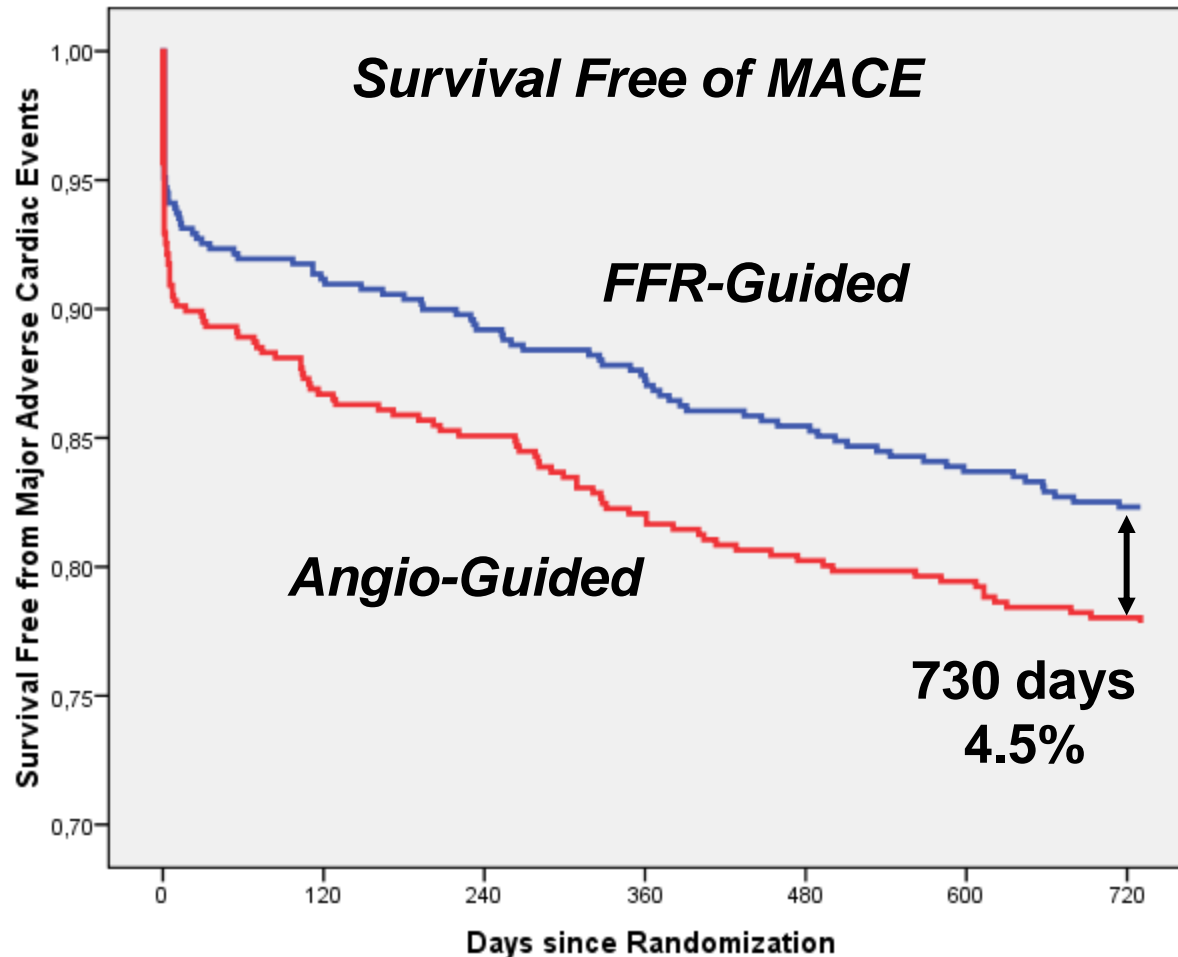
1,005 patients with multivessel CAD randomized to FFR or Angio-guided PCI





