

Teaching Evidence-Based Veterinary Medicine in the US and Canada

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ABSTRACT

There is no comprehensive review of the extent to which evidence-based veterinary medicine (EBVM) is taught in AVMA-accredited colleges of veterinary medicine in the US and Canada. We surveyed teaching faculty and librarians at these institutions to determine what EBVM skills are currently included in curricula, how they are taught, and to what extent librarians are involved in this process. Librarians appear to be an underused resource, as 59% of respondents did not use librarians/library resources in teaching EBVM. We discovered that there is no standard teaching methodology nor are there common learning activities for EBVM among our survey respondents, who represent 22 institutions. Respondents reported major barriers to inclusion such as a perceived shortage of time in an already-crowded course of study and a lack of high-quality evidence and point-of-care tools. Suggestions for overcoming these barriers include collaborating with librarians and using new EBVM online teaching resources.

Key words: evidence-based veterinary medicine, literature searching, instruction, skills, veterinary medical librarians, information resources in veterinary medicine

INTRODUCTION

Evidence-based medicine (EBM) refers to the careful and systematic integration of research with clinical expertise to support medical decision making.¹ In the early 1970s, the practice of using scientific evidence in human medicine was identified. In the 1980s, the term “evidence-based medicine” was being used by the medical school at McMaster University in Canada. EBM has a longer history and a more robust application in human medicine than in veterinary medicine, with evidence-based veterinary medicine (EBVM) being first documented in the literature in 1998.² EBVM does not solely depend on the results of clinical research, but instead attempts to balance the best clinical research results with the informed clinical judgment of the clinical veterinarian to serve the patient and animal owner or manager.¹

The appeal of EBM is that it informs decisions about a specific patient at a given time using current research, in contrast to a veterinarian relying solely on continuing education or reviewing medical texts to improve clinical skills.³ The skills of EBVM are summarized in four steps:

- Step 1: Ask relevant, answerable clinical questions regarding diagnosis, treatment, or prognosis (focusing on patient or problem, intervention, comparison, and outcome).
- Step 2: Locate the best evidence to answer the question.
- Step 3: Critically appraise the evidence for validity, impact, and applicability.

- Step 4: Integrate the appraisal with clinical expertise and with the patient’s and client’s unique biology, values, and circumstances.⁴

The first EBVM skill needed for veterinary practice is to understand the information needs of the veterinarian, turning those needs into a clinical question that can be researched.⁵ Rosenthal emphasizes the importance of formulating the clinical question in such a way that the clinician will be able to identify “relevant and precise answers.”⁶ The next skill in EBVM is searching for current evidence to answer clinical questions. Unfortunately, veterinarians rarely use peer-reviewed journals for purposes of answering EBVM-related questions.⁷ Veterinarians are more likely to do a literature search after they have created a treatment plan instead of relying on the literature to create the treatment plan.⁸ The decision not to use current research in clinical practice is partly linked to the inability to formulate clinical questions effectively, as well as a lack of experience in doing effective literature searches resulting from a limited understanding of the information resources available.⁹ Because of the complexity of veterinary medical literature reviews and the subscription-based nature of some databases, practitioners tend to rely heavily on the freely available MEDLINE PubMed rather than broadening the search to other databases. This practice is less efficient in the long run for answering specific clinical questions.⁸

The next step is for clinicians to master critical appraisal of the evidence. Research studies often have methodological flaws.^{10,11} The skills needed to appraise the literature

critically include knowledge of clinical trials and experimental design, and a thorough knowledge of common statistical tests.¹² The proliferation of information, the time it takes to review the literature, and the lack of skills on the part of clinicians to efficiently evaluate and interpret the literature present barriers for implementing EBM.^{3,10,13,14} In veterinary medicine, there may be few reliable research studies addressing a specific clinical question, and even when clinicians find a relevant study, they need to review it with a critical lens to answer clinical questions.¹⁵⁻¹⁷ Lastly, practitioners must also be able to determine how to apply the research in clinical practice and assess how well it worked.¹⁸

If veterinarians are expected to apply evidence-based practice as clinicians, they need to have adequate training to do so. Veterinary medical students must master skills in searching for research information, appraising this information critically, interpreting the information, and using the information in clinical diagnosis and treatment. The traditional veterinary curriculum is largely based on studying textbooks and pre-selected articles. Even in veterinary programs that follow problem-based learning, students explore cases almost exclusively through textbooks and prescribed research articles.¹⁹ Because of the large amount of information, students are not encouraged to develop problem-solving skills.^{12,16}

