Evidence-based medicine and the role of journal quality

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Clinical decision making

- Very few clinicians are completely irrational when making a decision
- We have received a ‘scientific’ training
- Our knowledge consists of beliefs each of which is held for a reason
- There is a provenance (evidence) behind our knowledge

What do I look for in ‘evidence’?

- Appropriate methodology
- ‘Scientific Method’
- Scepticism
- Avoiding confounders
- Recognition of uncertainty
- Quantification of that uncertainty
- Objectivity - avoiding bias

Veterinary Knowledge

- The ultimate clinical trial
  - An infinite number of parallel universes containing your patient
  - Everything identical apart from the treatment
  - Double-blinded
  - Placebo controlled
- In the absence of this we need to rank the evidence
  - Results of a RCT
  - A case series
  - Lecture notes
  - A friend once told me

Pyramid of Evidence

Strong Evidence

SIDS (Cot Death)

- “Invalid health information is potentially lethal”
- Iain Chalmers
  - Founder of the Cochrane Collaboration
Results of a meta-analysis

- Collation of the results of many studies contradict this advice
- Extract from publicity prepared for the UK ‘Reduce the Risk’ Campaign (early 1990s)

“The risk of cot death is reduced if babies are not put on the tummy to sleep. Place your baby on the back to sleep. Healthy babies placed on their backs are not more likely to choke.”

Iain Chalmers

- “No doubt like millions of his other readers, I passed on and acted on this apparently rational and authoritative advice.”
- “We now know that the advice promulgated so successfully in Spock’s book led to thousands, if not tens of thousands, of avoidable cot deaths.”

Letter to BMJ

Belief and Knowledge

- A belief may be true
- A belief implies an undefined uncertainty
- Knowledge is defined by our ability to test its truth
- Knowledge implies a degree of certainty (or low level of uncertainty)
- Knowledge is never absolute, it is a strong belief
- All knowledge is really just belief supported with evidence
1. Propound empirically testable theories;
2. Aim to refute them;
3. Given any theory T, aim to replace it by another theory T’ which is more general and precise

Popper later placed much more emphasis on the importance of non-empirical theories, while retaining empirical content as the ultimate goal of theory development.

Tests

- A test is just an observation
- An experiment is just an arrangement in order to make an observation
- An untested belief while possibly true remains a belief

A belief that fails a test

- Discard the belief
- Modify the belief
- Question the test

Randomness and chance

- The natural world is riven with it
- Biological events especially so
- Statistics is a tool to help us deal with it
- Psychologically we are ill equipped to deal with it
- Unusual or interesting phenomena gain undue emphasis in our observations
- Hope, fear or desire clouds our judgment of risk or chance

The UK National Lottery

- 50 balls numbered 1 to 49
- 6 balls are randomly removed
- Possible combinations 49!/(6!(49-6)!) = 13,983,816
- Chance of winning 1:14 million
- To buy one ticket purchases hope
- To buy more than one demonstrates the triumph of hope over expectation
Reporting statistics

- What do we as clinicians need to know?
- How likely is it that the result is a ‘lottery win’?
  - If we make an observation enough times we will ‘win’!
  - We arbitrarily choose 1:20 (5%)
- How representative is the result?
  - What range of values might we expect to see if we repeated the observation
  - Confidence Interval
  - 95% of observations will fall in this range

A Theological View

“Our twentieth century, far from being notable for scientific scepticism, is one of the most credulous eras in all history. It is not that people believe in nothing - which would be bad enough - but that they believe in anything - which is really terrible.”

Malcolm Muggeridge

What we need to avoid

- False assumptions of knowledge
  - What is the evidence on which you believe something to be true?
  - Beware the ‘self-evident’ truth
- Bias
  - I want it to be so (conscious or unconscious)
- Chance
  - Improper use of statistics
- BE SCEPTICAL (but not cynical)

So what!