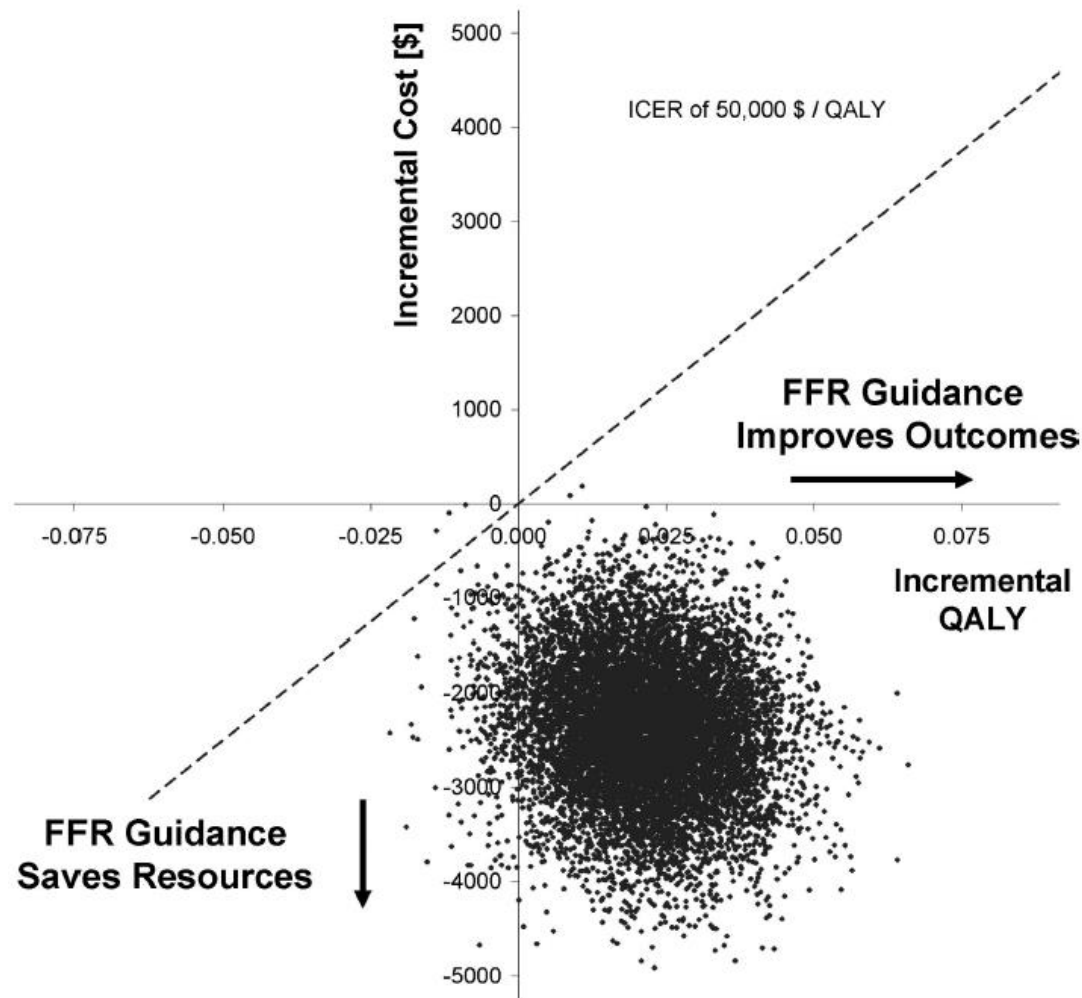
# FAME Study: Two Year Outcomes

*Death/MI was significantly reduced from 12.9% to 8.4% (p=0.02)*



# FAME: Economic Evaluation

## *Bootstrap Analysis*

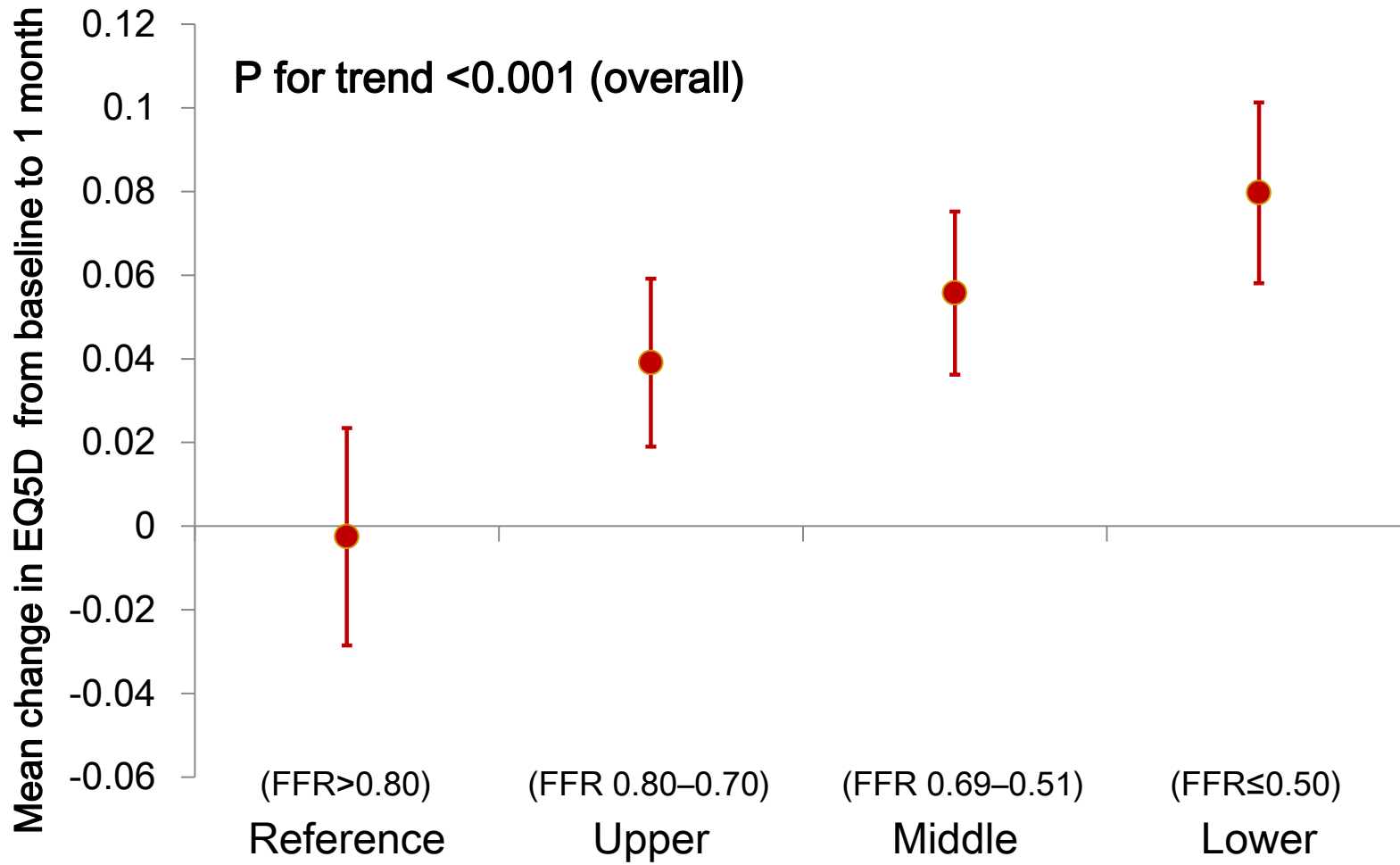


***FFR-guided PCI saved >\$2,000 per patient at one year compared to Angio-guided PCI***



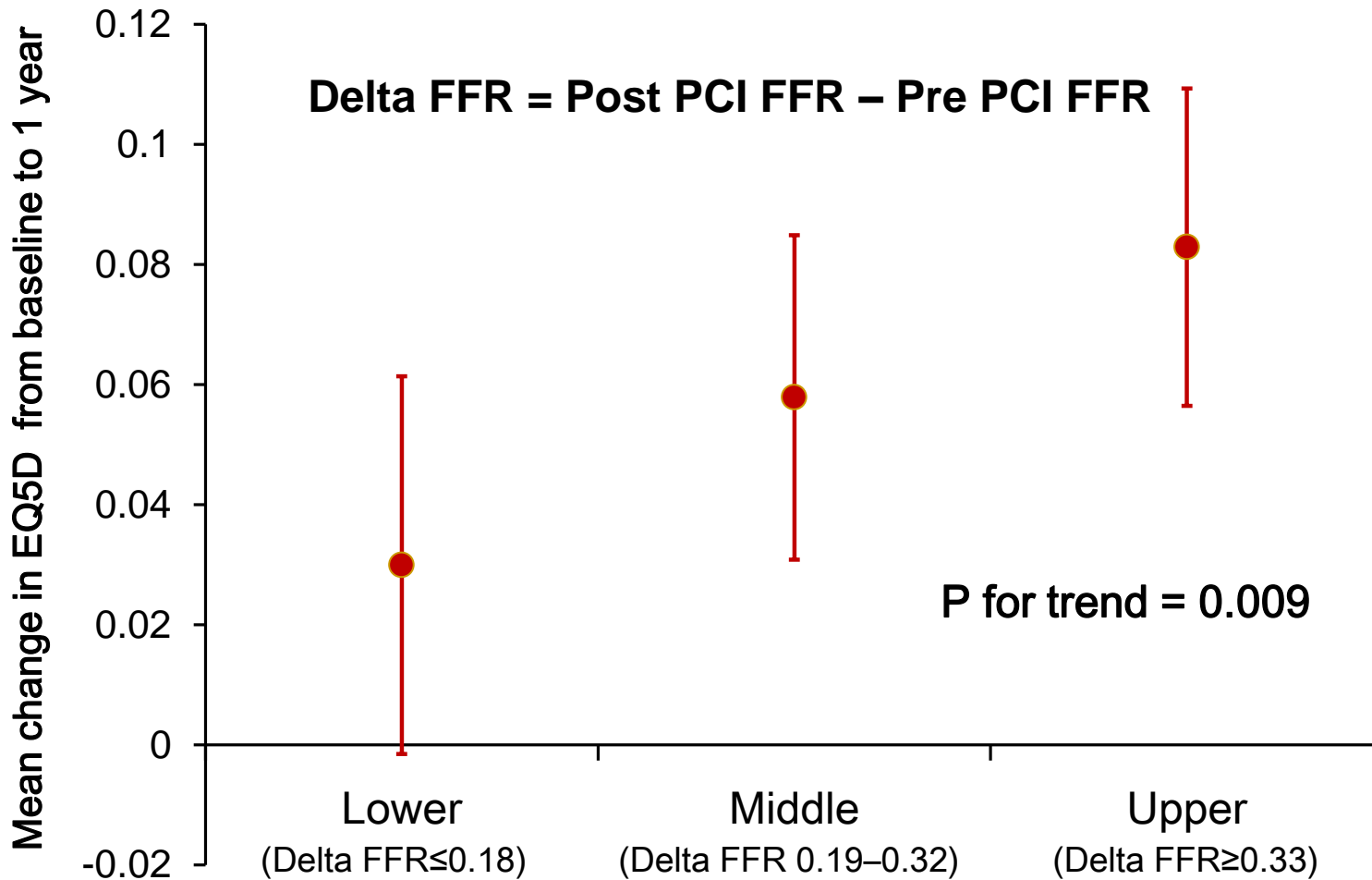
