Top 5 Steps to Practice Evidence-Based Veterinary Medicine

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Veterinarians in all disciplines[1] should use optimal diagnostics, interventions, and medications to examine and treat veterinary patients. However, many veterinarians may not be using the newest information to aid clinical decision-making.

The principles of evidence-based veterinary medicine (EBVM) provide structured methods for processing the large amount and different types of clinical trials, studies, and other information available and applying that information to clinical case management.[2] In the context of a specific case, following the 5 steps of EBVM[3] can help veterinarians avoid mistakes, be more circumspect in practice, and provide the best patient care.

1 Ask

Formulate a relevant and answerable clinical question.

It is important for veterinarians to recognize knowledge gaps and limitations when facing a specific case. Using treatment protocols simply because they have "always been used" is often not appropriate in the rapidly developing veterinary field. Accepting that more valid information is needed to make an appropriate clinical decision is the first step in using the concepts of EBVM.

After identifying a gap in knowledge, situations or concepts that are often complex should be broken down into a precise clinical question. For example, a veterinarian treating pyometra in a dog should not simply ask, *How should I treat a pyometra case?* Instead, the veterinarian should formulate a question that addresses all aspects of the case. The PICO approach is a practical way to formulate a question:

- P: Patient, population, and problem
- I: Intervention
- C: Comparison or control
- O: Outcome

In the pyometra example, the *patient* and *problem* element is a female dog with pyometra. *Interven-*

TOP 5 STEPS TO PRACTICE EVIDENCE-BASED VETERINARY MEDICINE

1. Ask
2. Acquire
3. Appraise
4. Apply
5. Assess

tion would involve hysterectomy, whereas choosing to do nothing would serve as a *control*. A hysterectomy as intervention can also be *compared* with the choice to treat with progesterone blockers or antibiotics. Finally, the *outcome* is considered: Will the patient survive or maintain fertility?

Considering each of the steps in the PICO approach leads to the precise clinical question, *In a 6-year-old female dog with open pyometra and only moderate clinical signs and slight WBC elevation, does hysterectomy have a better survival rate as compared with treatment with progesterone antagonists and antibiotics?* The clinician can then research surgical versus medical treatment for pyometra.

A PICO question can be adjusted to different situations, including treatment considerations (eg, *What medication is best? Is there risk for negative reaction?*) or diagnostic questions (eg, *Which diagnostic test provides the most reliable results?*).

2 Acquire

Access the best available information to answer your question.

With so much information available, it may not be practical to read all veterinary journals. Thus, veterinarians should develop skills to efficiently find relevant articles via literature databases (eg, PubMed, CAB Abstracts). After developing a PICO-based question, the terms determined in the PICO process can be used as search terms. In the pyometra case example, "pyometra in a dog," "hysterectomy," "surgical intervention," "medical management," "fertility," and "antibiotics" could all be used to search for relevant data.

It can be difficult to determine whether an article or study will contain the expected information based on an abstract or title alone. Many journals charge considerable fees to access articles, making it difficult for veterinarians to decide whether an article is relevant and worth purchasing. To overcome these obstacles, some projects aim to provide knowledge synthesis, systematic reviews, and meta-analysis of journal content (see ***Suggested***

CHECKLIST 1

CHECKLIST TO ASSESS THE QUALITY OF RESEARCH ON DIAGNOSTIC TESTS

Evaluation of diagnostic tests should include examination of the usefulness of new diagnostic tests. Results of a new diagnostic test are typically compared with current gold standard outcomes to establish the sensitivity, specificity, and likelihood ratios for the new diagnostic test.

