Dr Mariska Leeflang
Dept. Clinical Epidemiology, Biostatistics and Bioinformatics
Academic Medical Center, University of Amsterdam
Room J1B – 210
PO Box 227700
1100 DE Amsterdam
m.m.leeflang@amc.uva.nl

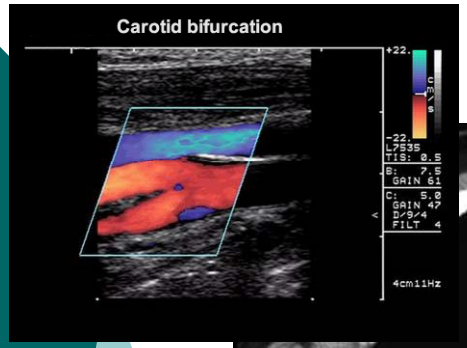
Systematic Reviews of Diagnostic Test Accuracy

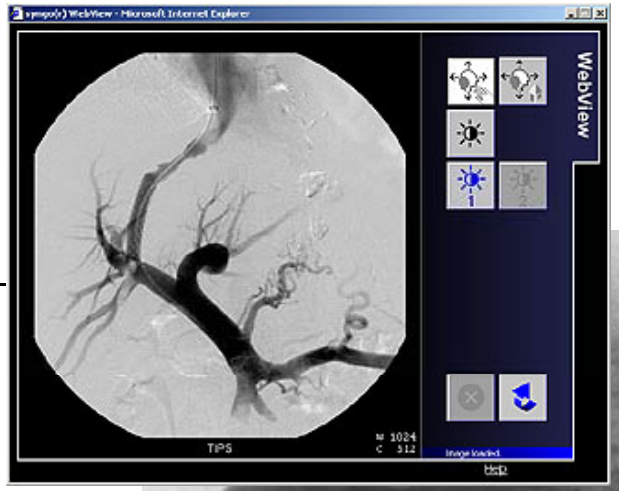
Montreal, Monday May 25th, 2009

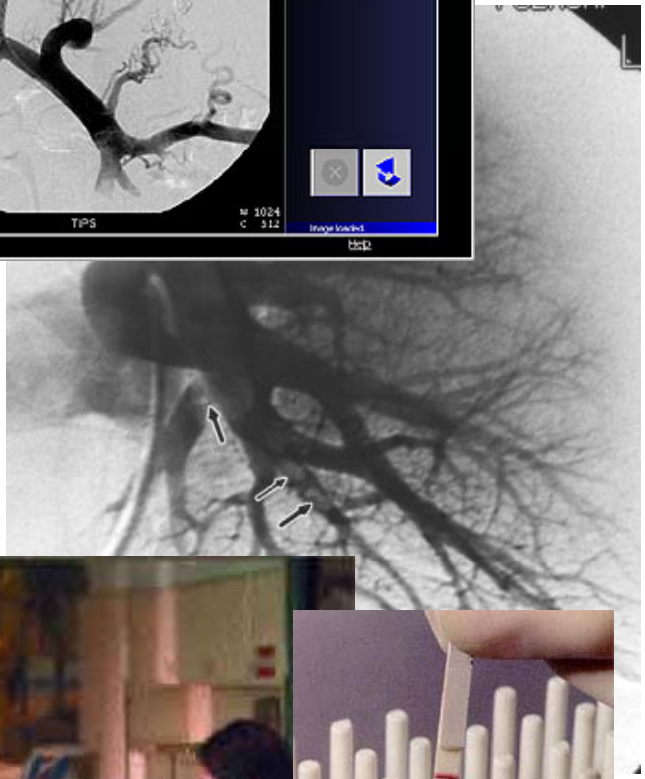
WHY?

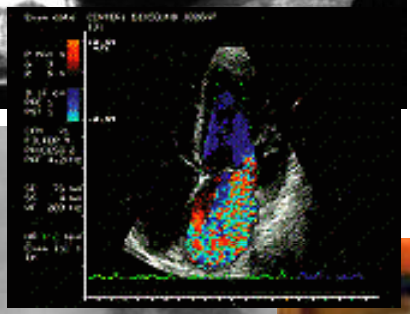
HOW?

