

Principles of Evidence-Based Veterinary Medicine

What is it & Why Does It Matter?

What is EBVM?

Evidence based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research.

David Sackett, DL. et al. Evidence based medicine: what it is and what it isn't



What is EBVM?

The integration of the best research evidence with our clinical expertise and our patient's unique values and circumstances.

Strauss, SE. et al.

Evidence-based medicine: how to practice and teach EBM.



What is EBVM?

At its heart is the confidence in the scientific methodology that has developed over the centuries to enable us to distinguish what is likely to be true from what is likely to be false (or unproven).

Cockroft, P. Holmes, M.

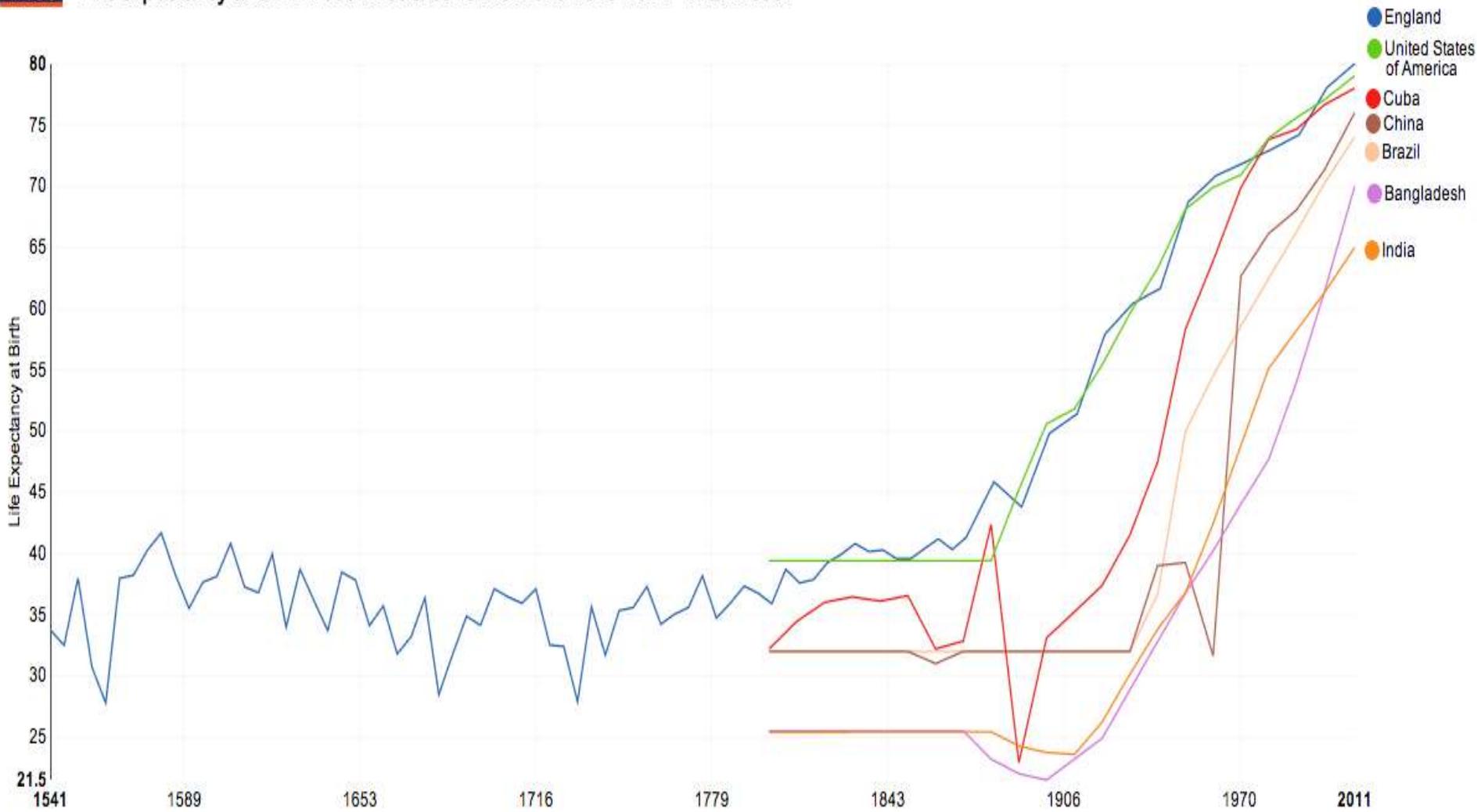
Handbook of Evidence-Based Veterinary Medicine