In libraries, the mastery of finding, evaluating, and using research literature is called "information literacy."²⁰ A study of the information literacy skills of veterinary medical students indicates that this form of literacy is at an insufficient level. The limited research in this field indicates that, like veterinarians, veterinary medical students do not routinely conduct literature searches unless they are working on publishing a paper.²¹ Without strong skills in searching the literature and a keen ability to evaluate the research literature, future veterinarians will be ill-equipped to determine which studies best meet the criteria for making sound clinical treatment decisions. If students do not master these skills during their formal veterinary education, they will be challenged to develop and apply them in clinical practice. Patterns of critical thinking and analysis that start in formal education can deepen during years of practice.¹⁸ Incorporating EBM into the veterinary medical curriculum will allow students to develop the requisite skills in EBM, and it will enhance the application of research into practice.²²

Human medicine programs are incorporating EBM into the curriculum worldwide, but with some struggles.¹⁸ Time devoted to EBM in the medical school curriculum is limited.^{23,24} The skill level of faculty who can teach EBM was also found to be limited.²³ Rather than having specific courses devoted to EBM, US and Canadian medical schools most often embed the principles of EBM into existing courses. It is also most common for the training to occur in the first or second year and not in the clinical years when application is most useful and important.

There have been a few reports of EBVM skills being incorporated into single courses or rotations in veterinary curricula. During the fourth clinical year at the Texas A&M University College of Veterinary Medicine and Biomedical Sciences, case-based exercises were assigned on

the anesthesia clinical rotation to reinforce the four steps in applying EBVM. In that report, Fajt suggests that students need more exposure to EBVM concepts throughout the curriculum, because veterinary students who formulated good questions wrote better papers.⁴ Hardin describes a veterinary informatics and EBM course that was being taught at Mississippi State University College of Veterinary Medicine to first-year students.⁹ The course introduced the concepts of informatics and EBM as well as the concept of critically appraised topics (CATs), which are reviews developed to help health care providers make decisions in clinical settings. Students were also trained in online searching skills. In this course, students learned to "(1) evaluate factual knowledge by reading and analyzing articles; (2) apply conceptual knowledge by understanding article content; (3) create a clinically relevant question (conceptual knowledge); (4) implement literature search procedures (procedural knowledge) relevant to the project; and (5) analyze peer projects (procedural and metacognitive knowledge), including providing peer feedback."^{9(p.476)} Non-peer-reviewed reports of EBVM skills being taught in veterinary curricula have been collected informally by one of the authors (VF) and published on the Evidence-Based Veterinary Medicine Association website, but there has been no comprehensive gathering of data.

Several researchers recommend that EBVM be taught to students systematically in the DVM curriculum and that EBVM be presented to practicing veterinarians through continuing education.^{25,26} However, there is no current comprehensive snapshot of how EBVM is being taught to veterinary students.²³ Paralleling Blanco's research to survey faculty in US and Canadian medical schools on how EBM is taught, this study attempts to fill the gap by investigating the presence of instruction of EBVM in schools and colleges of veterinary medicine in the US and Canada.²⁷

METHODOLOGY

To capture how EBVM is being taught at US and Canadian schools of veterinary medicine, we created an online survey to collect and document which EBVM skills are taught, how and when EBVM skills are taught at the respondent's institution, strengths and challenges of EBVM instruction at each institution, and demographic information. Survey questions were based in part on the questions used in Blanco's study of how EBM is taught in medical schools, with adaptations made to address the veterinary context.²⁷ Besides collecting basic demographic information, survey questions asked for information about the courses/rotations in which faculty taught the five steps of EBVM (asking, acquiring, appraising, applying, and assessing), including the course name and number, year in the curriculum, whether the course was required or an elective, and the number of students and credit hours of the course. Respondents were also asked for modalities by which they taught EBVM skills, whether lecture, demonstration (faculty or librarian), assignments, exercises, homework, student presentations, or other. One question asked if faculty used their institution's library resources or librarian in any of the courses/rotations

they taught. Another question asked for specific information resources discussed or used in courses, such as CAB Abstracts, CABI, evidence resources within Electronic Health Records, gray literature (conference proceedings), mobile resources (Unbound Medicine, Lexi-Comp), PubMed or Ovid MEDLINE, VetMed Resource, or VIN. Respondents were asked to rate, using a Likert scale, how well they feel their students at their institution do upon graduation in finding, appraising, applying, and assessing research for patient care. They were also asked for challenges and successes they have observed at their institution in teaching EBVM. Another question asked how they define EBVM and if they think it should be directly taught in veterinary medical programs. The survey in full is available upon request from the corresponding author (SS).