# FFR Predicts Quality of Life

*706 stable patients treated with PCI in FAME 1 and FAME 2*



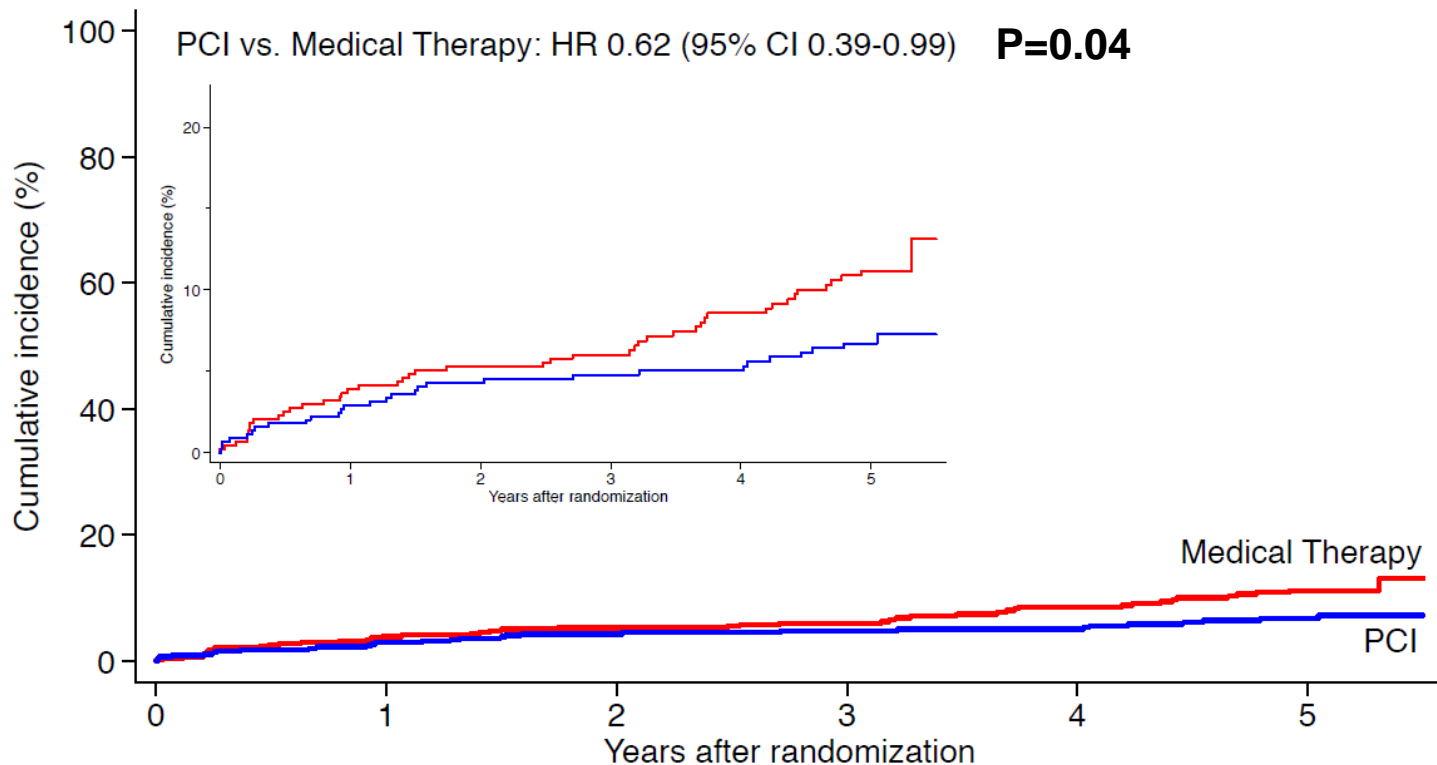
# FFR Predicts Quality of Life

*706 stable patients treated with PCI in FAME 1 and FAME 2*



# FAME 2: Five Year Follow-Up

## Five Year Rate of Spontaneous Myocardial Infarction



No. at risk

Medical Therapy

441

415

405

394

319

306

PCI

447