Study Design	
The disease/condition to be tested is clearly defined.	1 point
Clear thresholds for physiologic/nonphysiologic conditions are defined.	2 points
Clear inclusion/exclusion criteria for patients/samples are reported.	1 point
An appropriate number of patients/samples was included in the study.	1 point
The test procedures are described in detail.	1 point
The study was blinded.	2 points
Test Characteristics	
The test was compared to an acknowledged gold standard.	1 point
Sensitivity and specificity of the test are given.	2 points
Repeatability of the test is good (same results when test is repeated).	1 point
Possible bias or other problems of the test (preanalytical/analytical) are discussed.	1 point
Practical Relevance	
Quality of the test results is discussed in context to other diagnostic tools for the given disease/condition.	1 point
Applicability and reliability of the test in practice is discussed objectively.	1 point
Add the given rating points to obtain the overall rating score.	____ points

15-13 = very good, 12-10 = good, 9-7 = satisfactory, 6-4 = adequate, 3-2 = inadequate, 1 = fail

EBVM = evidence-based veterinary medicine

Reading, page 66).[4] Meta-analyses summarize information and statistically analyze the results of different clinical trials relating to a specific topic to formulate concise and advanced conclusions. Systematic reviews aim to collect and interpret all available information on a specific topic without a statistical approach but with a defined and rigorous search method. Knowledge syntheses (also referred to as critically appraised topics) are standardized summaries of research evidence around a specific clinical question, usually generated from a specific case or problem. Inclusion of case reports in knowledge syntheses is uncommon, as they are prone to bias. No quantitative assignments exist for meta-analyses, systematic reviews, or knowledge syntheses.

CHECKLIST 2

CHECKLIST TO ASSESS THE QUALITY OF REVIEWS

Literature reviews in journals aim to objectively summarize recent knowledge on a specific topic. In general, these knowledge compilations can be helpful. However, sometimes it is unclear how cited publications were selected and what the authors based their conclusions on. This checklist aims to provide an objective assessment of bias in literature reviews.

Literature Search & Inclusion	
Literature search was conducted systematically via databases and is well documented.	4 points
The used search terms are documented.	2 points
More literature was searched in reference lists of acquired articles.	1 point
Inclusion and exclusion criteria for papers are well documented.	2 points
Assessment	
The quality of each paper was assessed systematically.	4 points
The findings and conclusions are discussed objectively.	2 points
Add the given rating points to obtain the overall rating score.	____ points

15-13 = very good, 12-10 = good, 9-7 = satisfactory, 6-4 = adequate, 3-2 = inadequate, 1 = fail

A knowledge synthesis may be helpful if the specific clinical question is very similar to the posed PICO question. In other cases, reviews might provide a broader overview about different options and give helpful background information. Large-scale reviews of evidence, common in human medicine, would be helpful in veterinary medicine but are not generally available.

3 Appraise

Assess the quality of the relevant evidence found.

After reading a study, trial, or article, the clinician must assess the information's quality. Evidence can be ranked from weak to strong based on methodology.[5] The following questions may be helpful in assessing information[5]:

- Is the information relevant to my clinical question or my patient(s)?
- Is the study design appropriate to answer my clinical question?
- Is the level of evidence and the quality of the paper good enough to rely on the results?

Checklists are available to guide veterinarians through determining whether the level of evidence and quality of the paper are good enough to rely on the results (***Checklists 1***, previous page, ***2***, and ***3***). However, checklists are not comprehensive and do not cover all possible scientific research approaches.[6] The literature evaluation form (***Checklist 3***) can be helpful in assessing the quality of treatment information in a study but is not the only method available for determining quality. When using it to assess the quality of information, clinicians should first determine the evidence level (eg, meta-analysis, clinical trial, case report, expert's opinion or experience). Quality criteria such as study design, information content, and objectivity should then be assessed.

By assigning a subjective score for each area in the checklist and totaling these ratings to obtain an overall score (***Checklists 1***, previous page, and ***2***), an impression of the quality and practical