We piloted the survey with selected faculty at the investigators' institutions and then revised our questions based on their feedback. We gained approval from the Survey Committee of the AAVMC and the Texas A&M University's Institutional Review Board. Institutional Review Board approval or exemption status was received from Texas A&M University and each of the investigators' institutions. We chose to seek AAVMC Survey Committee approval to encourage veterinary medical teaching faculty to participate in our study.

In April 2015, the AAVMC Survey Committee sent an email on behalf of the authors to associate deans at the 35 US and Canadian colleges of veterinary medicine requesting that they distribute an email invitation and link to our survey to teaching faculty in their colleges/schools. The AAVMC Survey Committee also sent a follow-up email 2 weeks later. Theoretical potential respondents would be the total number of faculty teaching in professional veterinary programs at US and Canadian colleges of veterinary medicine, but this number is not available. The total number of faculty reported to be at US colleges of veterinary medicine is 4,171.²⁸ The institution of one of the authors, as an example, was reported to have 246 faculty in 2014, but less than half of those teach in the professional program.²⁹ Therefore, we estimated the theoretical number of potential respondents to be approximately 2000. The lowest number of potential respondents was assumed to be one per college, or 32. We also distributed an invitation to participate in the survey

via the listserv of the Veterinary Medical Libraries Section of the Medical Library Association, which has 62 members. We limited participation to US and Canadian Animal Health librarians directly supporting veterinary medical education. The survey was open for approximately 9 weeks.

RESULTS

Demographics

At the survey close date, 106 individuals had completed the survey. Respondents represented 22 of the US and Canadian colleges of veterinary medicine, with an average of four responses per institution. Of those who identified their status ($n = 95$), faculty represented 84%, administrators represented 10%, and librarians represented 6% of respondents. Because we knew how many librarians were on the listserv when the survey was distributed (62), we calculated the response rate of librarians as 10% of self-identified librarians. Respondents had worked for an average of 19 years in veterinary medical education.

EBVM Skills Taught and Teaching Methods

The most commonly taught EBVM skill was searching the literature (61%, $n = 106$); also frequently taught were formulating a clinical question (38%, $n = 106$), critically appraising the literature (40%, $n = 106$), and applying evidence to patient care (48%, $n = 106$). Least frequently taught was assessing how well clinical application of the literature worked (19%, $n = 106$). These skills were taught in all types of courses (see Table 1), with all of the skills most commonly taught during clinical rotations. Clinical didactic courses were the next most common venue for teaching all of the skills except for critical appraisal, which was more frequently taught in basic science courses.

Respondents were also asked how they teach each skill (see Table 2). Homework assignments were the most common method for teaching formulating a clinical question (54%), searching the literature (60%), and critically appraising the literature (59%), while faculty lectures were the most common method for teaching applying evidence to patient care (57%) and assessing how well that application worked (53%). Other common teaching methods

Table 1: In which courses/rotations do you teach the following skills?

Skill	Basic science	Clinical didactic	Clinical rotation	Other/unknown
Formulating a clinical question ($n = 56$)	14%	29%	41%	16%
Searching the literature ($n = 82$)	15%	18%	32%	35%
Critically appraising research articles ($n = 50$)	22%	8%	42%	26%
Applying evidence/research to patient care ($n = 65$)	9%	15%	57%	18%
Assessing how well applied evidence worked in patient care ($n = 24$)	4%	13%	79%	4%

The total number of responses for each category are not the same as in Table 2, most likely because some respondents teach in more than one course.

Table 2: How do you teach the following skills?

Skill	Faculty demonstration	Faculty lectures	Homework assignments	In-class assignments or exercises	Librarian demonstration	Student presentations	Other
Formulating a clinical question (<i>n</i> = 39)	13%	41%	54%	51%	13%	31%	26%
Searching the literature (<i>n</i> = 60)	27%	28%	60%	48%	32%	33%	25%
Critically appraising research articles (<i>n</i> = 39)	26%	49%	59%	49%	3%	44%	21%
Applying evidence/ research to patient care (<i>n</i> = 49)	37%	57%	45%	43%	2%	43%	35%
Assessing how well applied evidence worked in patient care (<i>n</i> = 19)	16%	53%	42%	42%	0%	37%	42%

More than one method of teaching could be selected for each skill.

