



# Philosophy of Evidence Based Medicine

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# What is Evidence Based Medicine?

Movement from 1990s

*Medical practice that “integrates the best available external clinical evidence from systematic research with individual clinical expertise and patients' choice” (Sacket 1996)*

# Hang on...

- But wait, wasn't medicine based on the best evidence before the 90s?!
- Well, really it's a philosophical position about what counts as the best evidence.
- So what is evidence? And what makes it good?

# Evidence

- Evidence is anything that give you reason to form a belief
- That's right, **ANYTHING**
- Different kinds of evidence that antibiotics work:
  - Reading clinical trial data
  - Understanding of the biological processes involved
  - Being told so by my doctor/teacher/Mum



# Good evidence

- What matters isn't what counts as evidence, but what counts as ***good*** evidence.
- What evidence is sufficient to do a good job ***justifying*** a belief



## So EBM is...

- So evidence-based medicine isn't the claim that medical practice should be based on evidence.
- It's a thesis about what constitutes the best evidence
- What's more, it tries to give a schematic for judging types of medical evidence against each other



**Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence**

Question	Step 1 (Level 1*)	Step 2 (Level 2*)	Step 3 (Level 3*)	Step 4 (Level 4*)	Step 5 (Level 5)
<b>How common is the problem?</b>	Local and current random sample surveys (or censuses)	Systematic review of surveys that allow matching to local circumstances**	Local non-random sample**	Case-series**	n/a
<b>Is this diagnostic or monitoring test accurate?</b> (Diagnosis)	Systematic review of cross sectional studies with consistently applied reference standard and blinding	Individual cross sectional studies with consistently applied reference standard and blinding	Non-consecutive studies, or studies without consistently applied reference standards**	Case-control studies, or *poor or non-independent reference standard**	Mechanism-based reasoning
<b>What will happen if we do not add a therapy?</b> (Prognosis)	Systematic review of inception cohort studies	Inception cohort studies	Cohort study or control arm of randomized trial*	Case-series or case-control studies, or poor quality prognostic cohort study**	n/a
<b>Does this intervention help?</b> (Treatment Benefits)	Systematic review of randomized trials or <i>n</i> -of-1 trials	Randomized trial or observational study with dramatic effect	Non-randomized controlled cohort/follow-up study**	Case-series, case-control studies, or historically controlled studies**	Mechanism-based reasoning
<b>What are the COMMON harms?</b> (Treatment Harms)	Systematic review of randomized trials, systematic review of nested case-control studies, <i>n</i> -of-1 trial with the patient you are raising the question about, or observational study with dramatic effect	Individual randomized trial or (exceptionally) observational study with dramatic effect	Non-randomized controlled cohort/follow-up study (post-marketing surveillance) provided there are sufficient numbers to rule out a common harm. (For long-term harms the duration of follow-up must be sufficient.)**	Case-series, case-control, or historically controlled studies**	Mechanism-based reasoning
<b>What are the RARE harms?</b> (Treatment Harms)	Systematic review of randomized trials or <i>n</i> -of-1 trial	Randomized trial or (exceptionally) observational study with dramatic effect			
<b>Is this (early detection) test worthwhile?</b> (Screening)	Systematic review of randomized trials	Randomized trial	Non-randomized controlled cohort/follow-up study**	Case-series, case-control, or historically controlled studies**	Mechanism-based reasoning

\* Level may be graded down on the basis of study quality, imprecision, indirectness (study PICO does not match questions PICO), because of inconsistency between studies, or because the absolute effect size is very small; Level may be graded up if there is a large or very large effect size.

\*\* As always, a systematic review is generally better than an individual study.

**How to cite the Levels of Evidence Table**

OCEBM Levels of Evidence Working Group\*. "The Oxford 2011 Levels of Evidence".

Oxford Centre for Evidence-Based Medicine. <http://www.cebm.net/index.aspx?o=5653>

\* OCEBM Table of Evidence Working Group = Jeremy Howick, Iain Chalmers (James Lind Library), Paul Glasziou, Trish Greenhalgh, Carl Heneghan, Alessandro Liberati, Ivan Moschetti, Bob Phillips, Hazel Thornton, Olive Goddard and Mary Hodgkinson



## So evidence...

- Turns out not all evidence is created equal.
- Much history behind the development of this...
- ... which I'm going to completely bypass in favour of vague handwaving.
- Fact is, according to EBM, expertise and mechanistic evidence are prone to lead us astray.

