Problem-oriented Exotic Companion Animal Practice

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Abstract

Problem-oriented veterinary medicine is a method of hypothetico-deductive clinical reasoning that can be recorded and easily understood by others. It is a stepwise process of gathering case information; defining problems; making plans for diagnosis, treatment, and client education; and evaluating patient progress over time. This explicit method of diagnostic reasoning forms the basis of evidence-based veterinary medicine and informed decision making. The goal of this article is to describe how problem-oriented veterinary medicine can help veterinarians refine case information into a diagnosis, satisfy the concerns of their clients, and provide the best possible quality of life for their exotic companion animal patients.

Key words: **DAMNIT; decision making; exotic companion animal; medical records; problem-oriented veterinary medicine; SOAP**

Veterinarians use clinical reasoning to protect the health and relieve the suffering of animals, and to investigate problems to provide the most appropriate treatment. The problems that veterinarians must consider when treating animals include client concerns, husbandry concerns, clinical signs, abnormal test results, and pathophysiological syndromes. The scientific approach to veterinary clinical problem solving is based on 4 steps: (1) identifying a problem; (2) making a hypothesis about how to solve the problem; (3) initiating diagnostic and therapeutic trials based on the hypothesis; and (4) proving or disproving the hypothesis through critical evaluation of results.[1] Problem-oriented veterinary medicine (POVM) organizes case information so it can be recorded, easily understood by others, and defended in a court of law. Problem-oriented veterinary medical records (POVMR) is the method many veterinarians use to do this and has been in place for more than 40 years.[2] Veterinarians frequently refer to POVM as a patient "SOAP," which is an acronym for the process of recording subjective (S) and objective (O) information, the clinical logic used to define and assess (A) each problem, and the diagnostic, therapeutic, and client education plans (P) instituted to address each problem. In addition, a POVMR includes progress notes that describe updated SOAPs entered during follow-up evaluations over time. Progress notes allow attending veterinarians to quickly review the status of the case and should include: (1) the goal of management, (2) the clinical signs caused by the problem (S), (3) the status of the patient (getting better, worse, or unchanging) in regard to the problem (S), (4) results of recheck diagnostic tests (O), (5) the basis for the problem statement (A), (6) potential complications

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Figure 1. Problem-oriented veterinary medicine is a cyclical process directed toward identifying a specific diagnosis and implementing effective treatment.

for which to monitor (P), and (7) how the problem is to be further investigated (P).

Modern veterinary students learn POVM (Fig 1) during their clinical training, and many veterinary graduates continue to regularly use the system. Most veterinarians practicing today apply the basic principles as an aide when working through difficult cases. The POVM method offers a technique for keeping clear, explicit medical records that are especially important in group, referral, and emergency practices, and for teaching. In addition, POVMR are immensely valuable in practices that employ locum tenens (relief veterinarians) because continuity of case oversight can be provided to clients and patients. In short, an accurately defined problem list can directly result in thorough, efficient patient care and appropriate treatment.[3] Exotic animal veterinary practice calls for the problem-oriented approach because these patients regularly present with complicated, previously unreported challenges. The goal of this article is to describe how POVM can be used to help veterinarians obtain a diagnosis, satisfy the concerns of their clients, and ensure the best possible quality of life for their exotic companion animal patients.

Step One: Information Gathering

Subjective Information

Start with a through medical history (anamnesis) and physical examination. In general, this information is descriptive and is considered by many to be "subjective." Clients provide the chief complaint or complaints. In exotic animal medicine, veterinarians often request that clients complete a prepared history form so one can efficiently gather detailed information about husbandry parameters such as housing, bedding, lighting, thermal environment, water provision, nutrition, sanitation, potential stressors, reproductive activity, and exposure to infectious diseases. Information about husbandry parameters can substantially contribute to the initial problem list and form the pathophysiological basis for the disease condition.