Table 3: Which information tools or resources do you discuss or teach?

Resource	Response rate (<i>n</i> = 78)
PubMed/Ovid MEDLINE	96%
CAB Abstracts (Ovid or Web of Science)	42%
VIN	41%
Other	26%
VetMedResource	10%
CABI (CAB Direct)	9%
Evidence resources within Electronic Health Record	3%
Gray Literature (S-PAC, conference proceedings, etc.)	4%
Mobile resources (Unbound Medicine, Lexi-Comp, etc.)	1%

More than one resource could be selected.

across skills were in-class assignments or exercises and student presentations. Librarian demonstration was used primarily to teach searching the literature (32%), and faculty demonstration was used primarily to teach applying evidence to patient care (37%). The most common response across skills for other teaching methods was one-on-one instruction or discussion.

Library Involvement and Information Resources Used

Respondents were asked whether they use their institution's library resources or librarian in any of the courses they teach; 41% did use library resources/librarian and 59% did not (*n* = 91). By far, the most frequently taught information tool or resource was PubMed/Ovid MEDLINE (96%); other commonly taught resources are CAB Abstracts (42%) and VIN (41%) (see Table 3). Frequently mentioned under "other" were Web of Science and Google Scholar.

Challenges

The most common themes among the 75 responses to the open-ended question about challenges faced in teaching EBVM were the difficulty in convincing students and colleagues of the importance of EBVM and students' resistance to looking to the literature for answers to clinical questions. In some cases, respondents felt that students are accustomed to being given the answers or are interested in quick answers. In other cases, this resistance to EBVM was attributed to both faculty members' and students' tendencies to rely on their own clinical experiences and expert opinion rather than research-based information. Similarly, several respondents stated that many students default to searching Google and VIN rather than resources focused on research results. Students may have an inflated opinion of their existing skills in searching and accessing the literature. This resistance to incorporating EBVM is also apparent among faculty: "I have

tried to implement assignments on clinical rotations, but have had resistance from many faculty."

Another common theme among the challenges to teaching EBVM was the lack of time available to devote to this topic. Some instructors felt that introducing EBVM competed with the primary course material they were tasked with teaching; others spoke to broader issues of overall veterinary curricular design, which still focuses on memorization and covering large amounts of material. One respondent comment summarizes this dilemma: "The veterinary curriculum is overfull... Having too much material to commit to memory leaves little time for students to focus on the critical role of research in advancing clinical practice."

Respondents also addressed difficulty integrating EBVM into clinical practice consistently and frequently enough to reinforce the practice among students. It was also unclear to respondents the extent to which students are applying EBVM when they leave their degree programs and enter practice, particularly given the limited access to literature of many veterinary practitioners. As one respondent put it, "Many students are focused on clinical practice and do not think they need to know research skills or appraisal of published literature. They view this as peripheral knowledge and many do not think they should be required to take the class."

The final theme that arose was the challenging nature of teaching critical assessment. Respondents indicated that, broadly speaking, students have a poor understanding of experimental design. Students were also described as having difficulty differentiating between peer-reviewed literature and industry-sponsored publications. Respondents found that students vary widely in their critical thinking skills.

Successes

The most common theme from the 61 responses to the open-ended question about successes in teaching EBVM was success in truly teaching students EBVM concepts. In some cases, student assessments show that they are learning; in other cases, interactive in-class activities allow students to demonstrate what they have learned. Respondents were especially gratified when students "got it" and were motivated to ask research-focused questions during their clinical rotations, as described in this comment:

There are students who "catch fire" when they are challenged by the diagnostic problem, which I present as "truth-seeking" based on evidence... [They] quickly discover the difficulties in a pragmatic plan to prove or disprove a hypothesis. In turn, this leads to a greater respect for those contributions that are available.

Even in cases where long-term student acquisition of these skills had not been assessed, respondents felt they were successful in exposing students to EBVM principles. Respondents also spoke about specific assignments that were successful and yielded positive feedback from students. Successful assignments ranged from case scenarios to presentations during student grand rounds to creating informative brochures for clients.