## **Computer-aided Diagnosis of Acute Abdominal Pain**

F. T. de DOMBAL, D. J. LEAPER, J. R. STANILAND, A. P. McCANN, JANE C. HORROCKS

*British Medical Journal*, 1972, 2, 9-13

### **Summary**

**This paper reports a controlled prospective unselected real-time comparison of human and computer-aided diagnosis in a series of 304 patients suffering from abdominal pain of acute onset.**

**The computing system's overall diagnostic accuracy (91·8%) was significantly higher than that of the most senior member of the clinical team to see each case (79·6%). It is suggested as a result of these studies that the provision of such a system to aid the clinician is both feasible in a real-time clinical setting, and likely to be of practical value, albeit in a small percentage of cases.**

# The sins of expertness and a proposal for redemption

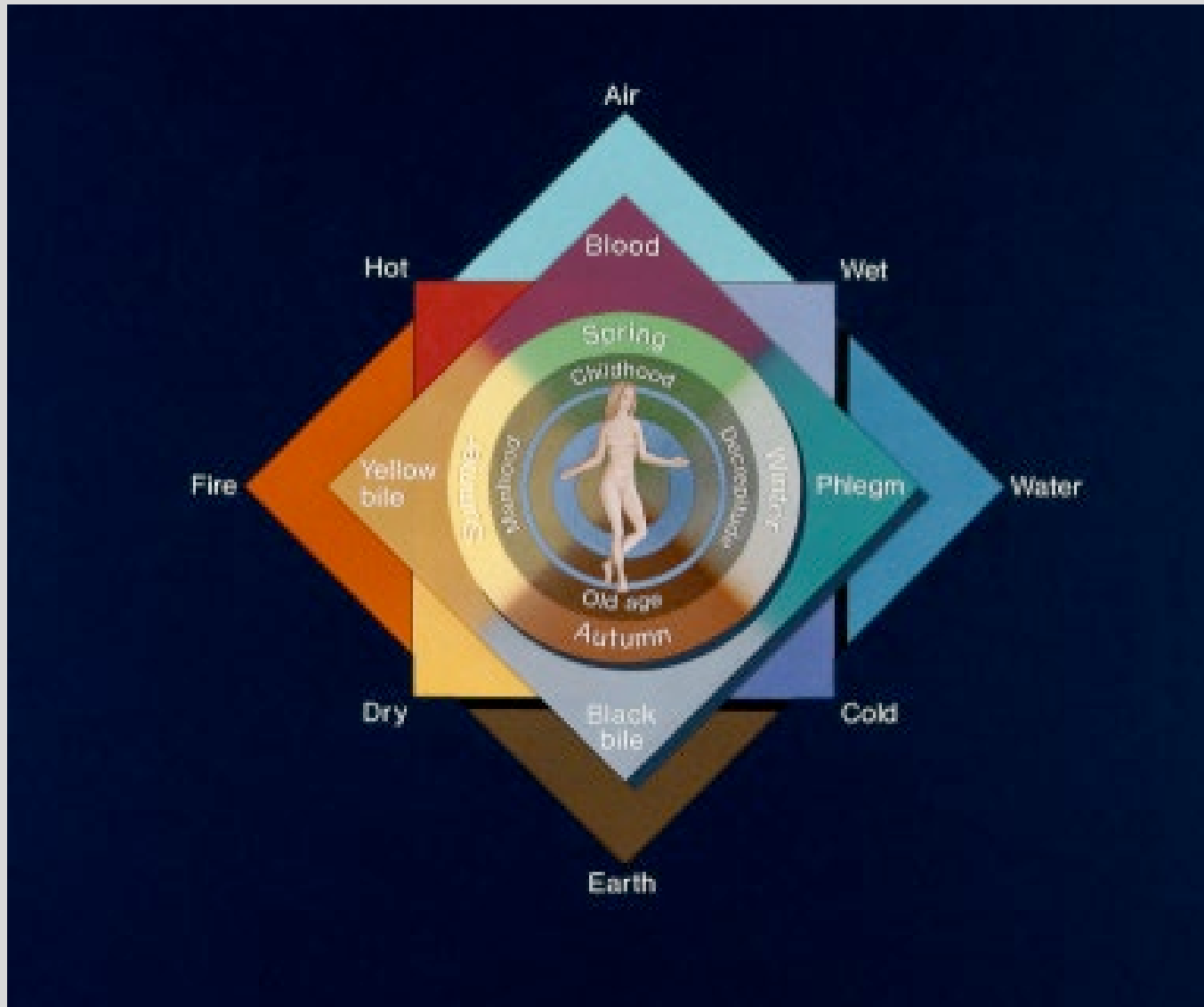
“experts ... commit two sins that [slow] the advance of science ... Firstly, adding our prestige to our opinions gives the latter far greater persuasive power than they deserve on scientific grounds alone. ... The second sin of expertness is committed on grant applications and manuscripts that challenge the current expert consensus. Reviewers face the unavoidable temptation to accept or reject new evidence and ideas, not on the basis of their scientific merit, but on the extent to which they agree or disagree with the public positions taken by experts on these matters.” (Sackett 2000)

