Understanding Veterinary Practitioners' Decision-Making Process: Implications for Veterinary Medical Education

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ABSTRACT

Understanding how veterinary practitioners make clinical decisions, and how they use scientific information to inform their decisions, is important to optimize animal care, client satisfaction, and veterinary education. We aimed to develop an understanding of private practitioners' process of decision making. On the basis of a grounded-theory qualitative approach, we conducted a telephone survey and semi-structured face-to-face interviews. We identified a decision-making framework consisting of two possible processes to make decisions, five steps in the management of a clinical case, and three influencing factors. To inform their decision, veterinary surgeons rarely take the evidence-based medicine (EBM) approach. They consult first-opinion colleagues, specialists, laboratories, and the Internet rather than scientific databases and peer-reviewed literature, mainly because of limited time. Most interviewees suggested the development of educational interventions to better develop decision-making skills in veterinary schools. Adequate information and EBM tools are needed to optimize the time spent in query and assessment of scientific information, and practitioners need to be trained in their use.

Key words: evidence-based medicine, decision, veterinarian

INTRODUCTION

In the veterinary profession, as in human medicine, a great deal of time is spent in making decisions in a complex and often uncertain environment.[1,2] The veterinary profession has the ethical obligation to provide effective and safe treatments and recommendations in a rapidly changing market with both more price-conscious clients and a more demanding regulatory environment.[3] Careful decisions are required to minimize potential liability risks.[4]

The evidence-based medicine (EBM) approach defined by Sackett et al.[5] bases decisions on information developed through scientific research. This approach was advocated in veterinary medicine in the early 2000s.[6] Although EBM may logically help veterinary surgeons make more informed decisions, obstacles to its use have been reported, including the inadequacy of EBM tools in veterinarians' busy daily practice.[7]

Understanding how veterinary practitioners make clinical decisions today, and how they use scientific information to inform their decisions, is important to optimize animal care, client satisfaction, and veterinary education. The literature investigating decision making has focused on human medicine, and few publications have discussed the process in veterinary medicine.[1,8,9] Although interesting theoretical models for clinical reasoning have been hypothesized,[9] research is required to understand how veterinary surgeons make clinical decisions and how these decisions could be improved. The aim of this study was to explore private practitioners' current process of decision making.

MATERIAL AND METHODS

Study Design

We used a qualitative approach and a grounded-theory strategy, which is based on a method of systematic collection and analysis of qualitative information to generate theory that explains a social or psychological phenomenon.[10] A guiding assumption of grounded theory is that there is a basic social psychological process[11] that people use in resolving a specific problem. The role of the researcher is to discover and describe this process using investigation techniques such as focus groups, survey questionnaires, or, as in this study, telephone survey and semi-structured face-to-face interviews.

Study Population

Recruitment of participants took place among veterinarians who work in the French-speaking part of Belgium (Communauté Française de Belgique). In Belgium, four universities confer the degree of Bachelor of Veterinary Sciences (the Universities of Namur [FUNDP], Louvain-La-Neuve, Brussels, and Liège [ULg]), and only one (ULg) confers the master's degree. All veterinarians in this study graduated from the same school (ULg). To be allowed to practice, registering with the regulatory body of the profession, the Ordre des Médecins Veterinaires (OMV), is compulsory. According to OMV member lists, 2,400 veterinarians

were in practice in 2010, of whom 38% were women.[12] Little information is available about other demographic variables. All veterinarians have access to the Internet.

Telephone Survey

We conducted a telephone survey of veterinarians to identify their perception of information resources and also to document the demographic characteristics of this study population. Veterinarians were selected randomly from the OMV member list. The telephone survey was performed between October 2010 and June 2011. Calls were made by trained master's students (Solène Vandeweerd and Catherine Gustin). Sex, type of activity (small animals, farm animals, pure equine, small animals plus horses), type of practice (clinic or not), number of veterinary surgeons in the practice, and years of professional activity were determined for all respondents. Survey questions can be found in Appendix 1. One question (Question 25) was added and asked of the last 50 participants, who were randomly selected. This complementary question aimed to provide further information about the two modalities of decision making that were identified in the semi-structured interviews. We used descriptive and inferential statistics for data analysis. A significance level of 0.05 was used.