DISCUSSION

The results of this survey support our own and colleagues' anecdotal and observational experiences that challenges outweigh successes in teaching EBVM and that EBVM skills are not being universally or consistently taught at colleges of veterinary medicine in the US and Canada. Time and over-crowded syllabi were the chief challenges. A related issue was the perception that too much information of widely varying credibility is available online. These issues are likely to persist in the foreseeable future.

While most respondents cited these issues, they also reported that they did not make use of librarians' expertise in aspects of EBVM other than database search skills. This is an area ripe for collaboration. Librarians are experts at developing relevant questions and evaluating the quality of search results as well as the skills of selecting the appropriate search tool, translating questions into effective search strategies, and making use of enhanced search functionalities in various databases.⁸ In addition to face-to-face workshops or classroom presentations, librarians design research assignments, create online tutorials and research guides, and offer individual and small-group consultations in person, online, by phone, or through chat messaging.³⁰ Furthermore, all this expertise is available without further cost to staff or course budgets.

In an example of fruitful faculty/librarian collaboration, two of the authors have successfully embedded EBVM assignments within a pre-clinical pharmacology course. Students are presented with a scenario or case and are asked to use principles of EBVM to make a recommendation about what drugs to prescribe for their patient. As part of the process, students write a clinical question in PICO (patient or problem, intervention, comparison, and outcome) format. Students are told that the process of building a clinical question includes completely defining the patient (e.g., signalment, disease, or condition), the intervention of interest (drug or drug regimen), the comparison (either no intervention or an existing treatment), and the outcome (what you expect the intervention to accomplish and how you know it occurred or how you would measure it).³¹ Librarians meet with groups of students in a computer lab to review best practices for searching databases to locate evidence related to their question. Following this session, students appraise the evidence they find for validity, impact, and applicability to their patient case. Finally, they integrate their appraisal of drug studies into a decision about which drug to prescribe to their patient case. The teaching faculty member of the team (VF) reports that

after several years of refining, I think I have a multi-step assignment that second years in pharmacology find interesting and useful. In the [clinical] rotation [in which] I have implemented an assignment (students write a PICO, I give them an article, they appraise and apply), follow-up surveys of students suggest that they find the assignment very helpful and are more confident with appraisal after than before, particularly after we have a discussion session about their papers.

Table 4: Selected free online resources to support the teaching of EBVM

Resource	Sponsoring organization	Description	URL
BestBETS for Vets	University of Nottingham	Simple reviews of current best evidence to answer specific clinical questions	https://bestbetsforvets.org/
EBVM Learning	Royal College of Veterinary Surgeons	Tutorial with overview of EBVM, including information and quizzes on EBVM steps	http://www.ebvmlearning.org/
OpenInfobutton Project	US Veterans Health Administration and the University of Utah	“Open source suite of Web services that enable infobutton capabilities within Electronic Health Record (EHR) systems”	http://www.openinfobutton.org/
RCVS Knowledge Summaries	Royal College of Veterinary Surgeons	Short critical summaries of the best available information on a defined clinical question	http://knowledge.rcvs.org.uk/evidence-based-veterinary-medicine/knowledge-summaries/
VetAllTrials	International consortium of organizations	Developing veterinary clinical trials registries	http://vetalltrials.org/
VetSRev	University of Nottingham	Database of veterinary medicine and science systematic reviews	http://webapps.nottingham.ac.uk/refbase/
Veterinary Evidence Journal	Royal College of Veterinary Surgeons	Open access, case studies, knowledge summaries	https://www.veterinaryevidence.org/

Another resource that may help address the issue of time in preparation and delivery of EBVM content is the new, freely developed EBVM Learning portal, sponsored by the EBVM Network and the Royal College of Veterinary Surgeons (RCVS) (see Table 4). This site provides an in-depth tutorial on the EBVM skills of asking, acquiring, appraising, applying, and assessing information in patient care that could be used by students and practitioners. Numerous schools of veterinary medicine in the UK are integrating this teaching tool into their formal curricula.

Several faculty members noted their own perception of a lack of strength of evidence in clinical veterinary literature and further reported their frustrations in trying to teach best practices in these circumstances. Another major concern is lack of access to indexing databases and peer-reviewed journals once students have completed their formal education. Fortunately, there are many ways in which research and clinical faculty, as well as veterinary practitioners, can contribute to improving the quality of the “best available” information and to making it available to the widest possible audience. International ventures such as the collaboration of the Evidence Based Veterinary Medicine Association, the RCVS Knowledge system, and the Centre for Evidence Based Veterinary Medicine at the University of Nottingham provide a framework for the creation and distribution of knowledge summaries to aid clinicians in a wide range of patient care decisions (see Table 4).