Record the physical examination findings by describing the way external anatomical features and physiologic parameters are measured and perceived by the senses of hearing, smell, touch, and sight. Findings should be described with terminology similar to that used for pathologic descriptions. Record anatomic location, distribution, color, shape, firmness, odor, sounds, and how the patient responds (movement and vocalization) to visual, auditory, and tactile stimuli. Simply describing the problem without interpretation helps prevent one from forming the wrong conclusion and missing important information. Exotic companion animals are, in general, more susceptible to fear during the examination than are domestic pets, so perform the physical examination in stages. The first stage is "hands off" and involves observation of the animal and the environment in which it is presented. Feces, urine, eating, activity, and response to visual and auditory stimuli are the key elements of the first stage of an internal physical examination. If the patient is judged to be in serious or critical condition, then delay the second stage until the animal has accommodated to the hospital environment with rest, oxygen, and heat support. The second stage is "hands on" and is similar to an examination of companion domestic species. Prepare all equipment, follow a routine, and examine obvious lesions after everything else. A preprinted checklist helps avoid omissions. Speak findings aloud to create a personal commitment, either to learn about unfamiliar, potentially normal findings or to generate a diagnostic plan for abnormal findings that may or may not be related to the chief complaint. Openness and honesty between the veterinarian and client build trust; it is acceptable to lack knowledge, but it is unacceptable to conceal a lack of knowledge.

Objective Information

Vital signs, species, breed, color, sex, age, weight, and size of the patient and its lesions are all forms of objective case information. In addition, the diagnostic screening protocol for exotic animals may in-

clude a complete blood count, plasma biochemistry panel, urinalysis, fecal examinations, and whole-body radiographs. In birds, and possibly certain reptile species, ionized calcium and protein electrophoresis should be included in the biochemistry panel because blood calcium cannot be interpreted from total calcium levels[4] and albumin cannot be reliably measured with standard dye-binding techniques.[5] Disease-specific diagnostic tests may be considered a part of the diagnostic screening protocol where the local prevalence of a disease is high. Screening tests are essential for exotic animals because the problems identified in the history and physical examination are usually not sufficient to begin the diagnostic process. Examples of common, nonspecific signs of illness include ruffled feathers in birds, unkempt coat in mammals, and anorexia in reptiles. Abnormalities in objective information are ranked as second-level problems and, during assessment, are combined with subjective information to begin understanding the pathophysiology of a disease process.

Step 2: Problem Identification and Assessment

Problems can be stated as subjective evidence, objective evidence, pathophysiological syndromes, or specific diagnoses. Avoid overstating problems by including rule outs or differential diagnoses. Define problems at the highest possible level of diagnostic refinement (Fig 2) based on subjective and objective case evidence and known pathophysiological disease mechanisms. Start with subjective and objective problems and, whenever possible, interpret these using background knowledge and published research evidence about disease mechanisms to combine and refine problems up to the third level, the pathophysiological syndrome. Once the problems are described at the highest level of refinement, hypothesize a list of differential diagnoses. The DAMNIT mnemonic (Table 1) is one tool that can help to formulate this list of hypotheses. Begin with 3 to 5 likely differential diagnoses for the problem and rank them according to probability. The "leading hypothesis" is the most probable of the differential diagnoses, and the others are "alternative hypotheses." The probability used to rank these differential diagnoses is referred to as "pretest," because diagnostic tests will be used to either increase (rule in) or decrease (rule out) the "posttest" probability of each differential diagnosis until a specific diagnosis is identified. The leading hypothesis is often referred to as a "working diagnosis."