Face-to-Face Semi-Structured Interviews

Recruitment The selection of participants was guided by the requirement to recruit participants of both sexes and from all types of clinical practice in representative proportions. We did not interview veterinary surgeons who worked in the meat industry, government, or universities. We used a purposive and convenient sample of veterinarians. That is, we chose to ask for participation from veterinarians with at least 2 years of practice who were readily accessible and whom we believed would agree to be interviewed. This study was supported and approved by ULg and was part of an educational project under the supervision of the Institut de Formation et de Recherche en Enseignement Supérieur (IFRES). Participants were assured that interviews would be confidential, and all signed informed consent forms before participation. Sample size was justified by interviewing participants until data saturation was reached (the point at which the most recent interviews did not seem to make any substantial contribution to the model, which had been generated successively on the basis of the earlier data).[13]

Interviews All participants were interviewed by a master's student (Solène Vandeweerd), who was not a member of the veterinary profession and was unaware of any prior hypothesis. The researchers initially prepared a list of questions and passed them to the interviewer. A semi-structured interview is flexible, allowing new questions to be brought up during the interview as a result of what the interviewee says. The interviews were audiotaped and then transcribed. The questions did not directly ask veterinary surgeons to explain their decision-making scheme but were intended to gain the information indirectly. Examples of questions are "How has your network of contacts with other professionals evolved in the past year?" "When a decision has been made, is it difficult to question it?" "Do you think you were well prepared at the veterinary school to make decisions?" Other examples of questions are provided in Appendix 2.

Data Analysis Two researchers (Jean-Michel Vandeweerd and Pascal Gustin) read the transcripts of the interviews. The first step was open coding. Data were examined line by line to identify the participants' descriptions of thought patterns, feelings, and actions related to the themes mentioned in the interviews. The codes derived were formulated in words; for example, the statement "When I was young, I did not like to manage an animal belonging to a human medical practitioner" generated the codes "young age of the veterinarian" and "owner being a medical practitioner." In a second step, the codes were sorted into core categories, superior categories, and categories. For instance, "young age of the veterinarian" and several other codes made up the category "personal characteristics," which in turn was one of the categories forming the superior category "veterinarian" in the core category "factors influencing decision making."

RESULTS

Telephone Survey

The interviewer phoned 213 veterinarians, which is 8.8% of the veterinary practitioners of the Communauté Française de Belgique.[12] Twelve veterinary surgeons refused to answer because of lack of time (response rate = 95%). Demographic characteristics of respondents are reported in Table 1.

Table 1: Demographic characteristics of participants in the telephone enquiry

Characteristic	*n* or %
Respondents (*n*)	201
Part 1*	151
Parts 1 and 2†	50
Sex (%)	
Men	61.5
Women	38.5
Type of activity (%)	
Small animals	56.0
Horses only	2.0
Farm animals	16.0
Small animals and horses	26.0
Type of practice (%)	
Office and extramural	76.0
Clinic and extramural	13.0
Extramural only	11.0
Veterinarians in the practice (%)	
1	63.0
2	22.0
3	8.5
4	2.5
5	2.0
6	1.0
7	1.0
Years in practice	
Mean	22
Maximum	51
Minimum	1

* Questions 1–24 in Appendix 1
† Questions 1–25 in Appendix 1

The mean duration of the conversation was 19 minutes (range = 2 to 65). Detailed results for each question item can be found in Appendix 1. The results are expressed in percentage of responses obtained. This survey indicated that colleagues, specialists, laboratories, and the Internet were consulted by, respectively, 64.0%, 85.0%, 86.0%, and 68.0% of respondents to better inform decision making when facing an unusual case. Only 2.5% reported using PubMed as an information source, and 19.4% reported being able to make a search with that database. Although 96.5% said they used textbooks, only 26% were able to name one or several titles, with only 9% mentioning state-of-the art textbooks. Of veterinarians, 53.7% cited titles of peer-reviewed scientific journals in French they claimed to read, and 6.0% named a peer-reviewed journal in English to support their assertion of reading Anglo-Saxon literature. Of the sample, 56.2% said they could speak English. Fewer than 19.5% had heard of EBM. However, 42.0% or more responded positively to most items referring to their self-confidence in being able to evaluate or apply scientific publication. Veterinarians spent a mean of 33 minutes per day reading scientific information, and 34.3% thought they had enough time to read before a decision. Eighty-three percent considered information tools (Internet, journals) to usually be adequate for practitioners. Beside these descriptive statistics, some associations were significant. Veterinarians with fewer than 10 years of experience were more likely to know about EBM than others. Veterinarians whose work experience was 10 years or fewer or more than 30 years reported spending significantly more time reading and were willing to read more.