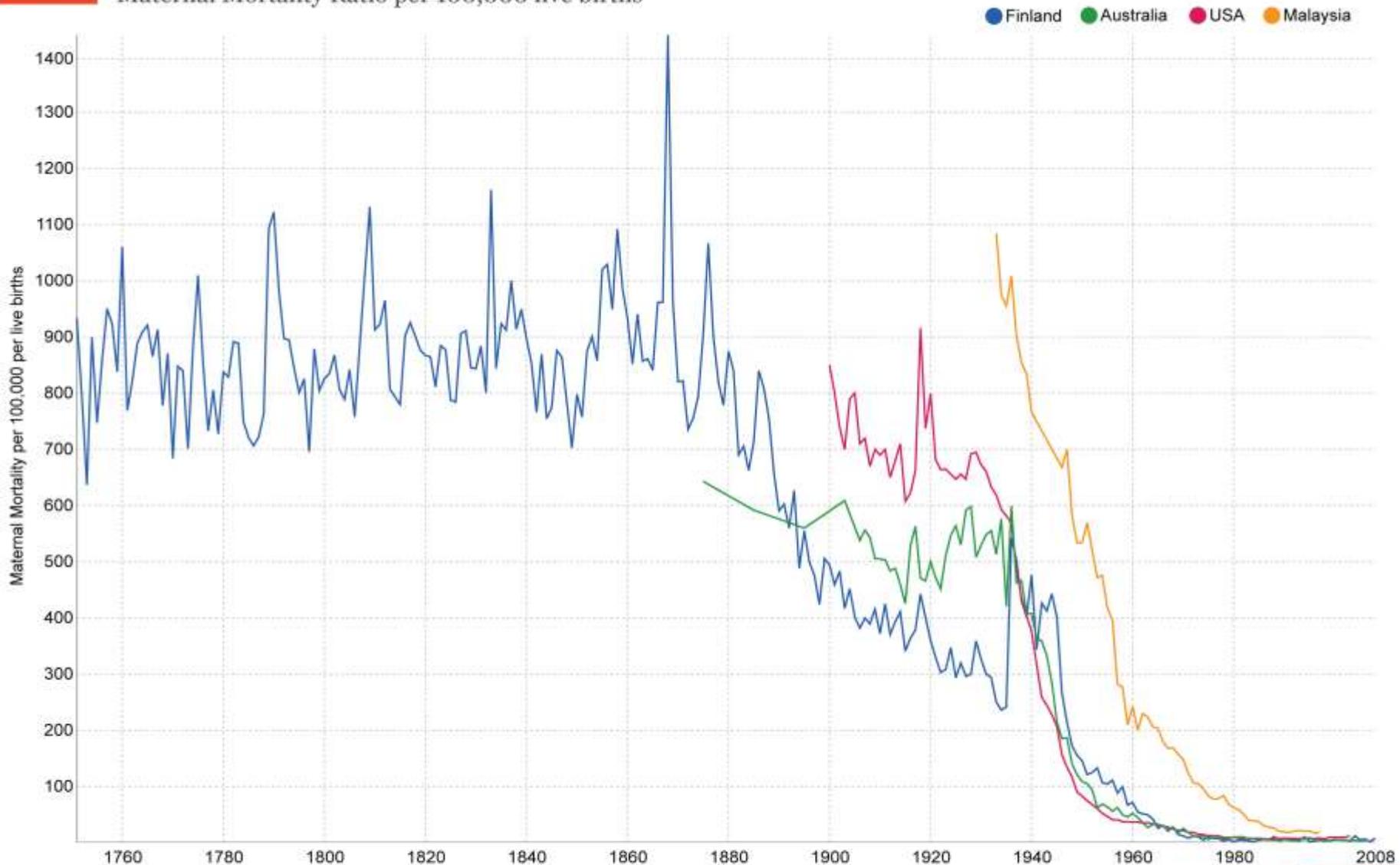
“[Science] is the worst form of [epistemology], except for all those other forms that have been tried.”