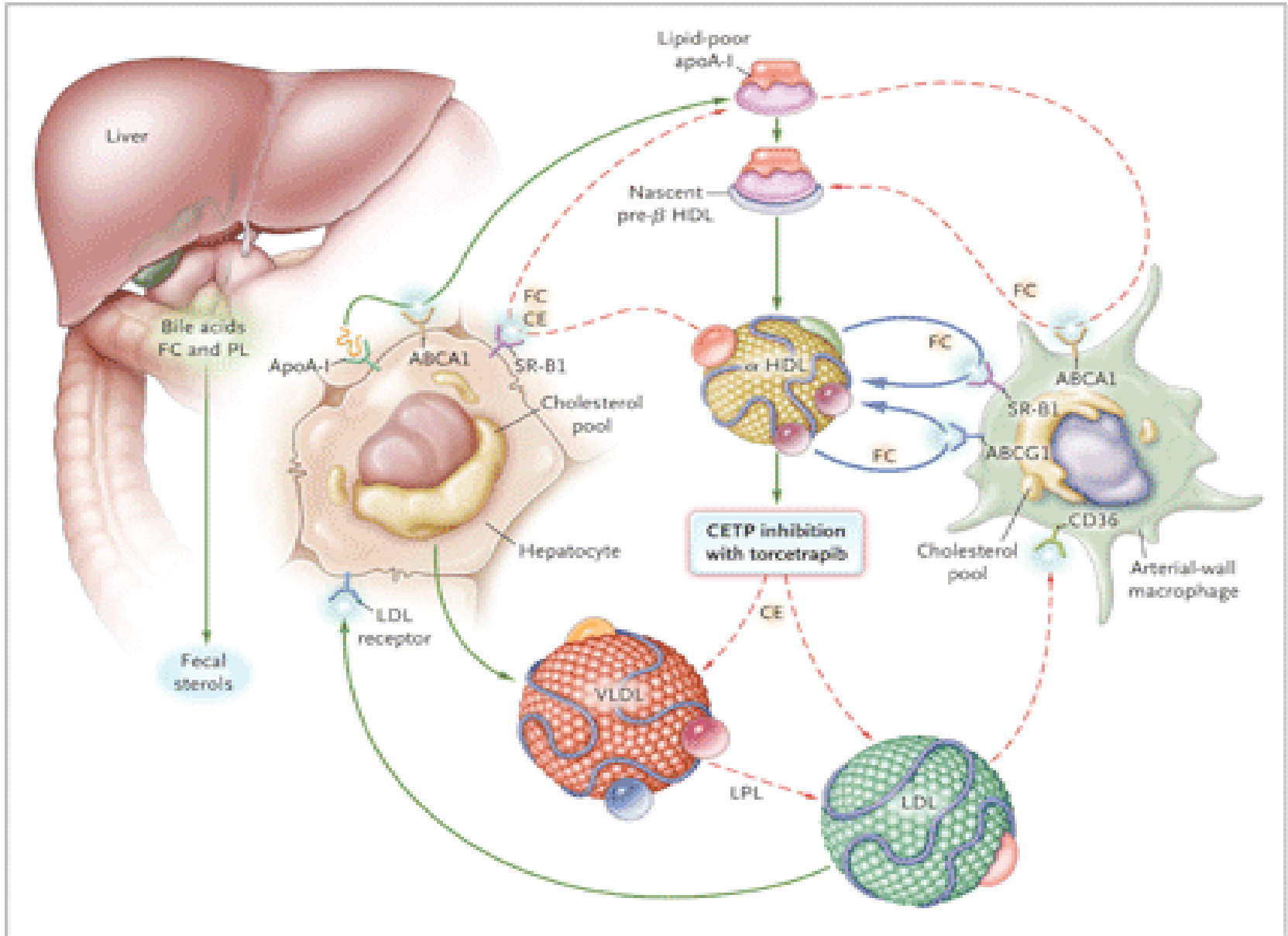
The patient regained consciousness. The doctors were ecstatic. Surely the king would benefit from more bloodletting.



