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EBVMA Evidence Anxiety Series

QUESTIONING AUTHORITY

Yes, you can critically appraise medical wisdom!

Can you determine...

- if a comparison is made between animal groups?
- how many animals are compared?
- if the animals are comparable and allocated fairly?
- if all groups are measured in the same manner?
- if the animals in the study are similar to the ones you see in your practice?

You should be able to determine these things about a study before looking at the results - each can be sources of bias (a.k.a. the things that cause results to be wrong!)

If this information is not available, ask more questions!

Prepared by EBVMA Website Steering Committee 7 May 2021

An important foundation of high-quality medicine is that health professionals should be willing and able to question authoritative declarations. Whenever a peer-reviewed article, a conference speaker, or an advertisement makes a truth-claim, the claimant should provide the necessary data for other health professionals to determine the validity and applicability of that claim.

To be able to evaluate a truth-claim, one must be able to clearly identify firstly that a comparison has been made and secondly, what was used as the comparison. Comparisons between two or more similar groups of animals provides results closer to real life; whereas if a treatment given to clinically-relevant populations is only compared to in-vitro or lab animal treatments that occurred in another place, time, and/or species - confidence in the truth-claim is greatly reduced. Studies without an appropriate control cannot be used to make a truth-claim; they are useful instead for directing further questions about causes, but do not provide answers.

The number of animals or groups of animals measured or observed provides necessary context as a professional considers the extent of uncertainty surrounding a claim based on few versus many observations. Claims based on very small groups are particularly prone to being refuted as more evidence is evaluated.

Claimants must be able to show that all study groups are essentially the same except for characteristics or treatments explicitly identified for comparison before the investigation is initiated. Fair comparisons can be assured by random allocation animals to receive treatments or diagnostic tests, or by appropriate selection among animals that are similar except for explicitly identified risk factors. Any method for determining how an animal becomes categorized into each comparison group that is not strictly impartial greatly increases the risk that claims will not withstand rigorous scrutiny.

Whether an outcome being investigated is subjective (such as being sick versus healthy or lame versus sound) or objective (such as body weight or serum hormone concentration), making sure that the person measuring or evaluating the outcome is not aware which treatment an animal received or which risk factor an animal possesses, is critical to ensure that pre-existing beliefs do not influence findings. Ensuring that

outcome evaluators do not know to which experimental group animals have been assigned is called blinding or masking. Reports in both the veterinary and human medical literature document the increased risk of biased outcomes when blinding is not explicitly described. For example, a study reported in the Journal of the American Medical Association found that studies that did not clearly indicate the method of blinding or that did not adequately use blinding, exaggerated the effectiveness of interventions by an average of 30% to 40% (Schultz et al, 1995). Another study investigating the importance of blinding found that un-blinded orthopedic studies reported 70% greater intervention effectiveness than blinded studies (Poolman et al., 2007). This does not mean researchers are intentionally modifying results, but every researcher has an underlying hypothesis that can subconsciously influence the likelihood of deciding which category an animal is subjectively assigned. But if implemented rigorously, blinding greatly reduces the chances of inadvertently introducing biased outcome assessments, and therefore even imperfect, subjective measures can serve as valid study outcomes.

And finally, an investigation may accurately measure or describe important effects or risks in the population of animals used for the study, but the results may not transfer to the animals encountered in your practice. For example the study may have used young beagles to test the effects of a disease prevention that you plan to administer to geriatric dogs of many different breeds, or a treatment protocol may have been investigated in rodent or human populations and you want to know the treatment effectiveness in cats, or a study to determine a diagnostic test's sensitivity and specificity may have been conducted in otherwise healthy cattle that were inoculated with known quantities of an antigen and you want to know the test accuracy when the exposure is natural and animals may have co-morbidities. In all these situations, the confidence with which one can transfer a truth-claim in one population of animals to another population is dependent on the similarity of the study population to your clinically relevant population.

Any health professional should be able to appraise a truth-claim without specific training in statistics or experimental design. If a claim is made without a clear comparison population that aligns with the assertion, or if there is evidence that the animals were

not allocated to treatment fairly or evaluated fairly, then the validity of the claim can be confidently doubted. In addition, a claim that is based on animals that have important differences compared to your patients may not be applicable to your clinical practice.

Questioning authority has an important role in clinical decision making by providing a set of questions that must be addressed by any truth-claim. A claimant must clearly communicate exactly what comparison was made, how many animals were studied, and if animals were selected and evaluated fairly between comparison groups. If an authority does not provide the information necessary to address these valid questions, or provides answers that indicates that the claim is not sound, critically thinking veterinarians must act accordingly.

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