Life expectancy at birth in countries around the world 1540-2011 – Max Roser



Maternal Mortality, 1751-2008 – by Max Roser

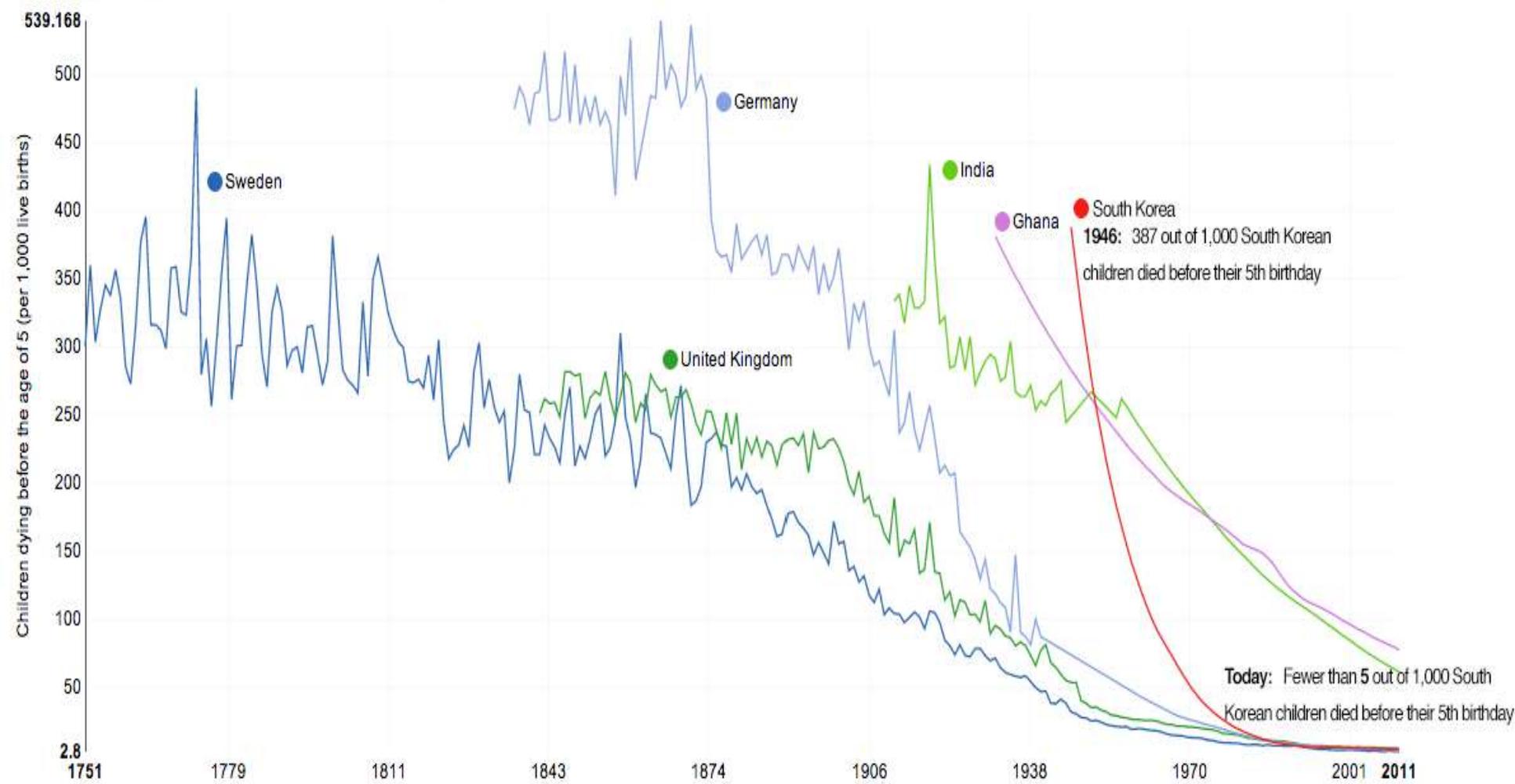
Maternal Mortality Ratio per 100,000 live births



Data source: Claudia Hanson (2010) – Gapminder Documentation 10 – Documentation for Data on Maternal Mortality.

The interactive data visualisation is available at OurWorldinData.org. There you find the raw data and more visualisations on this topic.

Child Mortality from 1751 to 2011 - Max Roser



The author Max Roser licensed this visualisation under a [CC BY-SA license](https://creativecommons.org/licenses/by-sa/4.0/). You are welcome to share but please refer to its source where you find more information: www.OurWorldinData.org/data/population-growth-vital-statistics/child-mortality

Data source: UNICEF's www.childmortality.org

Why do We Need EBVM?

- To prevent and correct our errors
- To improve patient care
- To meet our ethical obligation to our clients

Informed Consent

Information about the nature of the evidentiary record, or lack thereof, undergirding the physician's recommendation could be viewed as an essential part of the informed-consent process because such information might significantly influence the patient's decision to accept, reject, or negotiate around the physician's advice.

Kapp MB. Evidence-based medicine and informed consent. *Acad. Med.* 2002;77:1199-1200.



Alternatives to EBVM?

Basis of clinical practice

Basis for clinical decisions	Marker	Measuring device	Unit of measurement
Evidence	Randomised controlled trial	Meta-analysis	Odds ratio
Eminence	Radiance of white hair	Luminometer	Optical density
Vehemence	Level of stridency	Audiometer	Decibels
Eloquence (or elegance)	Smoothness of tongue or nap of suit	Teflometer	Adhesin score
Providence	Level of religious fervour	Sextant to measure angle of genuflection	International units of piety
Diffidence	Level of gloom	Nihilometer	Sighs
Nervousness	Litigation phobia level	Every conceivable test	Bank balance
Confidence*	Bravado	Sweat test	No sweat

*Applies only to surgeons.

Alternatives to EBVM?

