Osteoarthritis

perspectives of need

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presentation roadmap

- what do we know about OA?
- what do we need to treat?
- when do we need to treat?
- who do we need to treat?
- what do we need to get there?

what do we know about OA?

- by far the most common joint disease
- accounts for more functional limitation & disability than any other chronic disease among the elderly
- most common indication for total joint replacement
- costs ~ 2% of GNP in developed countries
- patients often have co-morbid medical conditions
- associated w. significant excess mortality
- modest efficacy of symptom-modifying therapy
- no disease-modifying therapy

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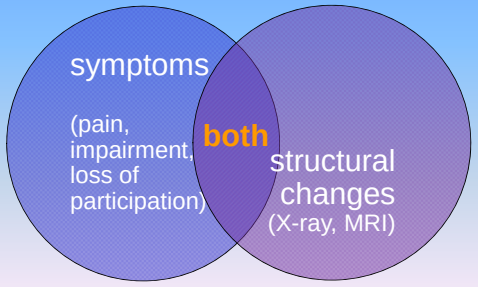
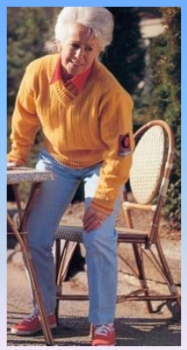
should we treat …
or should we treat…?



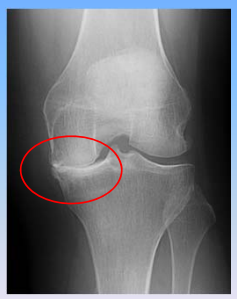
should we treat

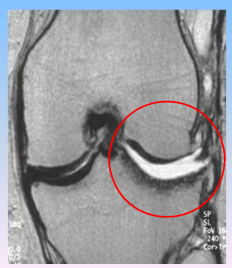


- symptoms: persistent knee pain, limited morning stiffness, function impairment
- findings: crepitus, restricted movement, bony enlargement
- ROA probability 99%

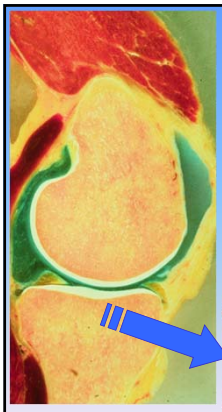
Zhang et al. EULAR evidence based recommendations for the diagnosis of knee osteoarthritis. Ann Rheum Dis 2010

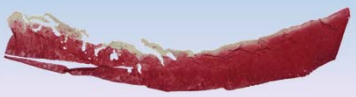
should we treat





should we treat





knee without OA

when does the ”real” OA begin?

knee with OA

we need primary endpoint(s) for use in dmoad trials

- cartilage (or other joint tissue) volume, quality?
- **p**atient **r**eported **o**utcome of pain, function, qol?
- delayed requirement for surgery (perceived)
- delayed requirement for surgery (the real thing)

Scandinavian Simvastatin Survival Study (4S)

The Lancet, Vol 344, November 19, 1994

Objectives

- Randomized trial of cholesterol lowering in 4,444 patients with CAD: The Scandinavian Simvastatin Survival Study.
- To investigate whether long-term simvastatin therapy reduces total mortality and coronary events in post-MI and or angina patients with total cholesterol between 212-309 mg/dL.

The Lancet, Vol 344, November 19, 1994

Design

- Double-blind, randomized, placebo-controlled
  - 94 centers in 5 countries
  - 4,444 men and women 35 to 70 years of age
  - Inclusion Criteria: Prior MI and/or angina pectoris
  - Total Cholesterol: 212-309 mg/dL
  - Follow-up: until 440 deaths occurred.

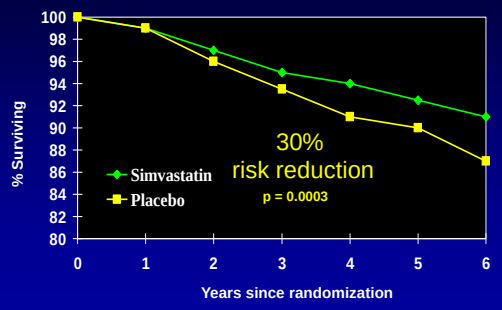
The Lancet, Vol 344, November 19, 1994

Endpoints

- Primary: Total Mortality
- Secondary: Major adverse coronary events
  - Coronary deaths
  - Nonfatal MIs
- Tertiary: Effect on:
  - PTCA/CABG procedures
  - Survival without atherosclerotic event (event-free survival)
  - Any coronary event
  - Non-MI acute CHD events

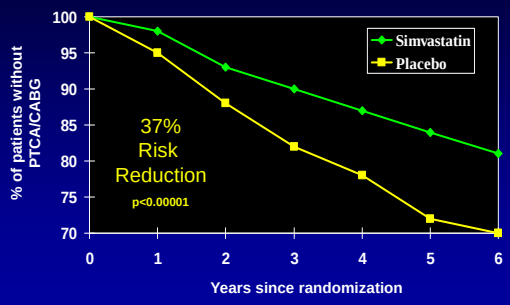
The Lancet, Vol 344, November 19, 1994

Primary Endpoint: Overall Survival



The Lancet, Vol 344, November 19, 1994

PTCA/CABG procedures



The Lancet, Vol 344, November 19, 1994

could this work also in OA?