Eleven consulting physicians decided he would benefit from more bleeding, so they opened both jugular veins.

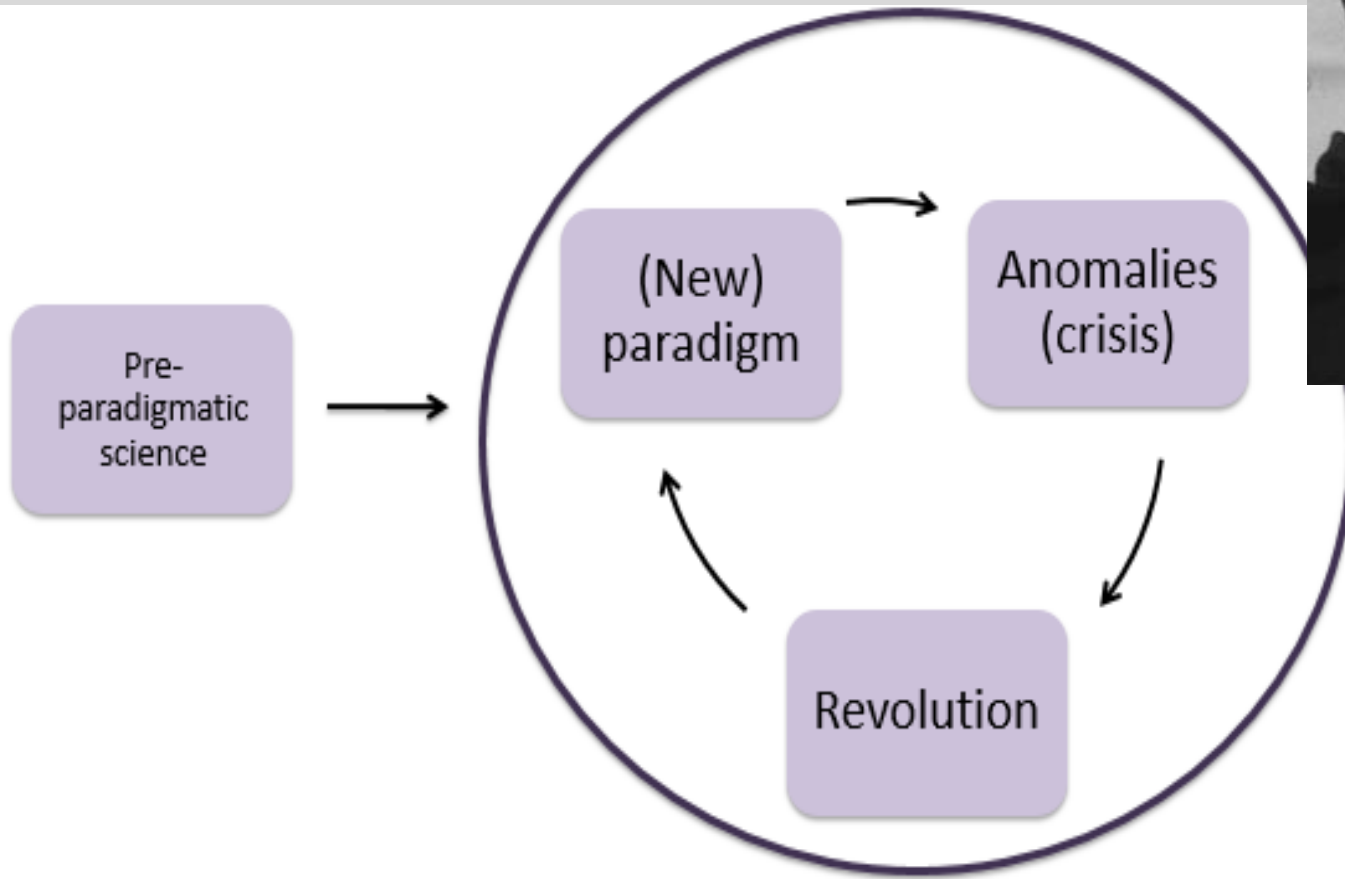
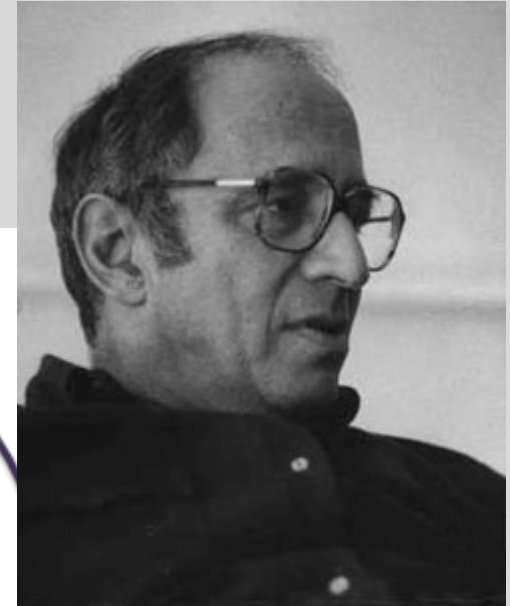