- All the journals use referees to check the papers for all this stuff
- Refereeing is an imperfect filtering process
- Referees can make the same mistakes as the authors
- Results are often reported in ways that make it difficult to use them in clinical decision making
  - No confidence intervals
  - No Number needed to treat
- All users of scientific reports need appraisal skills

Journals’ place in the process

- Central and essential
- Peer review
- Content
- Delivery
- Clinical research

Appraisal

- Practice of EBVM requires the readers to:
  - Know how to appraise papers
  - Have time and inclination
Peer review

- Becomes increasingly important
- Is increasingly difficult to perform
  - Statistics
  - Methodology
  - Technology
  - Pressure to publish
  - Sheer volume of work

User’s appraisal

- Similar criteria to those of a referee
- Less bothered by literary style etc.
- Close look at methodology
- Is the finding likely to be true
- Is the finding important

Is it true (for me!)?

- Standard appraisal criteria
  +
  - Case definition
  - Population
  - Follow-up
  - Facilities
  - Cost etc.

Is it important?

- What is the magnitude?
  - Number needed to treat
- How representative is the bottom-line figure
  - Confidence intervals

Therapy: a clinical scenario

- Boxer dog, vaccinated, neutered
- Pruritic
- Eliminated
  - Parasites
  - Primary bacterial & fungal disease
  - Food allergies
- Diagnosis atopy
  - Positive intradermal skin tests
- Therapy choices?

Therapy choice: a clinical scenario
Number Needed to Treat

- ARR = 5.5% ≈ 0.055
- NNT = 1/0.055 = 18.2

If we use cyclosporine on 18 dogs we will have helped one more than if we had used prednisolone

A small but tangible advantage

CIs for cyclosporine vs prednisolone

\[
95\% \text{ CI on the ARR} = \pm 1.96 \times \frac{0.286 \times (1 - 0.286) + 0.231 \times (1 - 0.231)}{14 + 13} = \pm 0.329 \approx 33\%
\]

CI for the NNT (best case) = \( \frac{1}{0.055 + 0.329} = 2.6 \approx \text{NNT 3 dogs} \)

CI for the NNT (worst case) = \( \frac{1}{0.055 - 0.329} = -3.6 = \text{NNH 4 dogs} \)

Qualitative studies

- ‘From recipes to adventures’
- The Open Question
- Epistemology
  - Positivism
  - Empiricism
  - Hypothetico-deductivism
- Scientific method
  - Absence of space for theory development
  - Elitism
  - Mythology
  - Cultural bias

Case Reports and Case Series

- Can form the basis of good qualitative research
- Is writing one a good training in either science or scientific writing?
- Are they of direct use to clinicians?
- New diseases or new manifestations of old diseases

Journal access

- Cost
  - Should it be free at the point of delivery?
- Delivery
  - The Internet
  - On-line early publishing
  - Some material: on-line only!
- Presentation
  - Structured clinical abstracts
  - Consistent use of NNT and CI
Costs of publishing

- Open access Internet publishing
- Who should pay?
- Why should the funders of research pay twice?
- ‘Publish or be damned’

CATs and POEMs

- Critically Appraised Topic
- Patient Orientated Evidence that Matters
- Address a single/simple clinical question
- Brief EBM analysis of the literature with conclusions
- Internet based, quick & easy to update

www.bestbets.org

Antibiotics are indicated following dog bites

www.bestbets.org
Clinical research

- Not enough
- Not good enough
- Poorly recognised
- The best papers are likely to have low citation indices

Practice-based research

- The place where most research will be applied
- The best place to identify questions that need answering
- Easiest access to appropriate clinical material
- Populated by skilled and motivated veterinarians

Barriers to Practice-based Research

- Education
- Academic elitism
- Access to supervision/mentoring
  - For performing research
  - For presenting material for publication
- Recognition of its value and potential rewards
- Time

Concluding remarks

- What we have isn’t broken
- Quality of reviewing is essential
- Online access is essential
- Consistent presentation
  - Structured clinical abstracts
  - NNTs and CIs
- Opportunities to innovate

Comment(s)

Do the studies need real antibiotics - mainly penicillin or penicillin-resistant penicillin. This paper accounts for the variable quality of the trials that were included. The tool for understanding of the relative risk was not significant (0.90, 0.98). Which is why the data cannot be used to address the issue of which antibiotics to provide, or which wounds are at higher risk of infection.

Clinical Bottom Line

One of the antibiotics for all types of dog bite wounds reduces the risk of infection by nearly half. A practice policy that limits antibiotic to higher risk wounds may be effective.

References

Thank you for listening

- Handbook of Evidence-Based Veterinary Medicine
- Peter Cockcroft & Mark Holmes, Blackwell Publishing