428

416

405

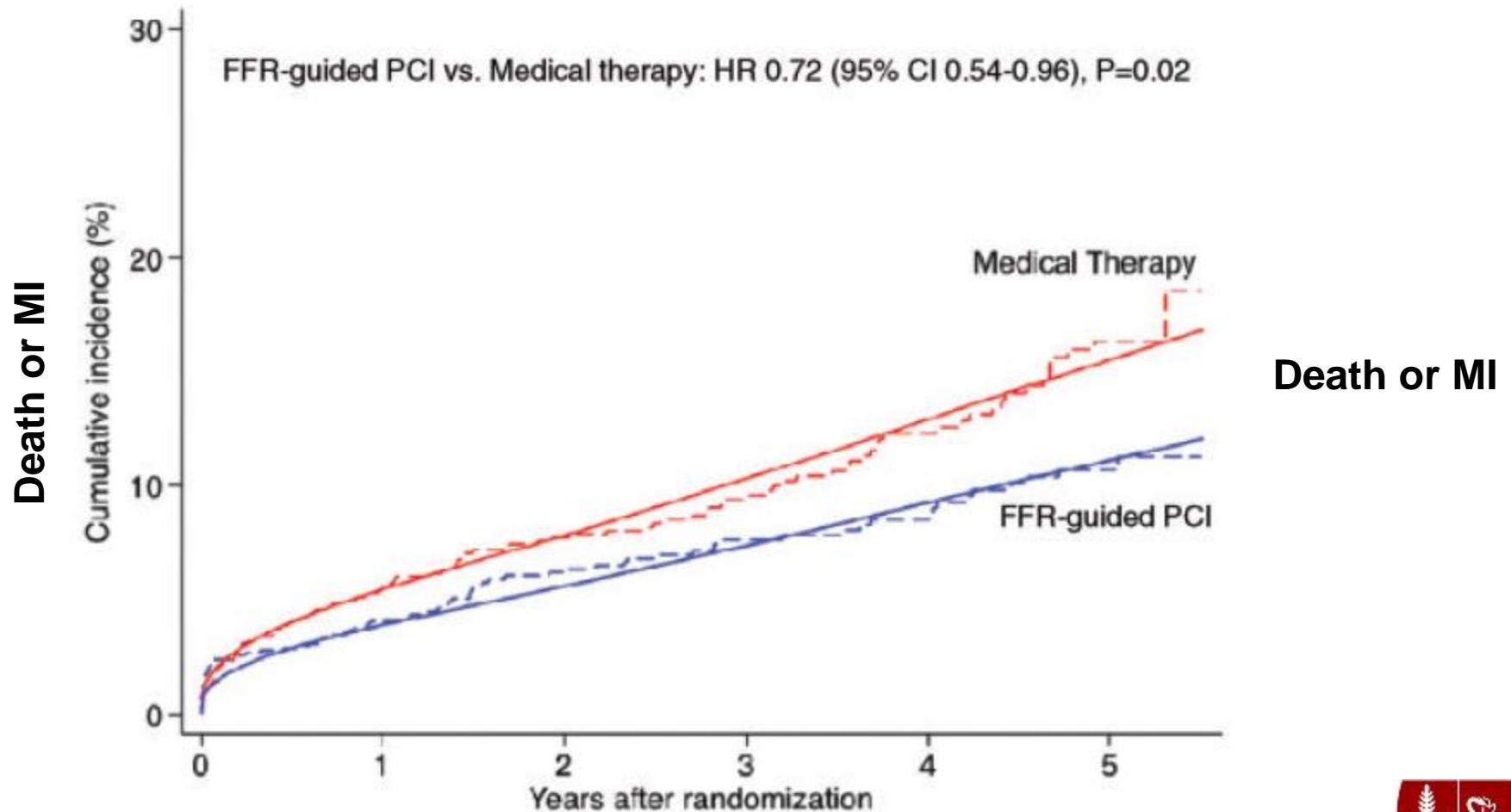
345

333



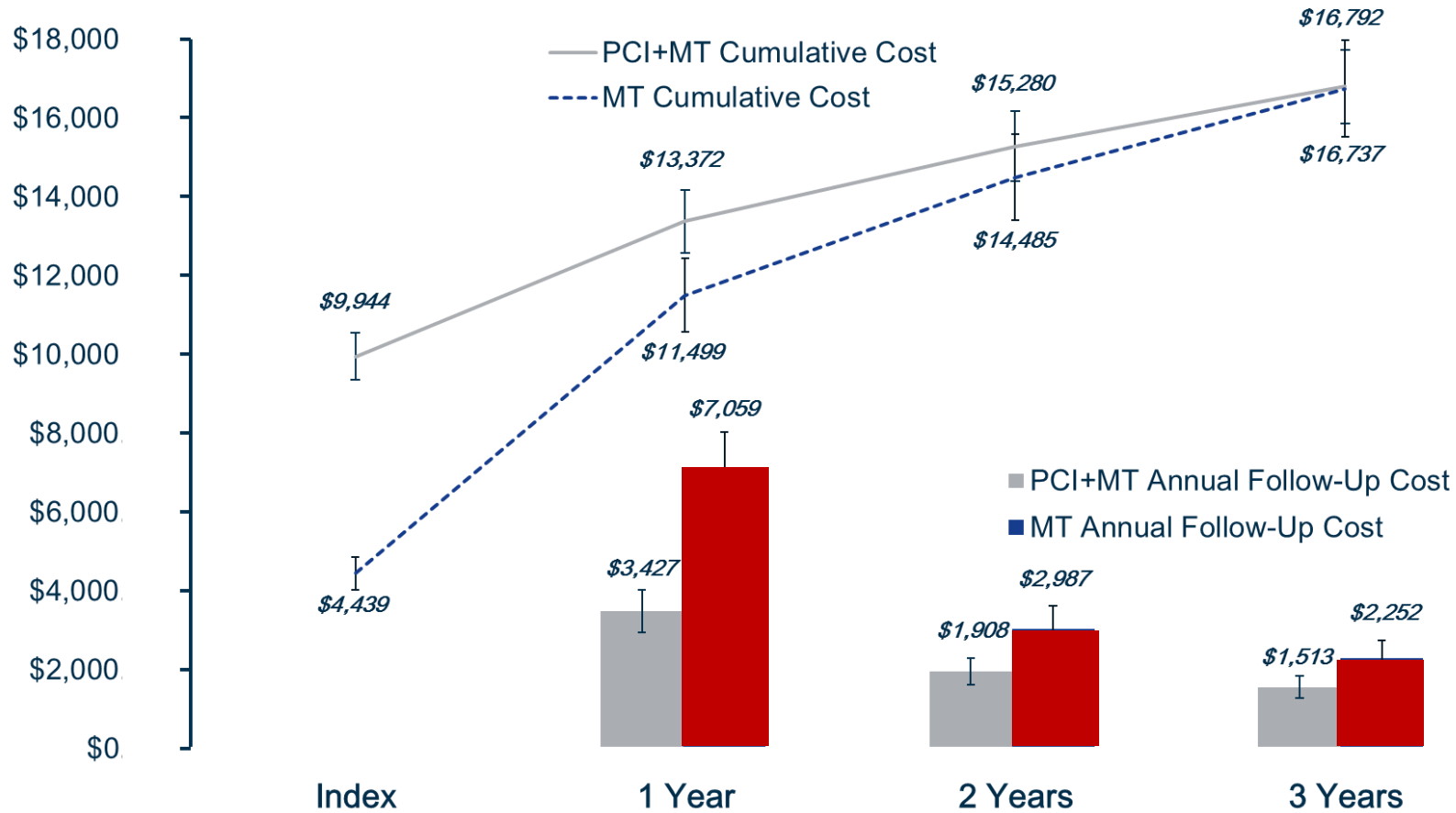
# Meta-Analysis of FFR-Guided PCI

*2,400 patients with stable (or stabilized) CAD from 3 randomized trials comparing FFR-guided PCI with medical therapy*



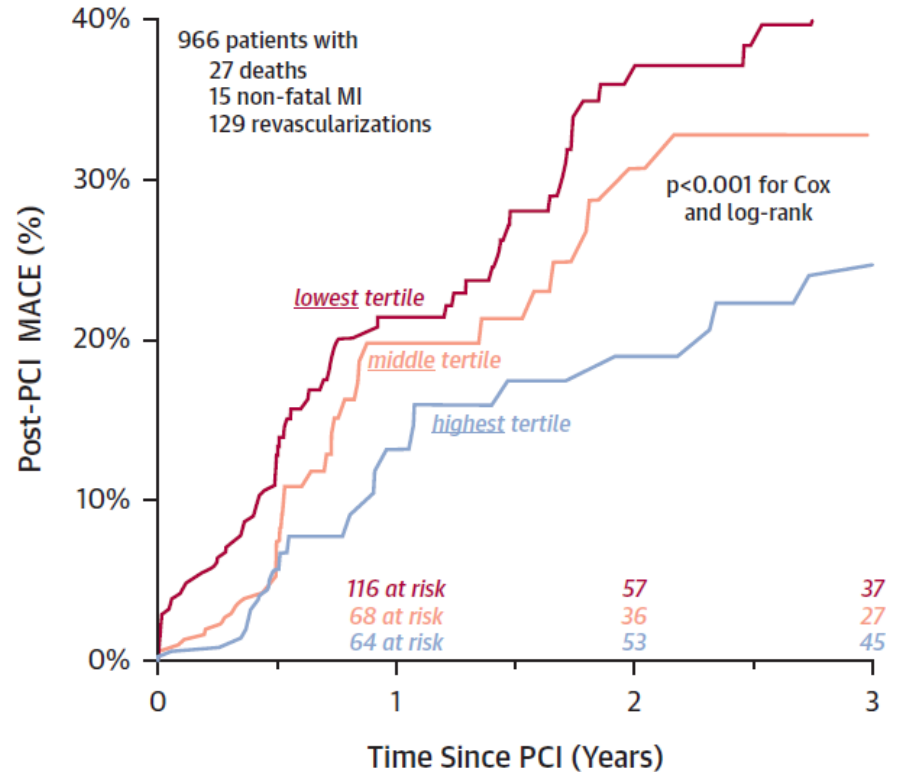
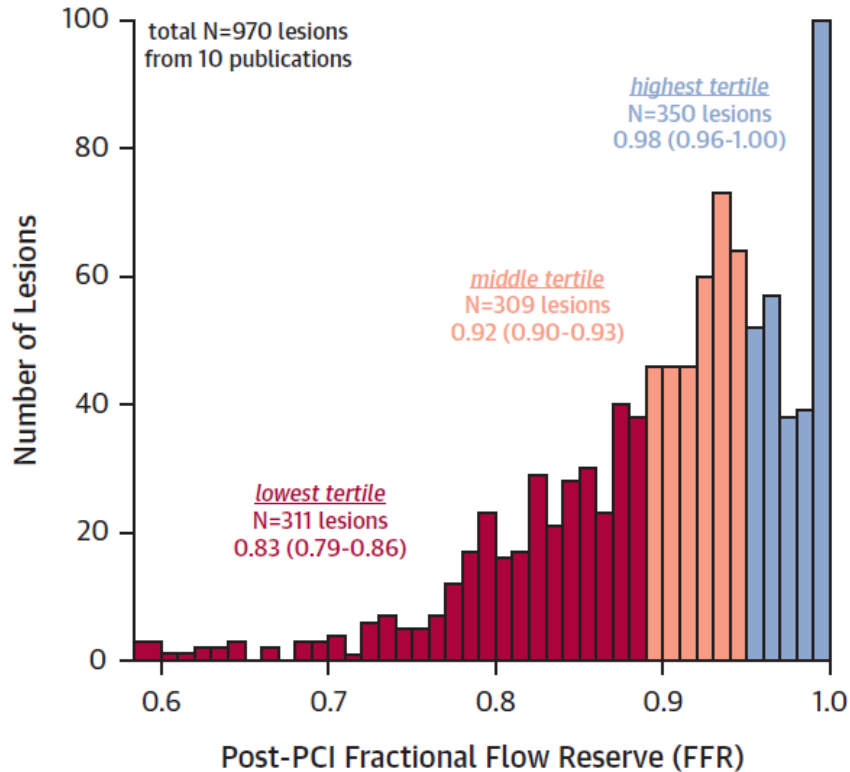
# FAME 2: Three Year Outcomes