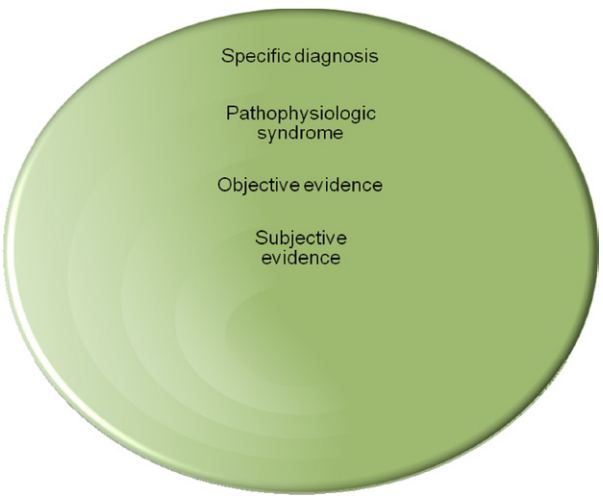

Figure 2. Levels of diagnostic refinement. This figure represents a graded bowl with "subjective evidence" at the bottom and a "specific diagnosis" at the top.

It is tempting, particularly for experienced clinicians, to guess the most likely diagnosis for a problem and shortcut the hypothetico-deductive diagnostic process.[6,7] Diseases that have not previously been encountered are likely to be missed when the hypothetico-deductive process is circumvented immediately after gathering case information. When veterinarians clearly define the problems and remain cognizant of the true level of diagnostic refinement, they are better prepared to accomplish their goals of client satisfaction through efficient use of funds for necessary diagnostic tests and patient quality of life via appropriate therapy.

Step Three: Planning

Diagnostic Plans

Problem-specific diagnostic tests are just as important in exotic animal practice as in domestic animal medicine. An ever-increasing body of clinical research provides strong evidence to support the use of many different clinical diagnostic methods in exotic animals. It is important, of course, to acknowledge that the accuracy of diagnostic tests is often species specific. For example, the diagnostic sensitivity of a fecal occult blood test might be similar between an herbivore and a carnivore, but diagnostic specificity probably differs greatly. So, it is not reasonable to conclude that a diagnostic test validated in one species will also be valid in a different species. Knowledge of this difficulty does not stop the diagnostic process, but instead motivates creativity and clinical research. A way to improve one's knowledge

Table 1. Mnemonic of diagnostic categories

Disease Category	Example Diagnoses
D	
Degenerative	Osteoarthritis, senile degeneration
Developmental	Shunts, organ agenesis, hypoplasia
A	
Anomalous	
Autoimmune	
Atmospheric	Environmental parameters, microhabitat
Allergic	
M	
Metabolic	Hormonal disorders, enzyme disorders, gout, lipidosis, xanthomatosis
Mechanical	Thermal, pressure, radiation, obstruction
Mental	Behavioral, psychological
N	
Neoplasic	Benign, malignant, encapsulated, locally invasive, metastatic
Nutritional	Deficiencies, excesses, insufficient UVB
I	
Infectious	Aerobic bacterial, anaerobic bacterial, chlamydophilial, mycobacterial, mycoplasmal, rickettsial, viral, fungal, parasitic, protozoal, microsporidial
Ischemic	Vascular, thromboembolic
Immune-mediated	
Other inflammatory	Eosinophilic, lymphocytic, plasmacytic, amyloidosis
Inherited	Coagulation factor deficiencies, enzyme deficiencies, lysosomal storage diseases
Idiopathic	
Iatrogenic	Drugs, surgery
T	
Toxic	Endogenous, exogenous
Traumatic	Internal stone formation, external forces

of a diagnostic test's performance is to correctly evaluate a patient's disease status at the same time as a similar patient that is clinically normal. Although this is not a statistically significant sample size, the results of the test can be anecdotally convincing if there is a substantial difference between the two individuals. Ideally, this case-control scenario would involve dozens of individuals, and in a busy hospital, the results of repeated case-control events can become statistically significant over time if results are compared with a "gold standard" test. Examples of readily available, problem-specific diagnostic tests include hormone testing (e.g., sex hormones, thyroid hormone, insulin, vitamin D); nutrients (e.g., zinc, copper, vitamin A); toxin measurement (e.g., heavy metals, illicit drugs); cytologic examination of aspirates and impression smears; bacterial and fungal cultures; mycobacterial culture; serologic tests (e.g., immunofluorescence, hemagglutination inhibition, serum neutralization, complement fixation, enzyme-linked immunosorbent assay); molecular diagnostics (e.g., polymerase chain reaction, reverse transcriptase polymerase chain reaction, in situ hybridization, polyacrylamide gel electrophoresis); electron microscopy; histopathology with or without special stains or molecular diagnostics; electrocardiography; electromyography; electroencephalography; plain and contrast radiography; ultrasonography; endoscopy; computed tomography; magnetic resonance imaging; and nuclear scintigraphy.