Face-to-Face Semi-Structured Interviews

We interviewed 31 veterinarians. They had between 2 and 35 years (median = 18 years) of clinical experience. Nine (29%) practiced predominantly farm-animal medicine, 15 (48%) practiced small-animal medicine exclusively, 5 (16%) practiced small-animal and equine medicine, and 2 (6%) worked in equine practice exclusively. Ten (32%) were female. Interviews lasted 60 to 120 minutes. A summary of the categories is given in Table 2. In the next paragraphs, we quote from participants' comments. We also present the participants' perception of how decision making is currently taught.

We must clearly state that what we report here is interviewees' perceptions of how they make decisions rather than how they actually make decisions, because their perception may not actually be what their brains are doing. Some participants even expressed their difficulties in articulating their reasoning process through statements such as "I am not conscious of my reasoning process. I probably have a personal scheme."

Framework of Decision Making Interviewees were unanimous in their opinion that decision making is a central, enjoyable, and rewarding activity, especially when decisions in a challenging clinical case were correct.

Process of Decision Making To decide, practitioners can proceed in two different ways. First (option 1), they can compare the new situation with the cases they have encountered in the past and choose the most likely solution to the new problem. Most participants reported that the variety of their clinical experience played an important role. The common opinion was that experience is gained through clinical case scenarios seen at veterinary school and in daily practice and through discussions with colleagues. Two young veterinarians (with 2 and 3 years of practice, respectively) reported that they compare a new case with those encountered in their limited experience and refer to more experienced practitioners when presented with more unusual cases or when they have no idea from the clinical presentation of the possible diagnoses. Second (option 2), they can try to rule out possible hypotheses one at a time before making a decision. They have a set of differential options (possible diagnoses), learned at school or accumulated during their professional life. This process involves usually further investigation, which may even be performed early in the process when a case appears unusually difficult. Veterinarians can also make a decision on the basis of a list of options and a trial-and-error process.

> I do not wait to have an accurate diagnosis before treating. I try the treatment for the most likely differential diagnosis and revise it if the progress is not satisfactory. I think it is a process of choosing a diagnosis while keeping other possibilities open. Then I proceed step by step, by trial and error, while keeping the owner aware of the different possible options,

reported a small-animal practitioner. Two veterinary surgeons working in mixed practice reported they used option 2 with small animals, whereas they used option 1 for farm animals. To obtain further information about the frequency of those two different modalities of decision making, the interviewer asked a complementary question in the telephone enquiry, and the answers of 50 respondents were analyzed. Of respondents, 35.1% reported mainly using option 2; 10.5%, option 1; and 36.8%, a combination of options 1 and 2, and 3.5% clearly

Table 2: Framework of decision making: core categories (CC), superior categories (SC), and categories (C)

	Category
Process of decision making	CC
Comparison with similar cases	C
Reasoning process	C
Steps of decision making	CC
Quick initial decision	C
Communication	C
Evaluation	C
New decision	C
Legitimization	C
Factors influencing decision making	CC
Case	SC
Difficulty	C
Progress	C
Veterinarian	SC
Information resources	C
Communication skills	C
Type of activity	C
Type of practice	C
Personal characteristics	C
Owner	SC
Personal characteristics	C
Information resources	C

reported using a combination of options 1 and 2 but preferring option 2 for farm animals. Fourteen percent of respondents could not answer the question. No other process was reported.

Steps in Decision Making We identified five steps in the management of a clinical case (quick initial decision, communication of decision, evaluation of decision, new decision if necessary, and legitimization of the new decision).

All interviewees usually made initial decisions quickly. They perceived that owners want to see immediate action, which does not allow any delay in decision making; as one participant stated, "If I am called, it is to give an answer to the owner. It is not possible to say or to do nothing, even if you are not sure. Owners request an action."