## Cost Differences over Three Year Follow-up



# Value of Post PCI FFR

**Meta-analysis of 10 publications (966 patients) with post PCI FFR and F/U**





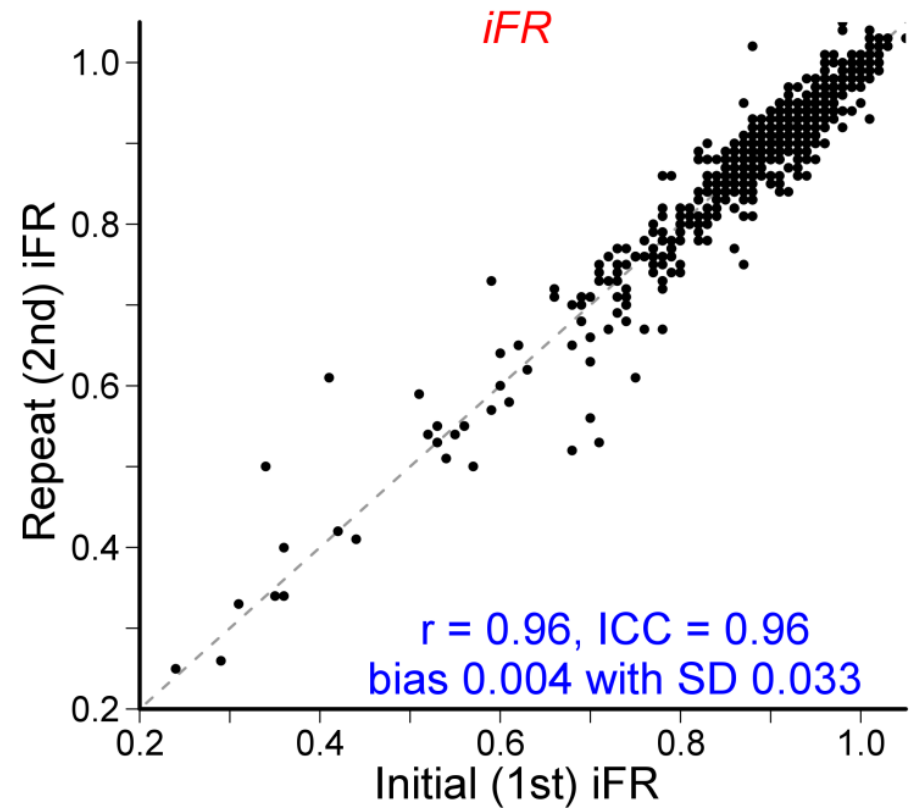
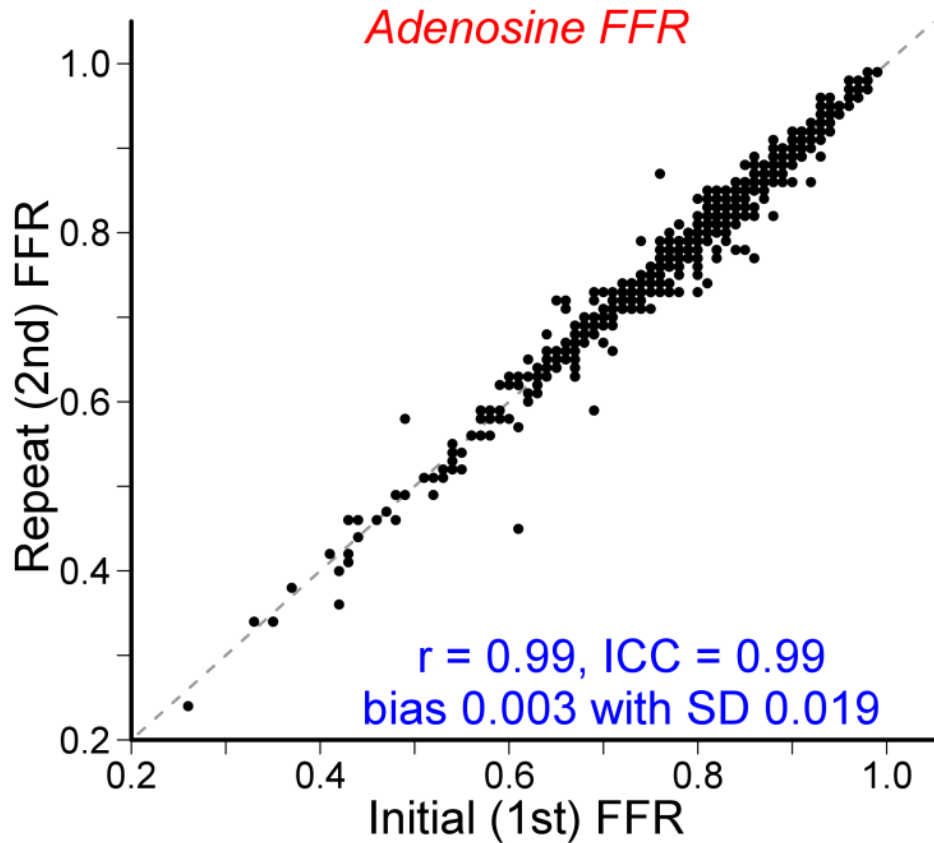
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**Why wouldn't you perform  
coronary physiologic lesion  
assessment?**