- Opinion-based medicine
 - Personal experience/anecdote
 - Expert opinion
 - Historical tradition
 - Habit
 - Haphazard use of scientific evidence

In

My

Experience



50c
GC • 40



DR. BENJAMIN SPOCK

BABY AND CHILD CARE



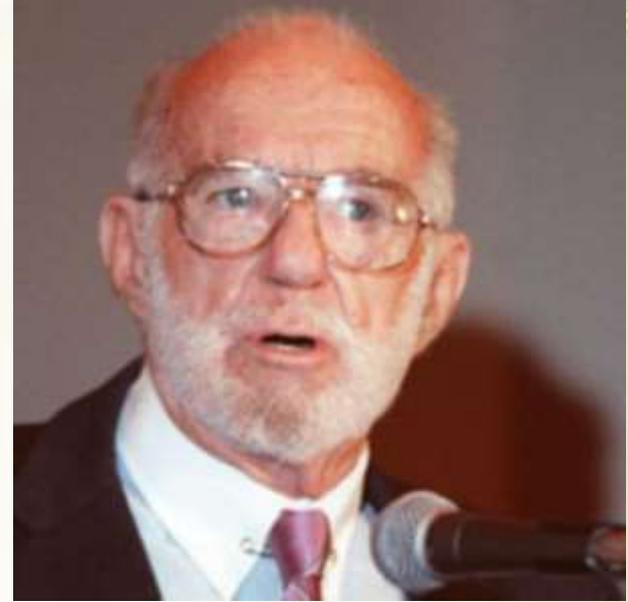
The most widely recommended handbook for parents ever published—
Authoritative, illustrated, indexed

Over 19,000,000 copies sold

The Complete Book
POCKET BOOKS

As near as my husband and I can figure, your book, Baby and Child Care, has become the Modern Bible of American Parenthood

Baby and Child Care is the Bible in my household. I do not know of any book which I admire more



By 1973 *Baby and Child Care* had gone through 201 printings and sold over 23 million copies; been translated into 29 languages; For two decades it sold about a million copies a year.

Every time the supply [of the book] runs out I get verbal and written pleas not only from parents, and relatives and friends of prospective parents, but from schools of social work, medical schools, teacher training schools, etc., who are using the book as a text, from obstetricians and pediatricians who give the book to each new patient, and even from a state health dept which is recommending it routinely

Advice to Prevent SIDS

Babies Should Sleep on Their Stomachs



There are two disadvantages to a baby's sleeping on his back. If he vomits, he's more likely to choke on the vomitus. Also, he tends to keep his head turned toward the same side—usually the center of the room. This may flatten that side of his head.

I think it is preferable to accustom a baby to sleeping on his stomach from the start if he is willing.