This initial decision is then communicated to the owner, and a first action is taken. It may quickly be followed by self-evaluation, sometimes "in the few minutes after the decision." Veterinarians may systematically reassess their cases over the next few days, for example, by calling the owner by phone. Practitioners may also just wait for the owner to call.

The progress of the case determines the next steps of the process. Either positive or negative, progress provides useful feedback that is used to refine the personal decision scheme and lists of differential diagnoses or decision options.

When the case does not resolve, complementary information or advice may be sought using differing information sources to better inform the next decision.

Revision of diagnostic or therapeutic plans must then be communicated and agreed to by the client before a new action is taken, which involves an explanation for the failure of the previous treatment and of the rationale for the next decision (legitimization).

Factors Influencing Decision Making Three superior categories of factors influencing decision were identified: the case itself, the veterinary surgeon, and the owner.

Case The influence of the unusual or difficult character of a case, and of its negative or positive progress, was explained in the preceding section.

Veterinary Surgeon The variable use of available information resources influences the process of decision making. The possibility of referring the case to a specialist or of asking another's opinion limits the pressure. Colleagues are the first resource consulted because they are the quickest way to obtain information: "When I need information, I contact my network of colleagues and I get a summarized answer in 1 minute." Internet and textbooks are also frequently used, whereas recent peer-reviewed publications are rarely consulted. Furthermore, the EBM approach was never mentioned in any of the interviews, with occasional isolated opinions such as "The information from research is not important and does not influence decision." Very few practitioners reported that they were able to keep up to date or use recent information. Interviewees reported several reasons. The first was the lack of time, which, in extreme situations, may lead to an "accumulation of books unopened for years." The availability and cost of recommended new therapeutics also limits the enthusiasm for an evidence-based approach. The language of publication is also an issue: "I mostly use French publications as I have very little time available and reading English would take more time and effort." Veterinary surgeons' salaries limit continuing education: "If veterinary fees were higher, we could work less and have more time to read and be informed." Scientific information is also sometimes difficult to use, too complicated, or too dense: "I find that information is not always adequate and does not answer my question. Information is not presented clearly."

Good communication skills limit future problems with owners, and being confident in those skills limits stress in decision making.

> I am not too worried about risks as I always clearly explain them and allow the owner to be part of the decision-making process. After my explanations, I ask them to think about it and I leave the room,

said one participant. Communication skills are particularly important when there is a delicate decision to make (e.g., when the life of the animal is in danger or when there is a psychological issue with the owner). With years of practice, veterinarians pay more attention to history taking (anamnesis), may be better at identifying what owners want ("it may be euthanasia"), and make the owner talk more easily (e.g., "admit self-medication, talk about finances"). "Before, I listened to half of what the owner said and I thought it was not important. Nowadays I spend more time in taking history, I listen to everything," reported one interviewee.

The type of activity may influence decision making. In large-animal practice, investigations are frequently limited for cost reasons. However, the necessity of obtaining a result remains the most important deciding factor and can convince those farmers who are reluctant to spend money. Fear of litigation is not essential because the risk is limited as long as one practices legally and ethically. The risk is less important at the individual level, in comparison to feedlot medicine. In small-animal practice, the legal aspect is rarely considered. Cost is also less of a limiting factor in small-animal practice. Veterinary surgeons tend to explain all the costs clearly, even if they may seem excessive to clients. Four second-opinion veterinarians were interviewed, and two reported that they ask clients to sign a consent form before surgery. In equine practice, however, the risk of litigation and cost issues influence decision making much more.

The type of practice also has an impact. Working in a team is more comfortable because it enables discussion of cases.

Personal characteristics may also influence decision making. The ability to make a decision can be a personal trait. "Some people are made to decide. Others are not." Decisions may be influenced by stress factors and personal constraints such as demanding regulatory environment, lack of time, tiredness, financial constraints, problems in their personal life, and overwork. Ambition may be a positive motivation, but it may also negatively influence

decision making. Some practitioners want to build case series. "Specialists in surgery rarely say no," said one participant. A good reputation helps make decision making easier because the owner is more ready to trust the veterinary surgeon. "It is more difficult when you are a young graduate and you do not have a reputation yet." With increasing age, self-confidence improves, and accepting one's own limits and confessing them to the owner becomes easier. With time, veterinarians accept being challenged. "When I was young I did not like to manage an animal belonging to a human general practitioner. Nowadays it is the opposite as I want to benefit from his experience."