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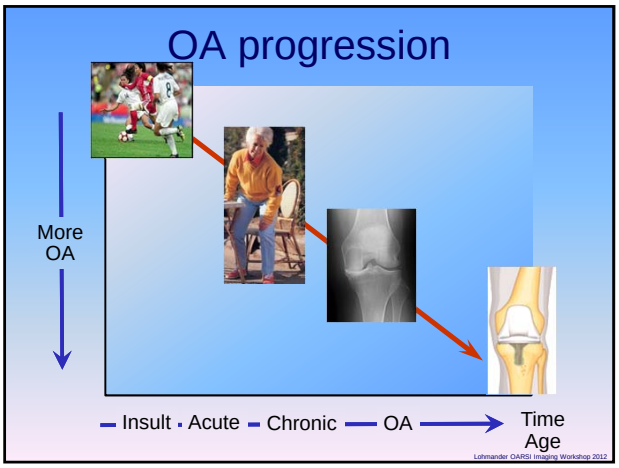
OA progression



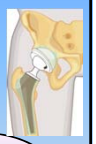
prospective population-based study

N~1,500
Colon radiography
1980-97

Mean age 60 years

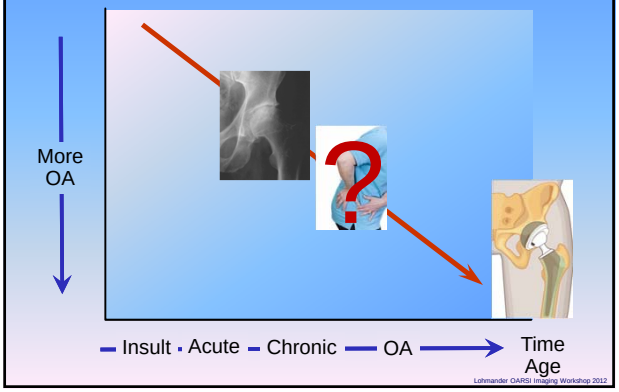
Follow-up 11-28 years

Incidence of THR for OA by linkage with the national Icelandic TJR register



Franklin J et al. 2011 AC&R

does radiographic OA predict THR?



Hazard Ratios for getting THR

Cox multivariate regression adj for age & sex

MJS (mm)	HR (95%ci)	K&L grade	HR (95%ci)
<=2.5	13.2 (8.1-21)	1→4	12.9 (7.9-21)

*ref JS>3.5mm or K&L 0

Franklin J et al. 2011 AC&R

only 17% of those with radiographic hip OA at baseline had undergone THR for OA at the end of the 11-28 year study

Franklin J et al. 2011 AC&R

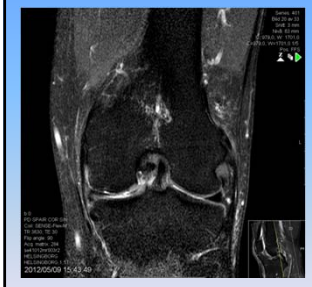
positive & negative predictive values of radiographic hip OA

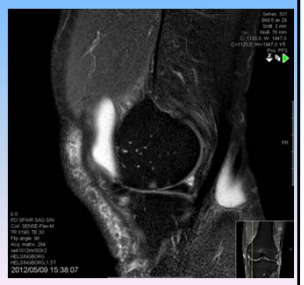
- PPV 0.40
- NPV 0.96

Franklin J et al. 2011 AC&R

radiographic OA: diagnostic criterion or risk factor?

diagnostic criterion or risk factor?





when to dmoad?

- primary prevention?
  - person w. high genetic risk?
  - person w. obesity?
  - person w. joint injury?
  - person w. structural joint change, no symptoms?
- secondary prevention?
  - person w. OA symptoms, no joint change?
  - person w. symptoms+ROA, to slow progress?
- tertiary prevention?
  - patient w. one replaced joint, to slow or prevent progress in other joint(s)?

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needs & expectations will (obviously) vary with person

- retired overweight physically inactive 64y female w end-stage hip OA
- working physically active 47y male w prev. meniscectomy & symptomatic knee ROA
- 31y female athlete w prev. ACL tear and w symptomatic knee ROA
- 23y male athlete w ACL tear & planned ACLR

in particular, consider

- patients with symptomatic OA who are unresponsive to conventional "care-as-usual" but are not suitable for joint replacement
  - 47y male…
  - 31y female…
- "treatment gap"

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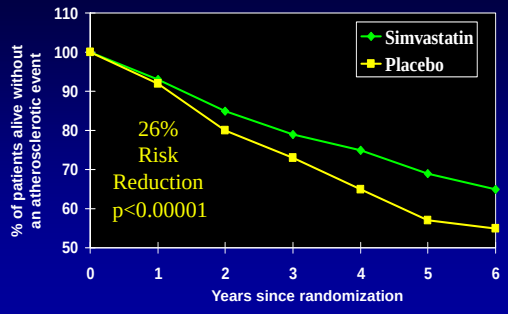
what "there"?

outcomes of research?