Benjamin Spock, MD

SIDS Research

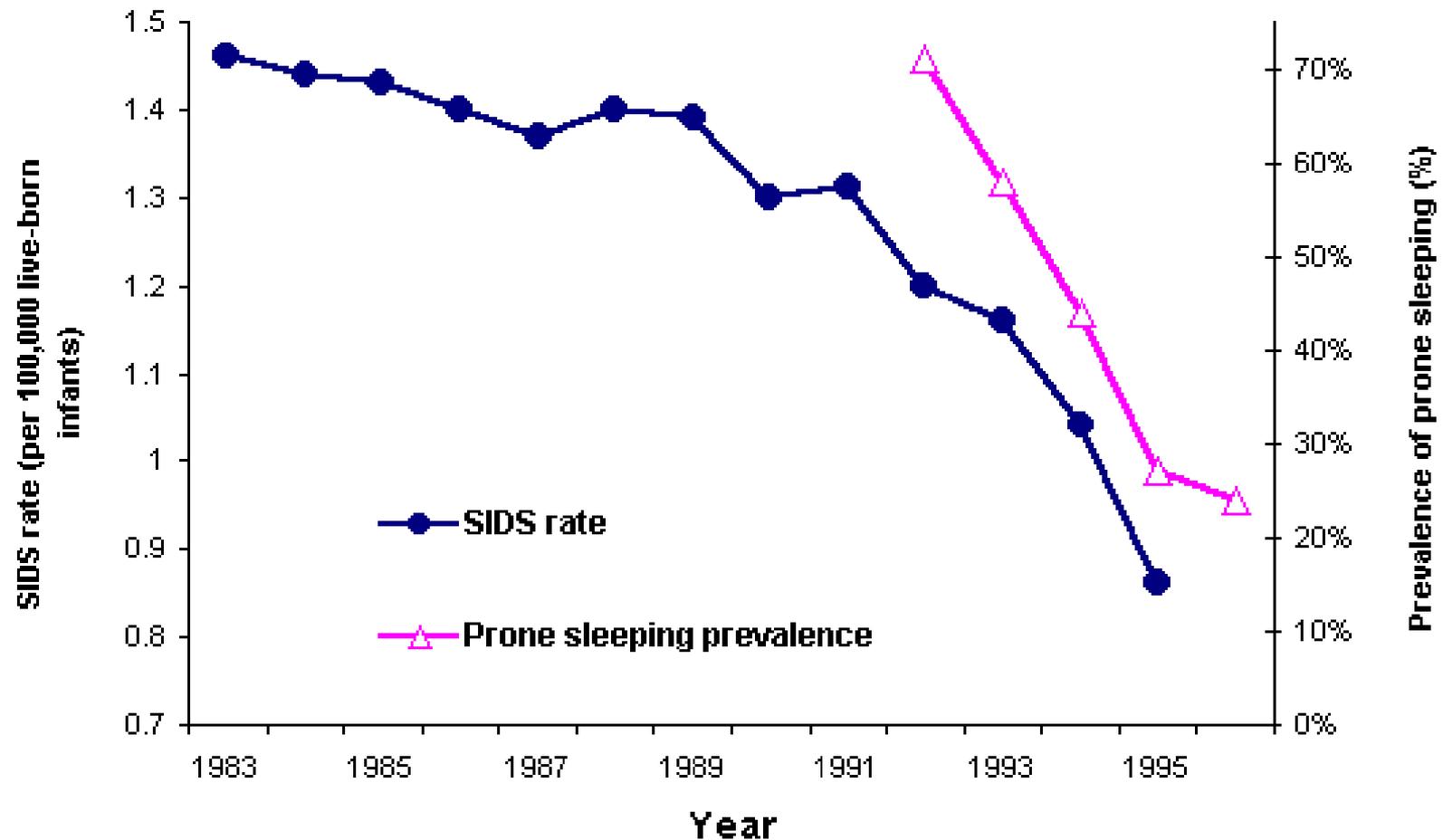
Babies Should Sleep on Their Backs



Advice to put infants to sleep on the front for nearly a half century was contrary to evidence available from 1970 that this was likely to be harmful. Systematic review of preventable risk factors for SIDS from 1970 would have led to earlier recognition of the risks of sleeping on the front and might have prevented over 10,000 infant deaths in the UK and at least 50,000 in Europe, the USA, and Australasia.

Infant sleeping position and the sudden infant death syndrome: systematic review of observational studies and historical review of recommendations from 1940 to 2002

Ruth Gilbert, Georgia Salanti, Melissa Harden, and Sarah See



SIDS Incidence and Sleeping Position Before and After Public Education Campaign to Reduce Prone Sleeping

Preaching to the Choir?



Preaching to the Choir?

Table 6: How would you describe **your** attitude towards evidence-based medicine? (118 responses)

Respondents Own Attitude Towards EBM	Percentage
Positive	91%
Neutral	19%
Negative	1%
No opinion	7%

Table 8: Do you feel research findings are useful in your day-to-day management of patients? (119 responses)

Usefulness of Research Findings	Percentage
Very useful	50.42%
Somewhat useful	47.06%
Not useful	2.52%
No Opinion	0.00%

Preaching to the Choir?

Table 14: When did you last do a literature search which influenced your clinical practices? (113 respondents)

Time Period	Respondents	Percentage
Within last month	46	40.71%
Within last 6 months	32	28.32%
Within last 12 months	14	12.39%
> 12 months	14	12.39%
Never	7	6.19%

Table 15: Have you ever received formal training in electronic literature search strategies or appraisal of scientific literature? (115 respondents)

Response	Respondents	Percentage
Yes	17	14.78%
No	98	85.22%

Preaching to the Choir?

Research not relevant

No Barrier	Slight	Moderate	Severe
9 (8.5%)	25 (23.6%)	57 (53.8%)	15 (14.2%)

Research not generalizable to practice

No Barrier	Slight	Moderate	Severe
2 (1.9%)	33 (30.8%)	55 (51.4%)	17 (15.9%)

Amount of research overwhelming

No Barrier	Slight	Moderate	Severe
12 (11.2%)	29 (27.1%)	39 (36.4%)	27 (25.2%)

Preaching to the Choir?

Response	Unfamiliar	Some Understanding	Could Explain	Total
Relative/Absolute Risk	28 (25.2%)	69 (62.2%)	14 (12.6%)	111
Systematic Review	30 (27.3%)	67 (60.9%)	13 (11.8%)	110
Meta-Analysis	85 (76.5%)	21 (18.9%)	5 (11.8%)	111
Confidence Interval	53 (47.8%)	44 (39.6%)	14 (12.6%)	111
Publication Bias	30 (27.0%)	56 (50.4%)	25 (22.5%)	111
Positive/Neg Predictive Value	32 (28.6%)	57 (50.9%)	23 (20.5%)	112
Confirmation Bias	65 (58.6%)	40 (36.0%)	6 (5.4%)	111
Number Needed to Treat	39 (35.4%)	64 (58.2%)	7 (6.4%)	110