Owner A decision is easier if the veterinary surgeon knows the owner and the owner has been a client for years. Personal characteristics may also have an influence. For example, practitioners made more careful decisions with owners who work in medical fields. Personal financial constraints or ethical issues have to be considered. Today, clients are also more informed, and the practitioner needs to be more cautious because there is a risk that the owner will use the Internet to obtain advice and opinions. The Internet may be used in the other way, too: "I use the Internet to convince my clients, telling them to check what I suggest."

Training in Decision Making Most interviewees felt that they had not learned decision making at school but had mostly acquired it through practice and memory of comparable cases. "The veterinary school was not an ideal environment to learn making decision as training was too theoretical and did not lead to proficiency in clinical cases. Furthermore, school did not provide an opportunity to experience attempts and mistakes." "Even if this is more possible during external rotations, some veterinary practitioners are also reluctant to let students decide," reported another participant.

Veterinary practitioners thought that veterinary schools should develop several skills in their students. Students should be trained to identify the hierarchy of information.

> Nowadays, students make a mix of everything and do not know where to go. There is a major difference between students today and several years ago. The number of topics they have to study is enormous. Their teachers are better trained, more specialized, and the quantity of information to study is increasing continuously. Unfortunately, they do not know what to do with that information,

reported one interviewee. "Students cannot determine the difference between the common and the rare!" said another one. There should also be room for students to make diagnostic decisions by themselves and to make mistakes. "They should have the opportunity to make diagnostic decisions alone." "Some decisional models could be provided. However, it is the role of the student to work by himself and to produce his own schemes."

DISCUSSION

This qualitative study identified several features of the decision-making process in veterinary medicine that could be taken into account when designing a veterinary curriculum.

First, veterinarians in this population were far from applying the principles of EBM as described in human medicine[5] and more recently in veterinary medicine.[1] The results of this study showed that the EBM approach (asking questions, searching the literature, critically appraising the internal validity of the identified publications, assessing the external validity of the scientific information)[5] was rarely used to inform decisions. In addition, this sample of veterinarians rarely consulted peer-reviewed English-language journals. The obstacle of language (only 50% of respondents said they could speak English) might partly explain a lack of enthusiasm to use PubMed or Anglo-Saxon peer-reviewed literature. However, similar observations were made in a survey of practicing veterinarians in the United States concerning their familiarity with the concept of EBM and their attitudes toward it.[14] Of 5,000 veterinarians, 119 completed Web-based questionnaires (response rate of 2.5%) and between 25.2% and 76.5% responded that they were not familiar with EBM terms. In our sample, more than 50% responded that they could evaluate or apply scientific publications. However, these results probably do not reflect the truth. Asking questions that evaluated respondents' real skills would have been better.

EBM is a recent discipline that has largely developed from the concepts promulgated in human medicine.[1] Veterinary pioneers in EBM have tried to apply techniques that are only partially transferable from human to veterinary practice convincingly. Several obstacles and difficulties have been identified, including a lack of high-quality patient-centered research, the need for a basic understanding of clinical epidemiology by veterinarians, the absence of adequate search techniques and accessibility of scientific databases, and the inadequacy of EBM tools that can be applied to veterinarians' busy daily practice.[7,15–17]

This last issue was obvious in this study. Most of the time, decisions must be made quickly, and little time is available to obtain useful information by reading or consulting PubMed. In this study, veterinarians preferred colleagues, the Internet, and textbooks to peer-reviewed journals and literature searches. That veterinarians were wrongly optimistic when they declared that they spent 30 minutes a day reading veterinary information is also likely. In human medicine, to remain informed, doctors should read 19 articles per day, 365 days per year, whereas the time available for reading is well under an hour a week.[18,19] Also in human medicine, the current culture is not one of performing extensive literature searches during the care of a patient.[20] When evidence is scarce (but also when it is not), doctors prefer to rely on the experience of professional colleagues than to search the literature.[21] In the United States, McKenzie[14] also reported that veterinarians relied on research summaries, consensus statements, and protocols promulgated by professional organizations far more than on independent use of the literature.