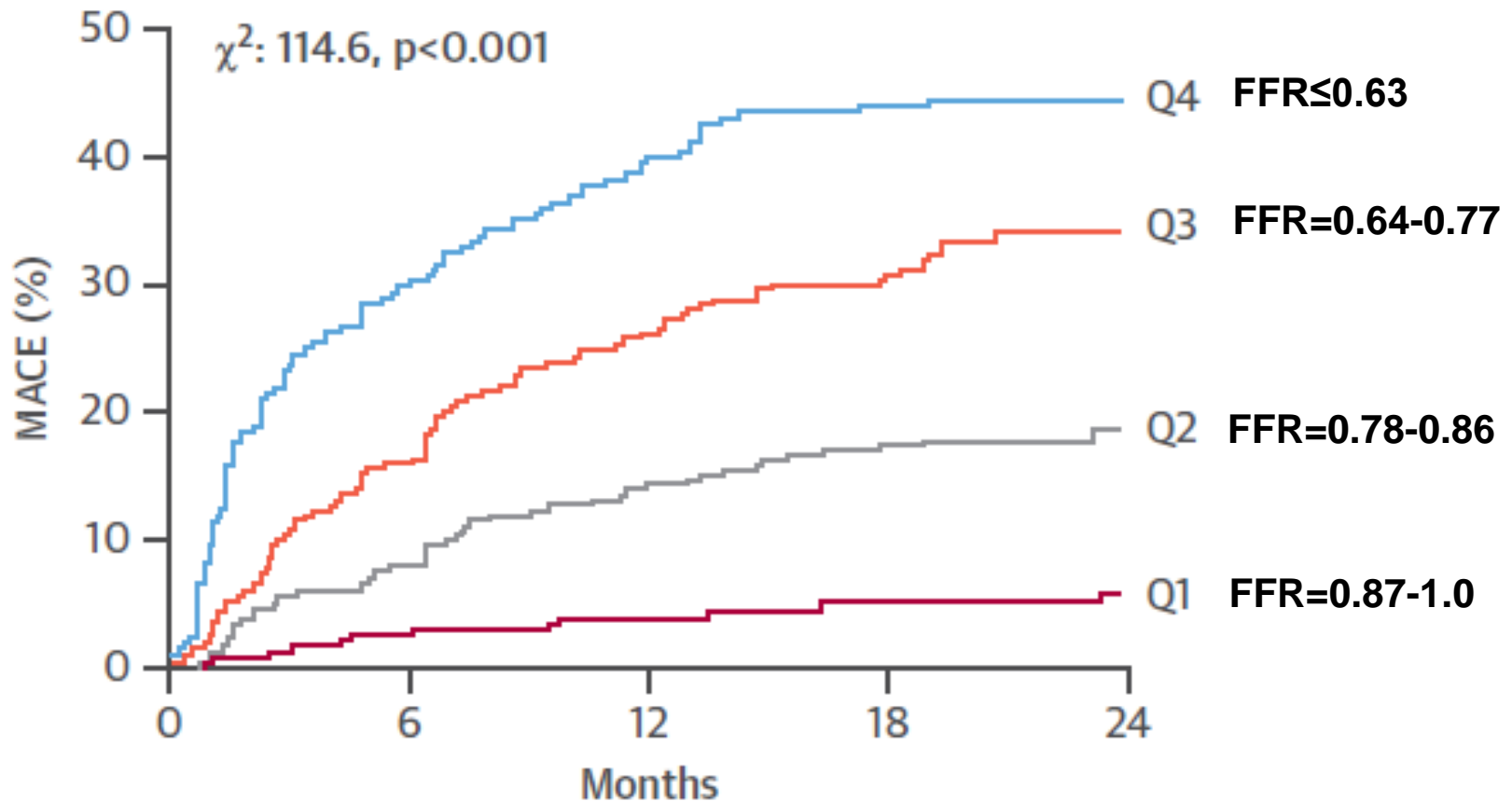
# FFR is not Reproducible?