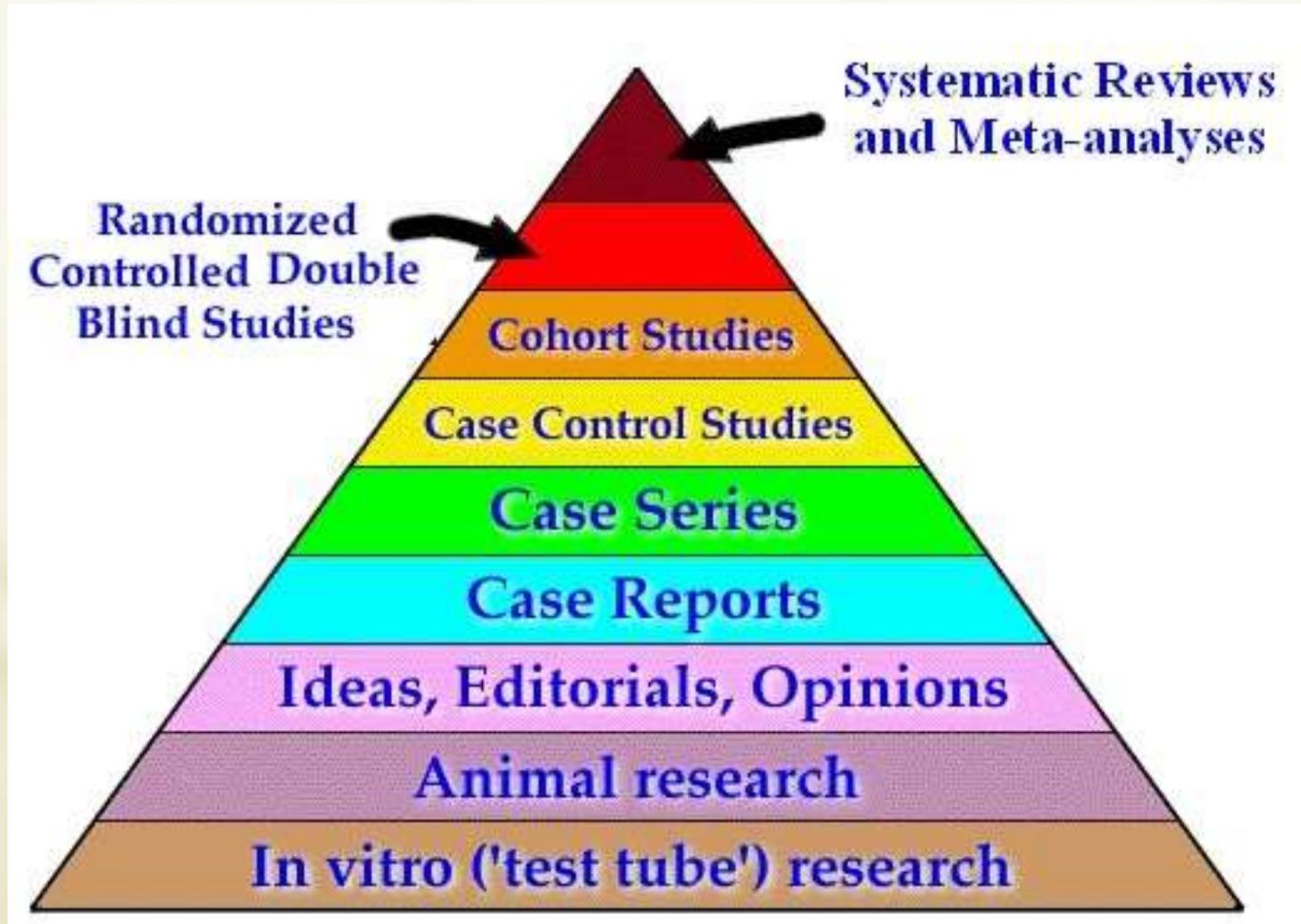


Steps of EBVM

1. Ask useful questions
2. Find relevant evidence
3. Assess the value and reliability of the evidence
4. Draw a conclusion
5. Assign a level of confidence to your conclusion