Outline a diagnostic plan (Fig 3) that is directed toward increasing (ruling in) or decreasing (ruling out) the posttest probability of the leading hypothesis. In follow-up evaluations over time, move down the ranked differential diagnosis list and rule out each successive alternative hypothesis until a specific, or etiologic, diagnosis is substantiated with compelling diagnostic evidence.[7] In exotic animal medicine, it can be difficult to assign numerical probabilities[8] because few clinical trials of diagnostic test accuracy (i.e., sensitivity and specificity of a test for a disease in a population with defined prevalence) have been published. Whenever possible, one should base diagnostic test selection and interpretation on the best-available published research evidence.

Therapeutic Plans

Always begin with empirical supportive care based on clinical signs and background knowledge about the species being treated. For example, birds and reptiles almost always benefit from heat support when they are ill, whereas chinchillas may be adversely affected by increased environmental temper-

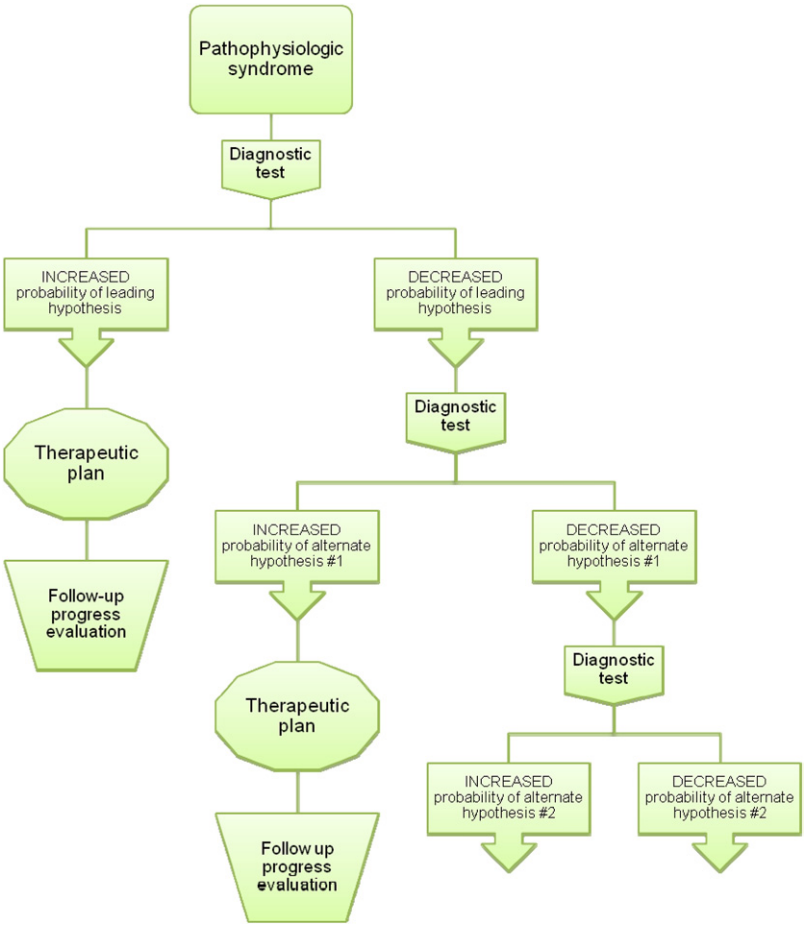

Figure 3. Basic structure of a diagnostic algorithm for problem-oriented clinical reasoning.