Several solutions have been suggested to improve EBM practice in veterinary medicine. Throughout the research community, the consensus seems to be that developing strategies to improve the level of evidence of the studies and to standardize their reporting is necessary.[22–24] Other authors have proposed that synthesized selected quality scientific information, such as systematic reviews

(SRs)[25,26] and critically appraised topics (CATs)[27] should be made available. Editors would be essential actors of this move forward because they could promote SRs and CATs and require the quality and accessibility of their summaries.[28] SRs and CATs could optimize the time spent in query and assessment of scientific information. However, because they necessitate a basic knowledge of clinical epidemiology that the veterinary practitioner does not necessarily fully understand, epidemiological training should consequently be part of the curriculum.[24]

Second, this study showed that similarities exist between the decision-making process in veterinary practice and that described in human medicine. In human medicine, doctors primarily use an approach to clinical decision making that is best described by the recognition-primed decision-making model.[2] They recognize that a clinical situation fits a particular pattern and, based on this, make management decisions. They are often not conscious of making decisions, but act in response to the pattern of the situation in front of them. An alternative model of decision making is based on rational choice strategies.[29] In this approach, health care decisions consist of three major steps, with each major step having three minor steps. The acronym PROACTIVE is used to illustrate this strategy: P = defining the problem; R = reframing the problem from multiple perspectives; O = focusing on the objectives; A = considering all relevant alternatives; C = considering the consequences of each alternative and estimating the chances; T = identify and estimate the trade-offs; I = integrate the evidence and the values; V = optimize the expected value; and E = explore the assumptions and evaluate uncertainty. However, assembling all the information and constructing and analyzing a decision analysis may take time with this model. For this reason, doctors tend to use this approach only with novel or complex problems.

This study suggests that veterinarians also use two modalities of decision making: either by (1) recognizing the similarity to a past situation or (2) choosing the most likely solution among a list of possible options, sometimes excluding options in a hypothetico-deductive approach, sometimes proceeding by trial and error. Further quantitative studies are also required to determine how veterinarians use the two decision modalities and to address any potential variability among respondents that could relate, for example, to a difference in years of practice or in type of activity (small animal vs. farm animal).

The framework of decision making identified in this study might have several implications for veterinary education. In medicine, the objectives are to make the undergraduates aware of the complexity of the medical action and the influence of context on medical decision making. Ultimately, physicians should be able to cope with the inevitable doubt in making decisions.[30] Veterinary undergraduates should also be trained in the management of doubt and error. This study shows that one could consider the scientific and informed decision as the revision of a less scientific and less informed initial decision, often made quickly. Students should be able to answer questions such as "If you have made a quick decision, what do you do now to confirm or inform this decision, to make another or better one, and to explain it to the owner?" Communication skills are therefore very important to develop.[31] Students should also be aware of the complexity of the professional environment, including the main sources of stress for veterinarians, such as worked hours, client expectations, poor personal relationships, finances, expectations of themselves, and the need to keep up their knowledge and technical skills.[32]

If it is essential that students be aware of the reality of decision making, as shown by the process reported by practitioners, this does not mean that students should not be taught a rational decision-making model. First, teaching must not only aim to train students to behave as current practitioners do, but to behave more as veterinarians ideally should. In consequence, our findings in this study are useful to describe the context of decision making but cannot be the only basis for designing educational interventions that aim to develop decision-making skills. Second, it has been suggested that, for medical students, this model is useful in making the decision-making process more explicit.[2]

Third, veterinarians reported that students were unable to rank clinical information and the importance of experience. They also reported that decision-making skills were not developed at school. This report, however, does not necessarily mean that it is the case. A slow process of integration may possibly be necessary during undergraduate education to develop those skills, the process of which practitioners may be no longer aware. Students are unlikely to behave as do professionals whose efficient memory is largely clinically based and allows them to focus quickly, fill in relevant details, and ignore irrelevant details.[33] Theoretical models of clinical reasoning in human medicine have been described in which learners begin with reduced knowledge: They are unable to connect clinical findings in the case to their own store of medical knowledge, either because this store is insufficient or because it is inaccessible. Next, they improve but still have dispersed knowledge and have trouble connecting it to the clinical facts: This difficulty manifests itself in long lists of differential diagnoses or suggested tests without clear focus or prioritization. Only with further experience do clinical findings become more focused and pertinent, and a shift in focus occurs from causative networks to organization of clinical features into illness scripts, generic production rules involving enabling conditions, fault, and consequences.[9] Clinical reasoning may possibly be similar in veterinary medicine.