CHECKLIST 3

CHECKLIST TO ASSESS THE QUALITY OF RESEARCH ON INTERVENTIONS

Step 1: Evidence Level		
Meta-analysis (statistical combination of the results of several studies)	☐	5 points
Clinical trial	☐	3 points
Case report	☐	2 points
Expert's opinion or experience	☐	1 point
Step 2: Additional Quality Criteria (Regarding the Corresponding Evidence Level)		
Meta-Analysis	**Agree**	
The literature search was exhaustive and reproducible.	☐	2 points
The included trials were comparable from a clinical point of view.	☐	4 points
Trials of a high quality (eg, randomized, controlled, blinded) were included.	☐	2 points
Results are discussed objectively and critically, including questions regarding comparability and publication bias.	☐	2 points
Clinical Trial	**Agree**	
The trial comprised a sufficient number of animals or samples.	☐	2 points
Essential information regarding the animals are given (eg, number, breed, age, sex, inclusion criteria, housing).	☐	1 point
The trial comprised an adequate control group.	☐	3 points
The trial is randomized.	☐	1 point
The trial is blinded.	☐	1 point
Examinations and interventions are described in detail. Results are presented completely.	☐	1 point
Adequate statistic procedures were used. Data is complete, or missing data is documented sufficiently.	☐	1 point
Results are discussed critically.	☐	1 point
The bibliography is adequate (extent and up to date).	☐	1 point
Case Report	**Agree**	
Essential information regarding the animals are given (eg, number, breed, age, sex, inclusion criteria, housing).	☐	2 points
Examinations and interventions are described in detail.	☐	2 points
Results are discussed critically.	☐	2 points
The bibliography is adequate (extent and up to date).	☐	1 point
Expert's Opinion or Experience	**Agree**	
Results are discussed critically.	☐	1 point
The bibliography is adequate (extent and up to date).	☐	1 point
Step 3: Summate Rating Points to Obtain the Overall Rating Score.		___ points

15-13 = very good, 12-10 = good, 9-7 = satisfactory, 6-4 = adequate, 3-2 = inadequate, 1 = fail

From Arlt SP, Heuwieser W. Training students to appraise the quality of scientific literature. *J Vet Med Educ*. 2011;38(2):137. doi: 10.3138/jvme.38.2.135.

applicability of the information in a given study or paper can be formed.

The methods section should be reviewed to determine the study type and whether possible bias was addressed appropriately. Common sources of bias in veterinary literature include a small number of animals, lack of or incomparable control groups, missing specifications of diagnostic procedures, or missing definitions of diseases. Earlier studies have shown that common flaws in many papers include poor reporting of essential information (eg, age and medical history of the animals in the study), small sample size, missing enrollment criteria, and missing information on allocation and blinding.[1,7] These are all factors that determine the quality of information and should be considered when deciding whether a study or paper is reliable.[3]

It is not possible or necessary for the reader to recalculate all the statistics given in a paper. However, by assessing other factors, the clinician can make some determination of quality.

4 Apply

Implement the evidence into clinical practice.

After new information is proven to be of good quality, the information should be assessed to determine if it is appropriate for a patient's condition. The availability of the suggested therapies, availability of equipment, the veterinary team's skills, whether the circumstances of the study are similar to the patient's circumstances, the owner's wishes, and legal and ethical aspects should all be considered. In the pyometra case example, step 4 involves discussing intended treatment extensively with the owners, including potential complications and recurrence.

Any new clinical applications or approaches should be communicated to the veterinary team and the pet owner. Even small changes concerning specific cases, practice protocols, or other routines in the practice may have a large impact on clinical outcomes, the practice, and the clinician's professionalism.

5 Assess

Evaluate the impact of the changes.

Because improving clinical practice is a never-ending task,[8] clinicians should assess whether changes implemented as a result of EBVM really led to better outcomes. Although it is easy to reflect on cases in which something went wrong or that had an unexpected outcome, it is also important to reflect on what went well in cases with positive outcomes. Assessment can be as simple as a personal reflection on individual cases at the end of a busy day. A more thorough assessment could include a reflection on the PICO-based clinical question, answers found through research, and a comparison to the actual outcome of the case. Finally, a formal practice-wide audit based on these 5 steps could be conducted.

EBVM = evidence-based veterinary medicine

See page 66 for references.

Amitriptyline

CORRECT RESPONSE 

Stress is thought to contribute to the development of FIC.[9-11] Amitriptyline, a tricyclic antidepressant that has both anxiolytic and analgesic action, may be beneficial in managing patients with severe or recurrent disease. Side effects include sedation, salivation, urine retention, thrombocytopenia, and neutropenia. Although there is insufficient evidence to support use of amitriptyline as a short-term medication, long-term use of this drug may be considered if or when other evidence-based methods of control—which include moist diet, veterinary therapeutic urinary diet, and multimodal environmental modification or environmental enrichment[11]—have not delivered a desired response.

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FIC = feline idiopathic cystitis

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Suggested Reading

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