



**Timothy A. Allen,
DVM, DACVIM**

**Philip Roudebush,
DVM, DACVIM**

Hill's Pet Nutrition, Inc.
Topeka, Kansas

A commonly used definition of evidence-based medicine states that "EBM is the integration of best research evidence with clinical expertise and patient values."

Application of Evidence-Based Medicine to Veterinary Clinical Nutrition

EVIDENCE-BASED MEDICINE CONCEPTS

The term "evidence-based medicine" (EBM) and associated concepts were first advanced by a group at McMaster University Health Sciences Centre in Canada and published in the early 1990s.¹⁻⁵ The underlying concepts, however, are not new. Rooted in clinical epidemiology, EBM reflects a movement to establish clinical medicine as a verifiable scientific activity.⁶ The concepts of EBM have also been discussed in several disciplines of veterinary medicine.^{3,7,8}

A commonly used definition of EBM states that "EBM is the integration of best research evidence with clinical expertise and patient values."² Best research evidence means clinically relevant research, especially from patient-centered clinical trials. Clinical expertise refers to the ability to use clinical skills and past experience to rapidly identify each patient's unique health state and diagnosis, the patient's individual risk, and the benefits of potential interventions.

Patient values include the unique preferences, concerns, and expectations each human patient brings to a clinical encounter and which must be integrated into clinical decisions to best serve the patient. In the case of animals, the concept of "patient values" must be extended to include the unique preferences, concerns, and expectations of the animal owner. The term "evidence-based clinical nutrition" attempts to integrate medical and

Key Points

- Evidence-based clinical nutrition attempts to integrate medical and nutritional research with clinical practice in the most efficient manner.
- Good decisions are reached through the integration of clinical expertise, research evidence, and owner/patient preferences.
- Implementing evidence-based medicine in your practice can improve the effectiveness of diagnostic, therapeutic, and nutritional interventions, resulting in better patient outcomes.
- High-quality evidence such as systematic reviews and randomized, controlled clinical trials is the most reliable predictor of results likely to be seen in clinical practice.
- Nutritional management often has equal or better evidence for its use compared to more traditional modes of therapy.

A Conceptual Model for Evidence-Based Clinical Decisions

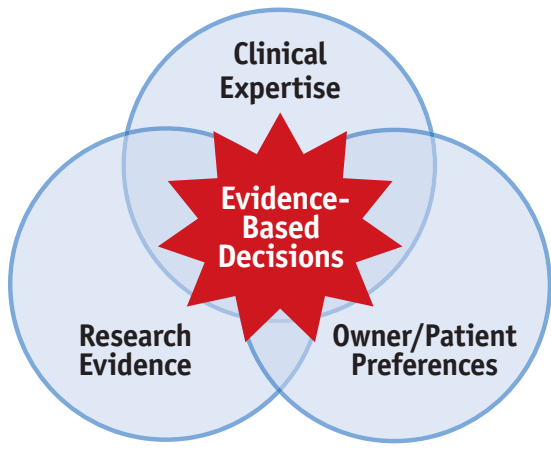


Figure 1: The best clinical decisions are made when clinical expertise, high-quality research evidence, and owner/patient preferences overlap. (Adapted from reference 9.)

nutritional research with clinical practice in the most efficient manner.

A conceptual model for evidence-based clinical decisions is outlined in **Figure 1**. The model shows that the best evidence-based clinical decisions are made when clinical expertise, research evidence, and animal owner or patient preferences overlap. This model can be easily adapted to veterinary clinical nutrition in which assessment of the animal, food, and feeding method leads to a comprehensive feeding plan¹⁰ based on current best evidence.

The challenge of integrating individual clinical expertise with current best evidence from medical and nutritional research is complex. Veterinarians usually seek to base their decisions on the best evidence available. This evidence often represents extrapolations of pathophysiological principles, studies in other species, and logic rather than established facts based on data derived from patients in clinical trials.¹¹ The advent and proliferation of randomized, controlled clinical trials have led to an increase in the quantity and quality of clinically valid evidence. When possible, veterinarians should use information derived from systematic, rigorous, controlled clinical studies to make diagnostic and treatment decisions.

RULES OF EVIDENCE

Scientific evidence is the product of well-designed and well-controlled research investigations. A single research

study does not constitute “the evidence” but rather contributes to a body of knowledge that has been derived from multiple studies investigating the same area. Unfortunately, there is neither a central repository for clinical nutrition information nor one system for establishing quality evidence.