- issue identification
  project specification, selection, granting, inputs from previous research
- research process
- primary outputs
- dissemination
- secondary outputs
  guideline, policy, product
- adoption, use
- patient benefit

Event-Free Survival

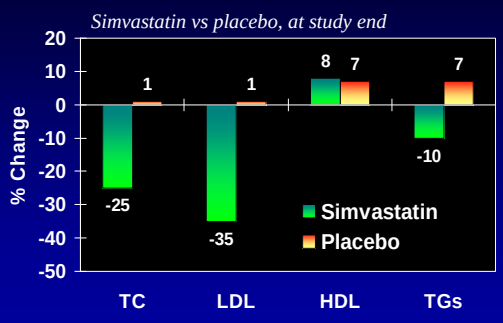
Survival without atherosclerotic event



The Lancet, Vol 344, November 19, 1994

Changes in Lipoprotein Levels

Simvastatin vs placebo, at study end



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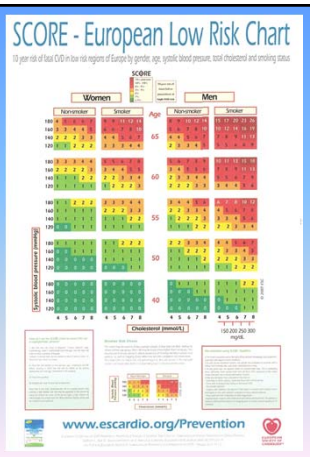

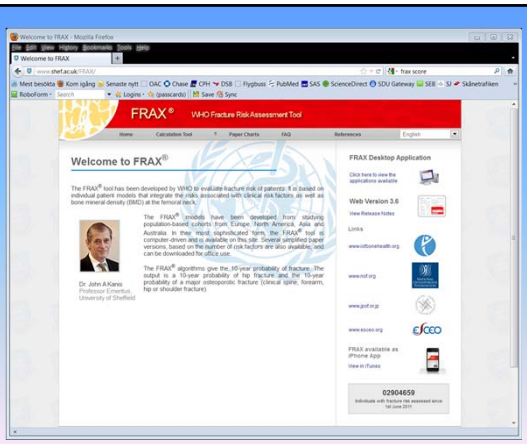

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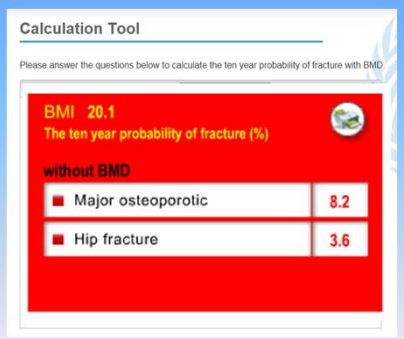

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what does biomarker add to other easily obtained risk factors or diagnostic criteria?

(age, symptoms, clinical exam, BMI, history of injury, family history, plain x-ray…)

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state of OA biomarkers?

"our lab results suggest that you are a rather short person"

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is this test useful?

- "risk" biomarker
  - does test & resulting prevention or treatment lead to fewer persons getting the disease, really?
- "prognostic" biomarker
  - does information provided lead to other decision or management leading to better survival, symptom or qol outcome, really?

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"cost of biomarker failure is high, patients have died…"

evidence matters

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’it is always too early (for rigorous evaluation) until, unfortunately, it’s suddenly too late’

(Buxton’s law)

Buxton. Economic appraisal of health technology in the European Community. 1987

the numbers game

what should we be aiming for?

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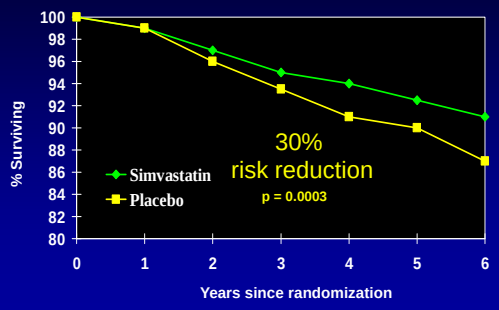

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Number Needed to Treat?

- for the 4S study, NNT for simvastatin was about 12 over 5 years
- for a lower risk population (no prior CAD event), 5y statin NNT is about 50
- for treatment of modest hypertension, the NNT may be 600-800 to prevent one major event

Number Needed to Treat?

- for a patient with ”major” (30%) 10 year risk of ”major OP fracture” the NNT for bisphosphonate treatment is about 10
- with a 10 year risk of 10%, the NNT is about 33
  - this means that 97/100 patients have no benefit from a 10 year treatment
- it is argued (by some) in the US that 3% 10y risk should be treated…

we really, really need…

1. better long-term natural history data
2. a web-based, public, quick & easy tool to identify those at risk of future joint failure
3. ”prognostic” biomarkers to improve precision of (2)
4. ”efficacy” biomarkers & endpoints for use in drug trials, esp. in early-stage development

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