*FFR and iFR measured in duplicate in 763 patients from the CONTRAST trial*



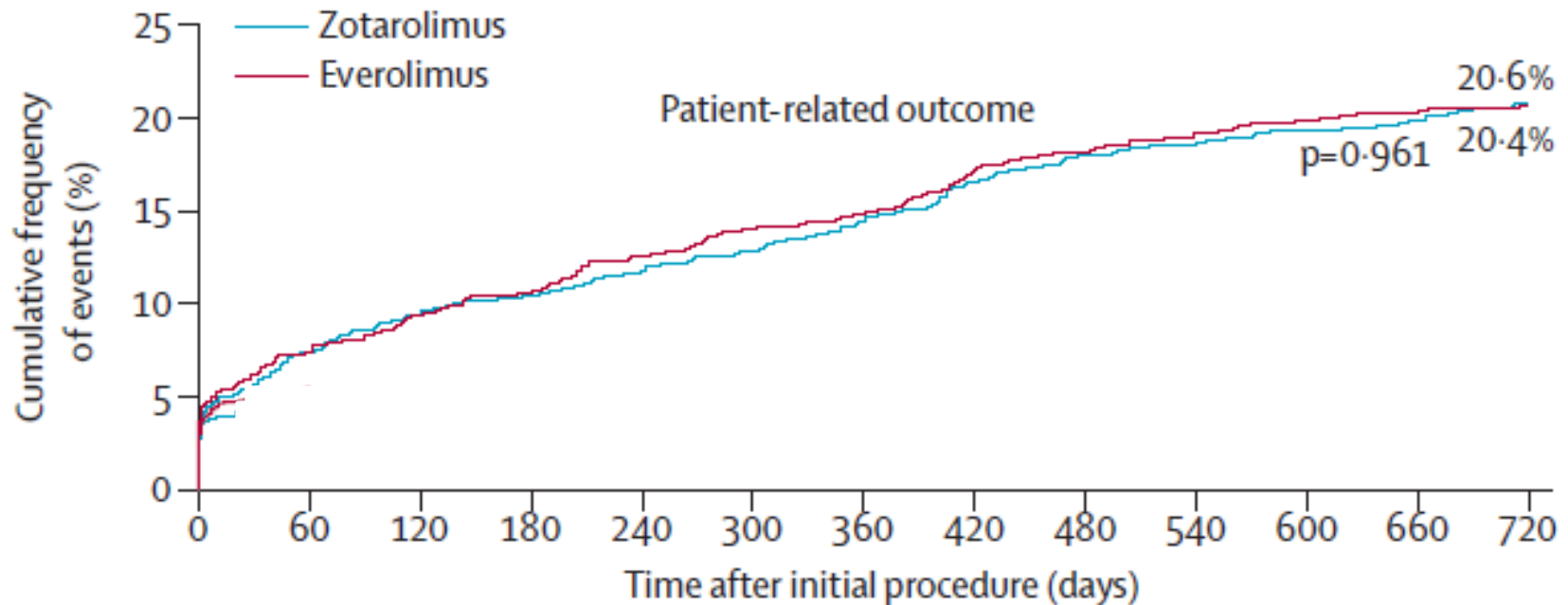
# Relationship between FFR and MACE

*607 medically treated patients in FAME 2*



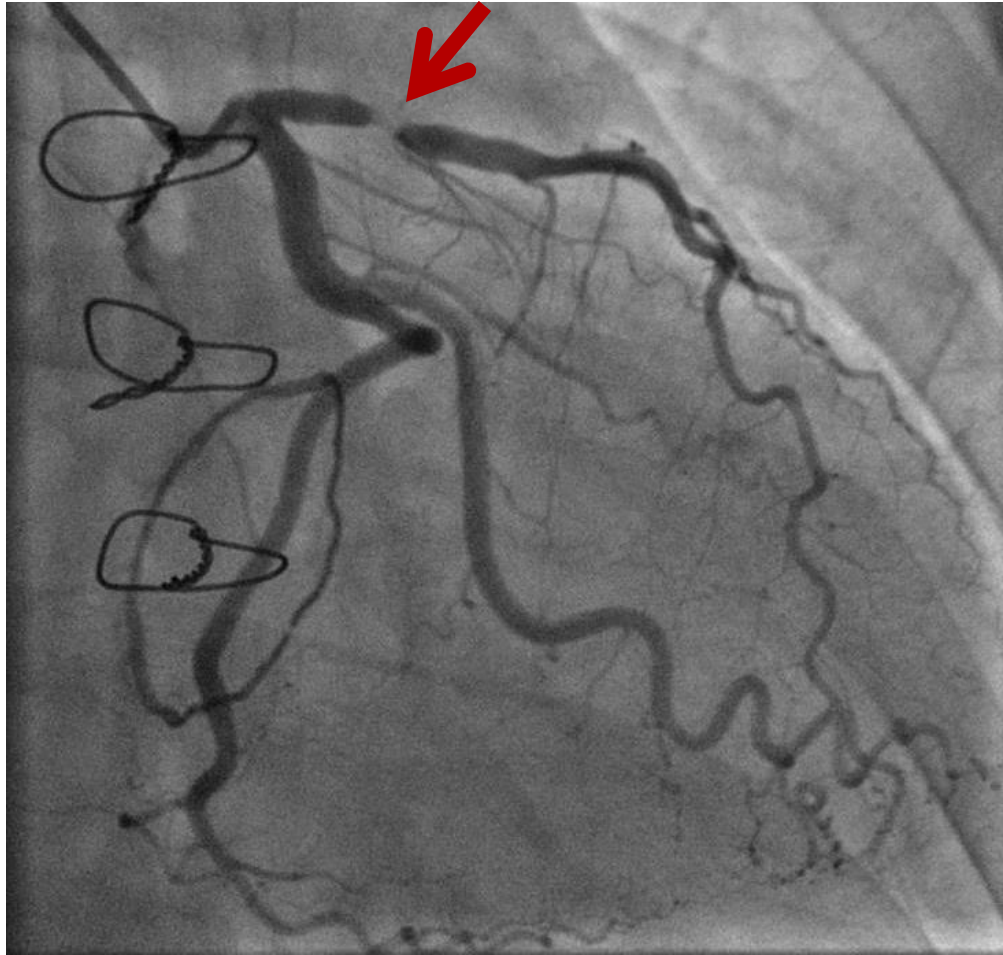
# Real World Angiography-Guided PCI

*Two year rate of death, MI, and revascularization in 2,292 patients treated with current generation DES*



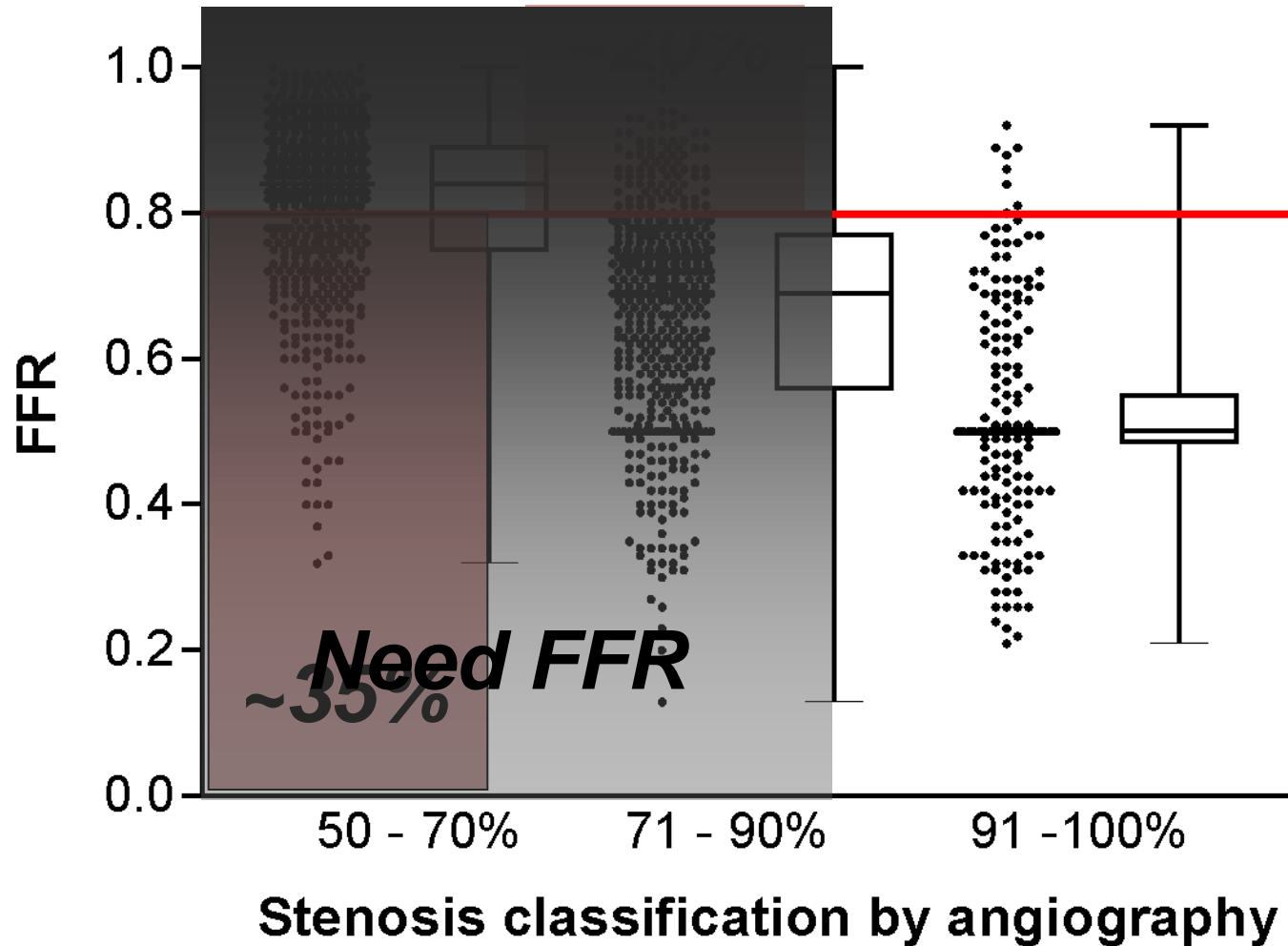
# In whom shouldn't we do FFR?

*42 yo man with chest pain and anterior ischemia on stress echo*



# Which Lesions Need FFR?

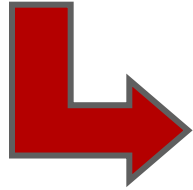
*1329 lesions in the FFR-guided arm*



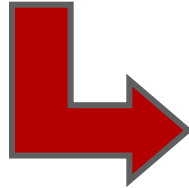
# In whom shouldn't we do FFR?