Traditional sources of evidence include printed materials such as textbooks, personal journal collections, conference proceedings, and clinical guidelines. Much of this evidence is not based on well-conducted clinical studies in the target species. Many clinical and nutritional interventions are used because the basic pathophysiological rationale makes sense, even though true clinical outcome data are lacking to show a positive effect.

Sources regarded as strong evidence include randomized controlled clinical trials or systematic reviews of more than one trial (meta-analysis). These are followed respectively by epidemiological studies (cohort studies, case-control studies), models of disease, and case series. The hierarchy of evidence is based on the notion of causation and the need to control bias (**Figure 2**).

APPLYING EVIDENCE TO THE INDIVIDUAL PATIENT

When clinical trial data are available, the following guidelines can be used to decide the applicability of evidence to nutritionally manage an individual patient:¹³⁻¹⁵

The Evidence Pyramid



Figure 2: It is important for veterinarians to identify, evaluate, and apply the most relevant evidence in making therapeutic decisions. The above pyramid illustrates the various sources of information available to aid veterinarians in the decision-making process. As a general rule, the quality of evidence increases as it nears the top of the pyramid. Strong evidence such as randomized, controlled, patient-centered clinical trials are the most reliable predictors of results likely to be seen in clinical practice. (Adapted from reference 12.)

- Were outcomes of the study clinically relevant?
- Are there patient differences or potential drug-nutrient interactions that may alter the treatment response?
- Are there differences in the nutrient profile of the food or supplement that may alter the treatment process?
- Is the food or supplement readily available and economically feasible?
- Is the nutritional intervention feasible in the animal owner's setting?
- What are the patient's likely benefits and harms from nutritional management options?
- How will the animal owner's values or patient's preferences influence the decision regarding nutritional management?
- Does the patient have comorbid conditions that significantly alter the potential benefits and risks of nutritional management?

Clinical practice guidelines are designed to improve patient outcomes; they are the translation – the implementation – of evidence-based medicine into actionable best practices.¹⁶ Such guidelines, if they represent the highest quality evidence, can improve the effectiveness of diagnostic, therapeutic, and nutritional interventions. Adopting veterinary clinical practice guidelines that include elements of EBM and clinical nutrition, and adapting them to each patient will likely improve patient outcomes.

SUMMARY

Finding and utilizing the best evidence available may sometimes prove a difficult task. When possible, veterinarians should use information derived from systematic, rigorous, controlled nutritional studies conducted in a clinical or research animal colony setting with animals of the target species. Fortunately, nutritional management often has equal or better evidence for its use compared to more traditional modes of therapy.

REFERENCES

1. Geyman JP. Evidence-based medicine in primary care: an overview. In: Geyman JP, Deyo RA, Ramsey SD, eds. *Evidence-based clinical practice: concepts and approaches*. Boston: Butterworth-Heinemann, 2000;1–11.
2. Sackett DL, Straus SE, Richardson WS, et al., eds. *Evidence-based medicine: how to practice and teach EBM*, ed 2. Philadelphia: Churchill-Livingstone, 2000.

Application of Evidence-Based Clinical Nutrition to Case Management

A 10-year-old neutered male shih tzu is examined as part of routine health maintenance. Body weight is 7.5 kg (16.5 lb) with a typical body condition score (3 on a 5-point scale). The owners report a recent increase in water consumption and frequency of urination. Results of physical examination are unremarkable, except for mild periodontal disease. Laboratory tests are performed, including a hemogram, urinalysis, and serum biochemical analysis. Azotemia is detected, with an increase in serum creatinine concentration (2.5 mg/dl; reference range, 0.4 to 1.8 mg/dl) and urine specific gravity of 1.018. Results of other laboratory variables are within reference ranges. Subsequent microbial culture of a urine sample yields negative results and virtually eliminates the possibility of a urinary tract infection. The tentative diagnosis is naturally developing chronic renal failure. As the attending veterinarian, you must answer the following question: For dogs with early renal failure, does dietary management delay the onset of uremic crises, reduce the risk of future uremic crises, improve quality of life, or delay death?