Hierarchy of Evidence



Hierarchy of Evidence

Systematic reviews, EBM guidelines, CATs

Synthetic
Literature

RCTs, other designs, case reports,
pre-clinical, human studies

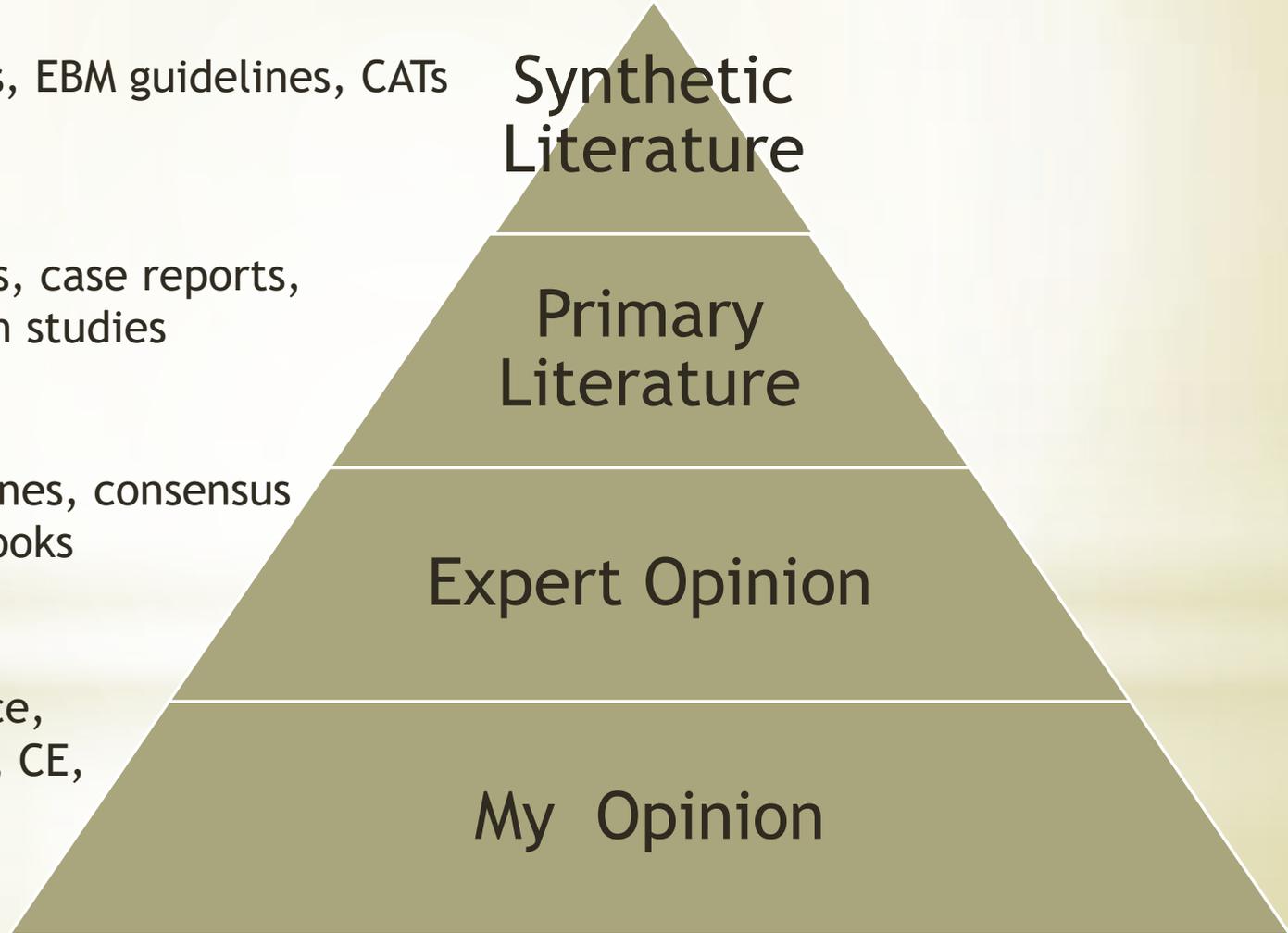
Primary
Literature

CE, clinical guidelines, consensus
statements, textbooks

Expert Opinion

personal experience,
colleagues, school, CE,
???????????