## *Culprit vessel of a STEMI*

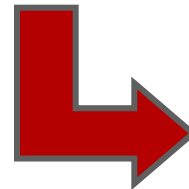
*STEMI*



*Variable Degree of  
Reversible Microvascular  
Stunning*



*Maximum Achievable  
Flow is Less*



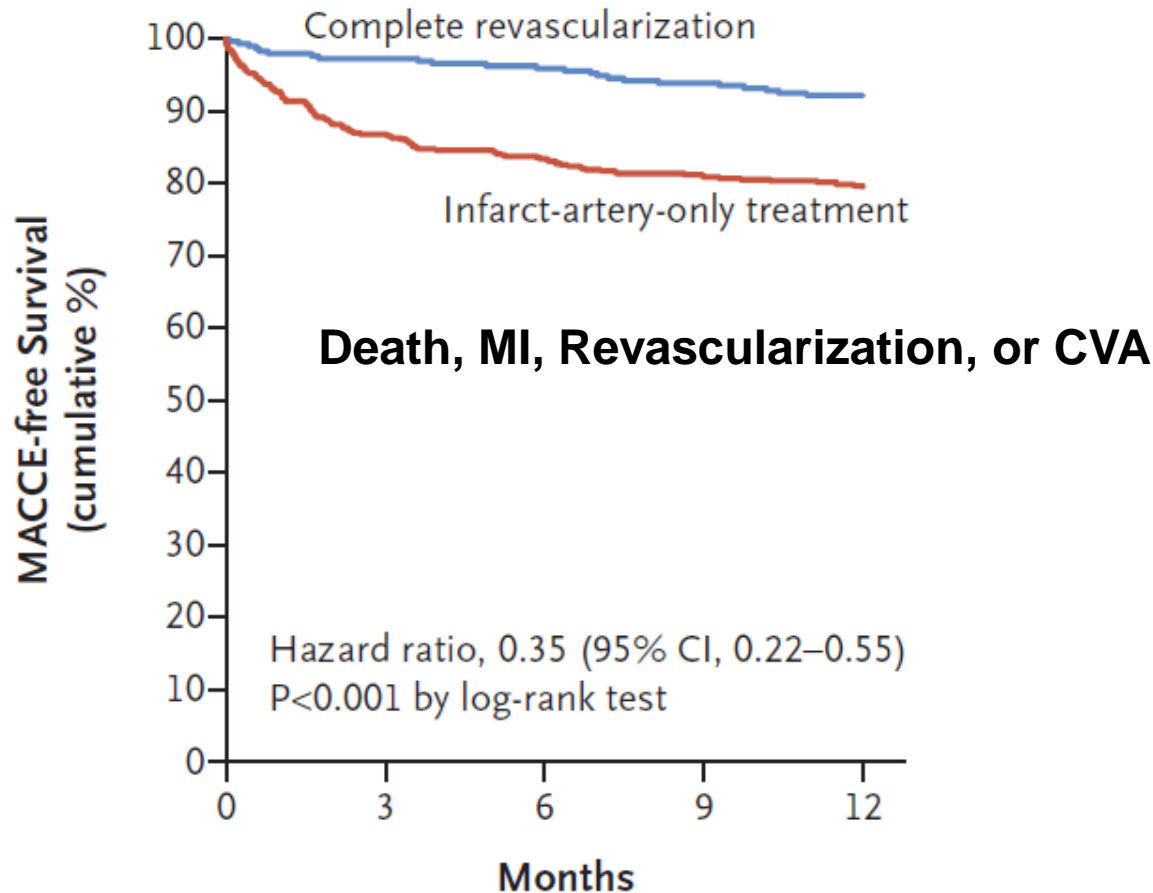
*Smaller Gradient and  
Higher FFR across  
Any Given Stenosis*

*With time, the microvasculature may recover, maximum achievable flow may increase, and a larger gradient with a lower FFR may be measured across a given stenosis*



# COMPARE-ACUTE Trial

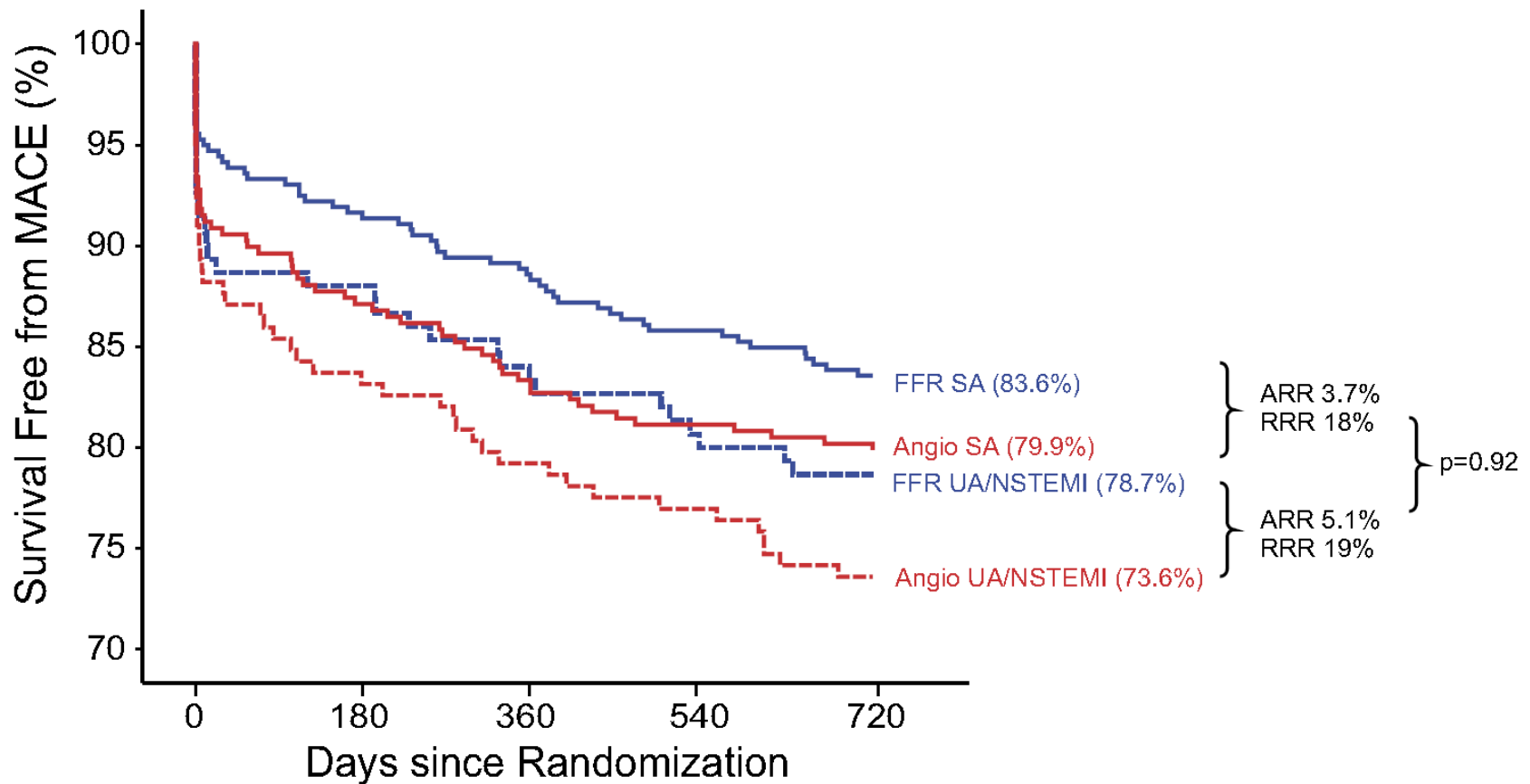
**885 patients with STEMI and MVD randomized in 2:1 fashion to culprit only PCI or to FFR-guided complete revascularization**





# FFR NSTE ACS (Culprit + Non Culprit Vessel)

## Comparison of MACE in FAME patients with and without ACS



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# Is Physiologic Lesion Assessment Mandatory in Every PCI?

- FFR is useful in a broad range of patients:
  - Intermediate single vessel CAD
  - Almost all multivessel CAD patients
  - ACS patients (except the culprit vessel in the acute setting of STEMI)
  - After PCI to predict outcome



# When Shouldn't We FFR?

- Patient with typical angina and ischemia on non-invasive testing in a region supplied by a vessel with an angiographically high grade lesion
- Culprit vessel of a STEMI in the acute phase
- If the FFR result is not going to change your treatment plan