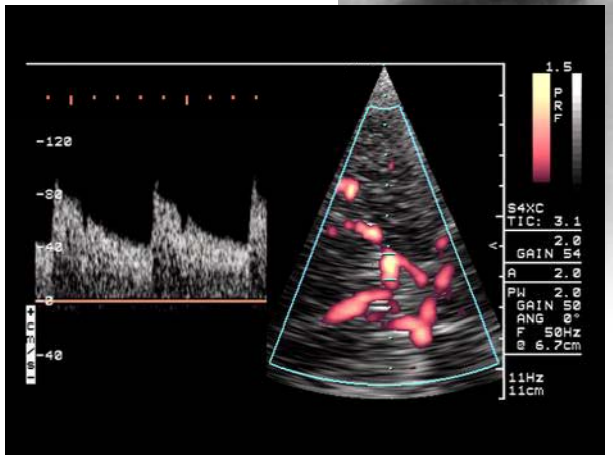
Mariska Leeflang


Carotid bifurcation


WebView
TIPS






-120
-80
-40
S4XC
TIC: 3.1
GAIN 54
PW 2.0
GAIN 50
ANG 0°
F 50Hz
@ 6.7cm
11Hz
11cm


2x

Why reviews?

- Test development increases
- Patients ask more reassurance
- More tests available
- Greater choice

- But also:
  - Higher costs
  - Higher burden on society
  - Difficult to choose

Why Systematic Reviews?

- Scientific summary of all available evidence
- Transparant and reproducible process
- Minimizes bias
- Studies can be formally compared to establish generalisability and consistency
- Heterogeneity can be identified and investigated
- Quantitative part (meta-analyses) may increase the precision of the overall result

Why diagnostic test accuracy?

- Practical reasons
  - Studies are easy to undertake
  - Sample sizes required are feasible
  - Answers can be obtained quickly
  - Results do not depend too much on human and health service factors
- RCTs of test strategies suffer from all these problems, and are rarely completed
- Methods to meta-analyze accuracy data have been developed

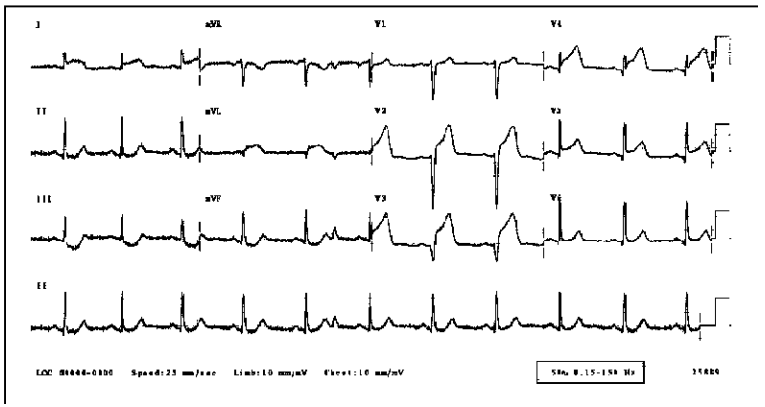
Limitations of test accuracy?

- "How well the test identify the target disorder?"
  - Does not directly assess effect of test on outcomes
  - Does not directly answer the question of whether using a test does more good than harm
  - Only possible when there is an adequate reference standard

How should test accuracy be used?

- To identify the best tests
- To identify the best use of tests
  - Replacing
  - In combination
  - In sequence
- Probabilistic thinking
- Combining with evidence of treatment effects in decision models

This was **why**, now comes **how**…



Steps in a Systematic Review

1. Question formulation
2. Identification and selection of studies
3. Quality assessment
4. Data analysis
5. Interpretation of results

1. Question formulation

Objective of a DTA SR can be

- To make comparisons between tests concerning their global accuracy
- To estimate the accuracy of a test operating at a particular threshold
- To understand why results of studies vary

Components of a question

- For intervention reviews
  - **P**atients
  - **I**ntervention
  - (**C**omparative intervention)
  - **O**utcome

Components of a question

- For diagnostic test accuracy reviews
  - **P**atients
  - **I**ndex test
  - (**C**omparator test)
  - **T**arget disorder

Components of a question

- For diagnostic test accuracy reviews
  - **P**atients
  - **P**resentation
  - **P**rior tests

  - **I**ndex test
  - (**C**omparator test)
  - **P**urpose

  - **T**arget disorder
  - **R**eference standard

2. Identification of studies

Problems in indexing of DTA studies

- No study design terms (MeSH: sensitivity-and-specificity)
- Diagnostic search filters based on terms used to report results
- Filters don't work (loss of relevant articles and not reducing NNR)