A literature search reveals a randomized, controlled clinical study that evaluated the effect of dietary modification for treatment of dogs with naturally developing chronic renal failure.^{17,18} Analysis of results of that study indicated that a food formulated for dogs with renal conditions had a beneficial effect regarding uremic crises and mortality rate in dogs with mild to moderate naturally developing chronic renal failure, compared with results for an adult maintenance food. Dogs fed the therapeutically formulated food had a slower decline in renal function, reduction in mortality rate, and improved health-related quality of life compared to dogs fed the adult maintenance food. It was also reported in the study that feeding the therapeutically formulated food to dogs with a lesser degree of azotemia (serum creatinine concentration, 2.0 to 3.1 mg/dl) delayed the onset of uremic crises for approximately 5 months.

The study represents Grade I evidence, which is the highest quality of evidence. Your patient is extremely similar to dogs enrolled in the published clinical study, and the food used in the study is a commercially available therapeutic food that is readily available and economically feasible. Evidence of Grades III or IV, which are weaker forms or lower qualities of evidence, also exist for use of dietary modification of single nutrients in dogs with experimentally induced renal failure. On the basis of this evidence, use of the therapeutically formulated food and other tenets of conservative medical management should be strongly recommended for your patient, providing owner and patient preferences are satisfied.

3. Cockcroft P, Holmes M. Handbook of evidence-based veterinary medicine. Oxford, U.K.: Blackwell Publishing, 2003.
4. Evidence-Based Medicine Working Group. Evidence-based medicine: a new approach to teaching the practice of medicine. *JAMA* 1992;268:2420–2425.
5. Sackett DL, Rosenberg WA, Gray JA, et al. Evidence-based medicine – what it is and what it isn't. *BMJ* 1996;312:71–72.
6. Naldi L, Braun R, Saurat J-H, et al. Evidence-based dermatology: a need to reset the agenda. *Dermatol* 2000;204:1–3.
7. Keene BW. Towards evidence-based veterinary medicine (editorial). *J Vet Intern Med* 2000;14:118–119.
8. Moriello KA. Introducing evidence-based clinical reviews in Veterinary Dermatology (editor's commentary). *Vet Dermatol* 2003;14:119–120.
9. Haynes RB, Sackett DL, Gray JMA, et al. Transferring evidence from research into practice: 1. The role of clinical care research evidence in clinical decisions. *ACP Journal Club* 1996;125:A14–A16.
10. Thatcher CD, Hand MS, Remillard RL. Small animal clinic nutrition: an interactive process. In: Hand MS, Thatcher CD, Remillard RL, et al., eds. *Small Animal Clinical Nutrition*. ed 4. Mark Morris Institute, Topeka, KS, 2000;1-19.
11. Rosenberg WM, Sackett DL. On the need for evidence-based medicine. *Therapie* 1996;51:212–217.
12. SUNY Downstate Medical Center. Guide to research methods: the evidence pyramid. Medical Research Library of Brooklyn Web site. Available at <http://library.downstate.edu/dbm>. Accessed Nov 2, 2003. Reprinted with permission.
13. Strauss SE, Sackett DL. Applying evidence to the individual patient. *Ann Oncol* 1999;10:29–32.
14. Dans AL, Dans LF, Guyatt GH, et al. Users' guide to the medical literature. XIV. How to decide on the applicability of clinical trial results to your patient. *JAMA* 1998;279:545–549.
15. Dans AL, Dans LF, Guyatt GH, et al. Users' guide to the medical literature. XX. Integrating research evidence with the care of the individual patient. *JAMA* 2000;283:2829–2836.
16. Pinsky LE, Deyo RA. Clinical guidelines: A strategy for translating evidence into practice. In: Geyman JB, Deyo RA, Ramsey SD, eds. *Evidence-based clinical practice: concepts and approaches*. Boston: Butterworth-Heinemann, 2000;119–123.
17. Jacob F, Polzin DJ, Osborne CA, et al. Clinical evaluation of dietary modification for treatment of spontaneous chronic renal failure in dogs. *J Am Vet Med Assoc* 2002;220:1163–1170.
18. Jacob F, Osborne C, Polzin D, et al. Effect of dietary modification on health-related quality of life (HRQL) in dogs with spontaneous chronic renal failure (abstract #121). In: *Proceedings, 22nd ACVIM*. Minneapolis, MN, 2004;828.

Summarized from Roudebush P, Allen TA, Dodd CE, Novotny BJ. *Application of evidence-based medicine to veterinary clinical nutrition. J Am Vet Med Assoc* 2004;224:1766-1771.

This article as well as further information on the topic are available on the Web at www.HillsVet.com/ConferenceProceedings.