atures. Consider fluid therapy, analgesics, and supplemental oxygen for patients in serious or critical condition. Select empirical antibiotics based on species-specific safety and the initial working diagnosis. Antifungal drugs are appropriate for species of birds that are highly susceptible to fungal infection (e.g., aspergillosis) or showing signs of respiratory disease. Most exotic companion species are thought to benefit from a hospital environment that provides reduced stimuli, so a quiet environment with dim lighting and minimal activity is ideal. Carefully consider empirical treatments that have reasonable potential to cause harm. It may be preferable to wait until after the results of diagnostic tests are available before therapy is initiated with some drugs to limit the potential for adverse side effects. For example, green iguanas with chronic renal failure often exhibit clinical signs of hypocalcemia, including muscle fasiculations, together with metastatic mineralization of arteries and renal tubules; therefore, parenteral calcium supplementation could contribute to life-threatening pathology.

Modify the treatment plans during follow-up progress evaluations based on patient response, and select therapy that addresses the confirmed or top differential diagnosis. Research evidence is available for many of the treatment regimens used in exotic animal clinical practice. Use it to guide therapeutic decisions in terms of safety, efficacy, and dosage. Utilize textbook information, narrative review articles, published roundtable discussions, hospital records, and consultation with experts when research evidence does not exist. Avoid relying on "gut feelings" and unsystematically recorded personal experiences to guide decisions because they are likely to be biased.[6]

Client Education Plans

Instruct clients on drug dosage, route, and possible side effects. Define nutritional support, including nutrition source(s), quantity, frequency, and level of assistance. Emphasize the potential husbandry prob-

lems identified in the history, and briefly discuss all basic husbandry requirements for the animal species being treated or direct clients to reliable resources. Any surgical site should be identified and the plan for postoperative management described in detail. Recommend specific products and describe how to use them. Although little research evidence is available to guide prognosis, use published information, hospital records, and all of the available case data to make a reasonable judgment on the anticipated outcome of the case being treated. Inform clients about how diagnostic and therapeutic follow-up progress evaluations will each serve as an opportunity to refine the diagnosis and ensure appropriate treatment. Reviewing written instructions quickly helps to convey this large amount of information and provide a reassuring reference for the client.

Step 4: Follow-up

Schedule follow-up evaluations over time, as is necessary, knowing that the time frame will be different for each case. Hospitalized cases should be reevaluated at least twice a day, and outpatients may require progress checks in days, weeks, or months. During each progress check, gather subjective observations and objective data, reassess the information since the last evaluation, and refine the diagnosis. Determine whether the treatment plan is working toward the case management goals. Note whether the clinical signs are improving, regressing, or static. Perform or submit examples for diagnostic tests to monitor for potential complications. Ask the owner questions that are likely to disprove the working diagnosis, rather than try to rule it in. This vigilance will help to ensure that case management is objective and thorough.[6] Reformulate diagnostic, therapeutic, and client education plans in light of new information and record how to further investigate the problem during future progress checks.

Conclusion

POVM is a process by which clinical problems can be effectively diagnosed and treated with hypothetico-deductive reasoning. This process forms the basis for the POVMR, which is the optimal tool for communication among veterinarians who attend the case and can be defended in a court of law. Adherence to this process of informed decision making helps veterinarians avoid problems inherent in intuitive decision making (Table 2) and works toward meeting the ultimate goals of every case, which are to satisfy the concerns of the client and provide the best possible quality of life for the patient. Exotic animal practice benefits immensely from this process because few diseases and treatments have been thoroughly researched, so each case serves as an investigation into appropriate veterinary care.

Table 2. Methods of clinical decision making

Intuitive Decisions	Informed Decisions
Unstructured process	Problem-oriented veterinary medicine
Recognize possible course of action	Consistent, logical, explicit
Imagine possible outcomes	
Difficult to record	Easily recorded
Rapid for experts	Requires effort
Ineffective for novices	Useful for novices and experts
Difficult to defend	Legally defensible
Success varies with circumstances	Success predicted by probability
Learned via emulation of mentors	Learning is structured
Easily biased	Can be unbiased

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