These concepts have influenced the curriculum of the FUNDP and ULg. Several implementations have been made at the level of these veterinary schools. Students are trained in the use of PubMed and Cab Abstracts in their second year. In their third year, they are exposed to EBM and critical appraisal of scientific publications. EBM skills are further developed in the fourth year. In the fifth year, they are trained in decision making in a so-called "multidisciplinary module."[34] This module is on the mode of problem-based learning. Over 8 weeks, students work on 14 different problems concerning a wide range of real situations. Several departments work on designing those problems. Students are trained to make decisions and experiment with the different phases of the process: (1) quick initial decision, (2) communication, (3) evaluation of this decision, (4) more informed decision making and an EBM approach, and (5) legitimization. In the sixth

year, during external rotations, students may be asked to write an essay on the decision process of one complex problem encountered by the practitioner.

This study also indicates that continuing education in EBM should be mandatory. This discipline should also be taught to experienced practitioners via continuing professional development and targeted publications. EBM papers summarizing English-language literature could limit the language obstacle. Interestingly, veterinarians with fewer than 10 years of experience were more likely than others to know about EBM, to spend more time in reading, and to be willing to read more, which may indicate that the recent efforts made in Belgium to develop EBM were useful.

CONCLUSION

Veterinarians make decisions in a complex environment, often quickly and rarely with an EBM approach. Obviously, this cannot mean that most practitioners make poorly informed decisions. These results illustrate the important role of experience in clinical decision making. In addition, when 82% of veterinarians in this study report that current information tools are adequate, does it mean that they do not realize the potential of the modern scientific peer-reviewed tools they do not use commonly or that the information currently obtained from colleagues or the Internet provides satisfactory results in practice? Two separate worlds seem to exist, academic research and the reality of practice, that need to join, probably by making the effort to include data from practice into research. Both worlds should also meet more in the field of education, where students should be trained in the complexity of contextualized decision making. More important, aside from those efforts to facilitate the development of evidence-based, accountable, and transparent veterinary medicine, there should be initiatives to scientifically demonstrate the benefits of an EBM approach for animals and owners, which would probably facilitate its adoption by veterinary practitioners.