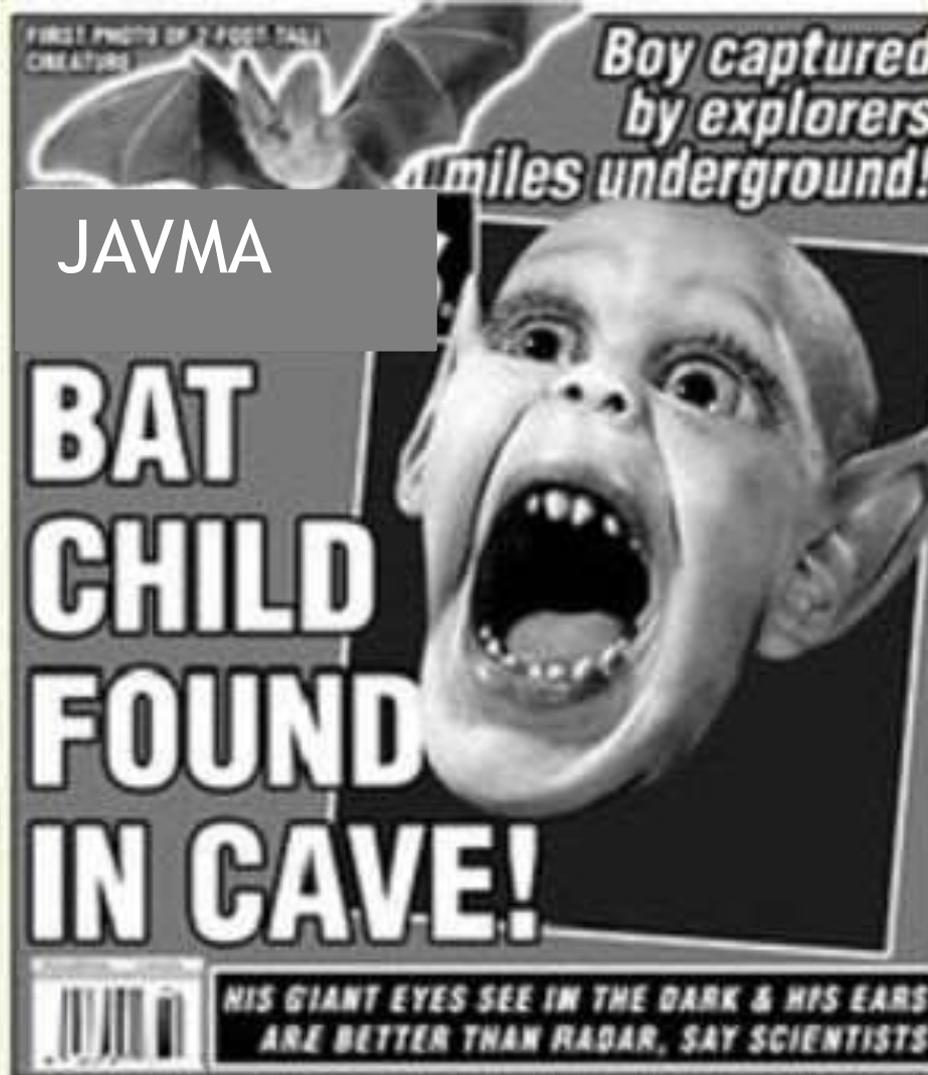
My Opinion



Published Research Evidence



Published Research Evidence



Published Research Evidence



A peer-reviewed, open access journal

Why Most Published Research Findings Are False

John P. A. Ioannidis



Simulations show that for most study designs and settings, it is more likely for a research claim to be false than true. Moreover, for many current scientific fields, claimed research findings may often be simply accurate measures of the prevailing bias.

Published Research Evidence

1. The smaller the studies conducted in a scientific field, the less likely the research findings are to be true.
2. The smaller the effect sizes...
3. The greater the number and the lesser the selection of tested relationships...
4. The greater the flexibility in designs, definitions, outcomes, and analytical modes...
5. The greater the financial and other interests and prejudices...
6. The hotter a scientific field (with more scientific teams involved)...

Published Research Evidence



Critical Appraisal

Critical Appraisal

- Key factors
 - Control Group
 - Placebo, positive control
 - Allocation (random)
 - Blinding
 - Investigator, caregiver
 - Stats
 - Power, multiple comparisons, confidence intervals

Critical Appraisal

- Key factors
 - Effect Size
 - Replication
 - Applicability
- Other sources of bias
 - Funding
 - Publication

Published Veterinary Research

Lund, E. M., et al. (1998)- overall reporting

RCT reports in the small animal veterinary literature are incomplete...Absence of reporting was found [for]...informed consent, eligibility criteria, sample size, and statistical power...group allocation, blinding...

Brown, D. C. (2006)- randomization

Randomization was reported...in most publications...However, in most reports, little corroborating information was included to support the claim.

Published Veterinary Research

Giuffrida, M. A., et al. (2012)- blinding

Most reports of blinding methodology were incomplete and there was no consistency in how blinding terminology was used.

Giuffrida, M. A. (2014)- power

Small animal RCTs with negative results were often underpowered to detect moderate-to-large effect sizes between study groups. Information needed for critical appraisal was missing from most reports.

Published Veterinary Research

Sargeant, J. Met al. (2009)- quality & reporting affect outcomes

There were substantive deficiencies in the reporting of many of trial features...these deficiencies may be associated with biased treatment effects.

Sargeant, J. M., et al. (2010)- quality & reporting affect outcomes

Many clinical trials involving dogs and cats in the literature do not report details related to methodological quality...There is some evidence that these deficiencies are associated with treatment effects.

Published Veterinary Research

300 controlled clinical trials from 25 journals

- Randomization- 19.5%
- Allocation Concealment- 15.4%
- Blinding
 - Investigator- 40%
 - Caregiver- 18.6%
- Power- 12%
- Mean proportion of 23 criteria adequately reported- 49.6%

Published Veterinary Research

Arlt , S., et al. (2010)- canine reproduction

- meta-analyses, clinical trials, and case reports published in German or English between 1996 and 2006.
- 287 articles from 64 journals met the inclusions criteria. Of these, 58 were controlled clinical trial, and the remainder were case reports, observational studies, or other uncontrolled designs.
- about 40% reported randomization
- 13.8% reported blinding.
- The authors concluded that overall, 67.9% of the reports evaluated were inadequate to allow clinicians to draw valid conclusions for integration in clinical practice.

Published Veterinary Research

Simoneit , C., et al. (2011)- bovine, equine, & canine reproduction

- 268 published research reports: 121 were controlled clinical trials.
- Randomization was reported in
 - 34% of bovine studies
 - 22% of equine studies
 - 12% of canine studies
- Blinding was reported in
 - 4% of bovine studies
 - 6% of equine studies
 - 7% of canine studies
- Overall, only 17% of the reports were graded adequate to draw valid conclusions,
 - 33% bovine studies
 - 11% equine studies
 - 7% in canine studies

Bottom Line

- EBVM improves decision-making and outcomes
- Formal, explicit integration of research evidence with expertise, circumstances
- Evidence must be critically appraised

Resources

- EBVMA (ebvma.org)
- CEVM (nottingham.ac.uk/cevm)
 - Best Bets for Vets (bestbetsforvets.org)
 - VetSRev (nottingham.ac.uk/cevm/refbase)
- RCVS Knowledge
 - EBVM Network
(knowledge.rcvs.org.uk/evidence-based-veterinary-medicine)
 - EBVM Forum (ebvmnetwork.org)

Resources

- VetAllTrials (vetalltrials.org)
 - Clinical trial registries
 - Transparency, Better Reporting
 - Facilitate Critical Appraisal
 - Better Evidence

Resources