Search Strategy: include elements for

- target condition AND index test
- (more titles to screen)

3. Quality assessment

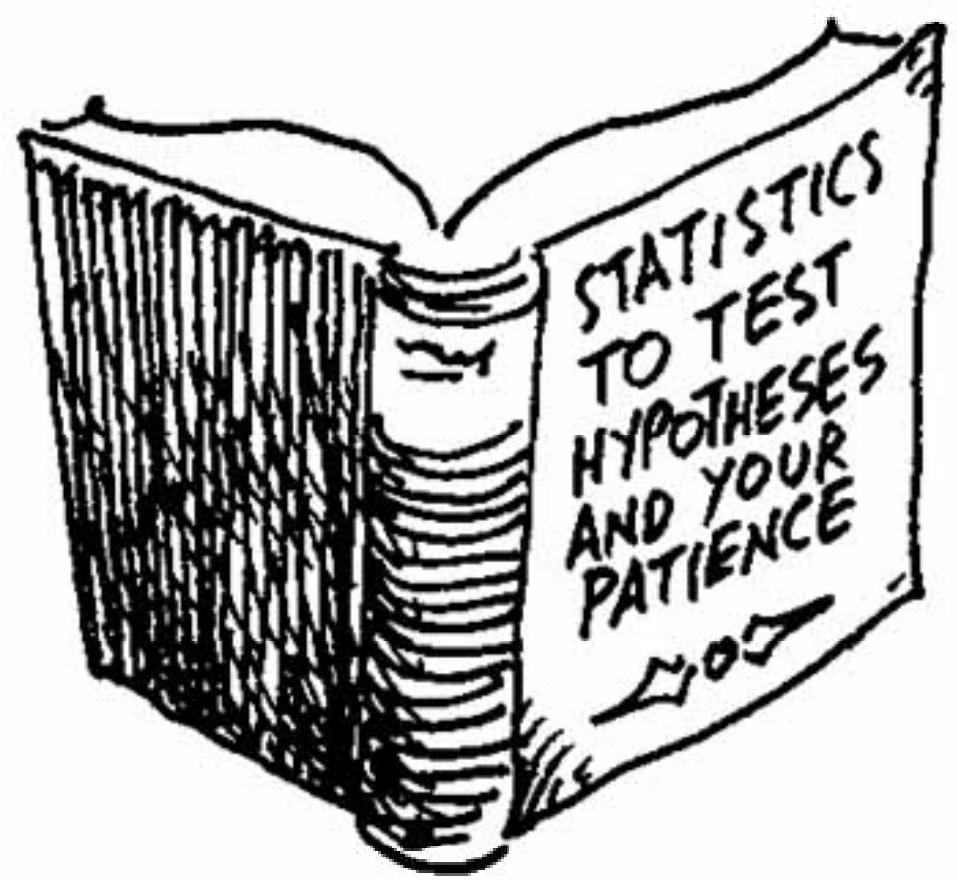
- Relation between quality items and bias is not as straightforward as it is for interventions
- Many more items: 11 mandatory and >10 facultative (QUADAS checklist)
- Main issues:
  - patient population
  - verification issues
  - blinding

3a. Data collection

- Assessment of study quality
- Data analysis and synthesis
- Investigations of heterogeneity
- Sensitivity analysis
- Assessment of reporting bias

  - **Data extraction Form**
  - **Procedure for handling disagreements**

4. Data analyses



Data and Analysis: challenging

- Outcome measure: paired.
  - Sensitivity and specificity
  - Pos and neg predictive values
  - Pos and neg likelihood ratios
- Cut-off problems
  - Explicit
  - Implicit
- Heterogeneity is rule rather than exception
  - Issues of bias
  - Different study designs

5. Interpretation of the results

- What do the results mean?
- How trustworthy are they?
- Any questions remaining?

Steps in a Systematic Review

1. Question formulation
2. Identification and selection of studies
3. Quality assessment
4. Data analysis
5. Interpretation of results

How does this look like in the end?

- Background
  - Introduction to the subject
  - Objectives / research question
- Methods
  - How and where did you search
  - How did you assess quality
  - How did you analyze the data
- Results
  - What are the results of the search, quality assessment and analyses
- Discussion
  - What do the analyses mean
  - Limitations
  - Implications