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APPENDIX 1: RESPONSES TO ITEMS IN THE TELEPHONE SURVEY

Question		Answers (*n* [%]) No	Yes
1.	In difficult cases, do you ask the advice of first-opinion veterinarians?	72 (36.0)	129 (64.0)
2.	In difficult cases, do you ask the advice of veterinary specialists?	30 (15.0)	171 (85.0)
3.	In difficult cases, do you ask the advice of laboratories?	28 (14.0)	173 (86.0)
4.	In difficult cases, do you ask the advice of pharmacists?	167 (83.0)	34 (17.0)
5.	In difficult cases, do you ask the advice of human general practitioners?	152 (76.0)	49 (24.0)
6.	In difficult cases, do you use the Internet?	65 (32.0)	136 (68.0)
7.	In difficult cases, do you use PubMed?	196 (97.5)	5 (2.5)
8a.	In difficult cases, do you use textbooks?	7 (3.5)	194 (96.5)
8b.	Which ones?		
	No. of veterinarians who gave a title of a French-language reference textbook	167 (83.0)	34 (17.0)
	No. of veterinarians who gave a title of an English-language reference textbook	183 (91.0)	18 (9.0)
9a.	In difficult cases, do you read journals in French?	36 (18.0)	165 (82.0)
9b.	Which ones?		
	No. of veterinarians who gave a title of a French-language peer-reviewed journal	93 (46.3)	108 (53.7)
	No. of veterinarians who gave a title of a non–peer-reviewed French-language journal	168 (83.6)	33 (16.4)
10a.	In difficult cases, do you read papers in English?	137 (68.1)	64 (31.8)
10b.	Which ones? (no. of veterinarians who gave a title of an English-language peer-reviewed journal)	189 (94.0)	12 (6.0)
11.	Can you perform a search with PubMed?	162 (80.6)	39 (19.4)
12.	Can you sort journals by scientific quality?	62 (30.8)	139 (69.2)
13.	Can you assess the scientific quality of a paper?	46 (22.8)	155 (77.2)
14.	Can you assess the methodology of a study?	93 (46.2)	108 (53.8)
15.	Can you identify biases in a publication?	117 (58.2)	84 (41.8)
16.	Can you evaluate whether information is applicable to my clinical case?	12 (6.0)	189 (94.0)
17.	Do you know what evidence-based medicine is?	163 (81.0)	38 (19.0)
18.	Do you know what a systematic review is?	47 (23.4)	154 (76.6)
19.	Do you know what a decision tree is?	78 (38.8)	123 (61.1)
20.	Do you know what a meta-analysis is?	169 (84.1)	32 (15.9)
21.	Can you speak English?	88 (43.8)	113 (56.2)
22.	Do you have enough time to read before making a decision?	132 (65.7)	69 (34.3)
23.	Information tools (Internet, journals) are adequate for veterinary practice?	35 (17.4)	166 (82.6)
24.	How many minutes a day do you spend reading veterinary literature? (*M* [*SD*])	33 (38)	
25.	How do you make a decision? (57 respondents; *n* [%])		
Veterinarians who could not answer		8 (14.0)	
Veterinarians who answered "comparison with similar cases (1)"		6 (10.5)	
Veterinarians who answered "reasoning on a list of different options (2)"		20 (35.1)	
Veterinarians who answered "combination of 1 and 2"		21 (36.8)	
Veterinarians who answered "combination of 1 and 2 but 2 for large animals"		2 (3.5)	

APPENDIX 2: EXAMPLES OF QUESTIONS THAT WERE ASKED DURING SEMI-STRUCTURED INTERVIEWS

Theme 1: How Was Decision Making Performed in the Past; What Has Changed Through the Years?

When you compare now and before: Are there types of information that you collect more today than before? Are there clinical signs to which you pay more attention? Do you have more or less doubt about diagnostic and therapeutic decisions? Are there particularly new precautions that you take and verification that you make? Are there precautions and verifications that you have abandoned? Are there contextual elements that you take more, or less, into account (economical, cultural, legal)? How have you managed the evolution of knowledge and scientific information? Has the Internet changed the way you make decision? How has your network of contacts with other professionals evolved? How has your library changed? How has the way you collect data from the owner, and the way you communicate with them, changed? How has your interest in making diagnostic and therapeutic decisions changed? Do you make decisions more (less) quickly, and more (less) quietly? Are you more (less) hesitant in making decisions? Do you self-reflect more on your decisions? Are you more aware of the risk of mistake?

Theme 2: How Does the Veterinary Surgeon Make Decisions in the Present Time?

Is decision making an occasional activity? Do you have pleasure in making a decision or do you feel anxious? Does it take time to decide? Do you collect a set of data before making a decision? Which sources of scientific information influence your decision? When a decision has been made, is it difficult to question it? Which are the elements that bring doubt in a decision, even if action has not yet been taken? Do you decide in a similar way outside the professional life? Is it easier to decide alone or in a group? What characterizes a difficult decision? Does recent scientific information influence your decision? What about cultural, juridical, economical elements? Do you ask yourself what the standard of the profession would be in such a situation? What do you think about the risk of medical mistake and litigation? What do you do when you do not know what decision to make? Do you easily ask advice? What are the advantages (disadvantages) of experience? What are the facilitating (complicating) factors in making a decision? Do you have the feeling that you follow a standardized scheme of decisional process? Do you record your decisional process and the decision made? How do you rank information? Where have you learned to rank information? What do you think of software or models that help decision making?

Theme 3: How to Train in Decision Making?

Do you think that the ability to make decision can be improved by education? What would you suggest to train students to make better informed decisions? Do you think that education should provide knowledge or also train students in the complexity of professional life? Do you think you were well prepared at the veterinary school to make decisions? What was lacking in your training and did you cope with this lack? If you had the opportunity to train students, what would you do first?