# Remember this guy?





# So how come EBM evidence is better?

## **Sodium Fluoride Treatment is a Major Protector Against Vertebral and Nonvertebral Fractures When Compared with Other Common Treatments of Osteoporosis: A Longitudinal, Observational Study**

**J. Farrerons,<sup>1</sup> A. Rodríguez de la Serna,<sup>2</sup> N. Guañabens,<sup>3</sup> L. Armadans,<sup>4</sup> A. López-Navidad,<sup>1</sup> B. Yoldi,<sup>1</sup> A. Renau,<sup>1</sup> J. Vaqué<sup>4</sup>**

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Received: 25 September 1995 / Accepted: 23 September 1996

## **A randomized trial of sodium fluoride (60 mg) +/- estrogen in postmenopausal osteoporotic vertebral fractures: increased vertebral fractures and peripheral bone loss with sodium fluoride; concurrent estrogen prevents peripheral loss, but not vertebral fractures.**

Gutteridge DH, Stewart GO, Prince RL, Price RI, Retallack RW, Dhaliwal SS, Stuckey BG, Drury P, Jones CE, Faulkner DL, Kent GN, Bhagat CI, Nicholson GC, Jamrozik K.

Department of Endocrinology, Sir Charles Gairdner Hospital, Nedlands, WA, Australia.

- The cornerstones of good evidence:
  - Internal validity
  - External validity

# Internal validity

- What we can call ‘the quality of the study’
- The extent to which you can rule out alternative explanations for your findings
- If someone were to repeat your study, would they find the same results?
- Factors That Improve Internal Validity:
  - Randomization
  - Blinding and concealment

# External validity

- Factors outside of the study and its design that affect how applicable
- Relates to the generalizability or applicability of a study's findings
- Factors that improve external validity:
  - Well chosen research question
  - Inclusion and exclusion criteria
  - Good reporting/publication of results

# RCTs and systematic reviews...

- How do they help?
- In what situations are other forms of evidence better?
  - What makes those other forms better?



# Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomised controlled trials

Gordon C S Smith, Jill P Pell



# Philosophical questions

- What role for expert/mechanistic evidence?
- Can we really not compare the EBM paradigm with what preceded it?
- Does EBM sound like inductive verification? Or Popper's falsification?
- Should we use parachutes?

# One last question:

- Where is the line between philosophy and science here?