Other initiatives underway include the development of and adherence to reporting standards for publication of articles, which would allow readers to determine rele-

vance and strength of evidence quickly.³² Faculty and practitioners can perform systematic reviews and meta-analyses (in collaboration with librarians) and place these and other publications in open access peer-reviewed journals, such as the recently launched Veterinary Evidence Journal from the RCVS (see Table 4). They can also encourage their professional organizations to convert well-established publications to open access platforms. Both teaching hospitals and community practices can adopt electronic health records systems and use not only the patient and practice management functions therein, but also the point-of-care evidence tools embedded in them via the OpenInfobutton Project, initiated by the US Department of Veteran Affairs and the University of Utah (see Table 4). Furthermore, patient records also form a rich data set that could be aggregated and analyzed to supply evidence that is lacking; the literature indicates that, currently, research is one of the least common uses of veterinary medical patient records.³³

Respondents in the current survey observed that students typically overestimate their own skill levels and often have negative attitudes toward EBVM teaching and assignments, preferring quick answers to spending time thoroughly searching for the best evidence or appraising the evidence. Instructors and librarians must be aware of these existing conditions and design learning activities to counteract them. We must also focus on teaching for entry-level competency in asking good questions, finding and appraising answers efficiently, and applying the information to patient care, and we must not expect the sort of expertise gained only through years of experience.

Although successes did not predominate in this survey, they are possible. One of these was meaningful integration into some courses/assignments, often case-based. In addition, some clinical faculty members have been exemplary in modeling EBVM to students and in collaborating to teach EBVM. Respondents also observed that there was sometimes an increase of appreciation of and application by students of evidence-based principles after being taught, resulting in increased confidence in practicing EBVM.

It was clear that there is no consistency in teaching EBVM across veterinary medical curricula, either within schools or between schools. Several respondents noted that EBVM efforts need a cooperative and systematic effort among many faculty members to succeed fully. Piecemeal efforts scattered across 4 years of instruction will not foster the necessary skills in new graduates. Clinical courses and rotations are the natural place for them to be reinforced and practiced, as students will see immediate relevance to patient care. Institutions could also require that each student complete a capstone EBVM experience, such as preparing a literature review and presenting a grand rounds on a patient-centered topic. Many of the challenges we face in integrating evidence-based practice in veterinary medical education and practice have parallels in human medicine. Veterinary medicine has the advantage of being able to learn from these experiences. For example, clinical librarians supporting human medicine are common, but they are rare in veterinary teaching hospitals.³⁴ Both veterinary medical librarians and clinical librarians, or health science librarians, could be used to support EBVM teaching.

Through this survey, we got a sense that not only is there a lack of time to teach EBVM now, but there is a lack of time to coordinate efforts to change the status quo. However, each institution is required to conduct a curriculum review every 7 years as a part of the reaccreditation process. This is a built-in opportunity to sequence and scaffold EBVM throughout the program of study. The American Veterinary Medical Association's Council on Education stipulates that colleges of veterinary medicine must provide evidence that graduating students have attained various competencies, including "critical analysis of new information and research findings relevant to veterinary medicine," but it makes no specific mention of EBVM skills.³⁵ In contrast, the Association of American Medical Colleges includes "form[ing] clinical questions and retriev[ing] evidence to advance patient care" in its Core Entrustable Professional Activities for Entering Residency.³⁶ Individual institutions can incorporate more specific outcomes related to EBVM for their new veterinary medical graduates, but until such standards are adopted at a national level, they are unlikely to be taught consistently across our professional schools. One observation of concern related to instructional methods in the results of this survey is that faculty lectures predominate as one of the most common methods of delivering content. If EBVM skills are to be considered a clinical skill of similar importance to other technical skills, instructors must consider other methods of content

delivery and implement active learning techniques to facilitate student learning.

One of the limitations of this study was possible uncertainty among participants about who should respond to the survey. The initial invitation to participate in the survey was sent by the AAVMC to academic deans at colleges of veterinary medicine, and the suggestion to pass the invitation on to all faculty was unclear. We realized this when one of the college deans wrote to the principal investigator, asking if she should respond to the survey or ask her faculty to complete it. Therefore, it is possible that some respondents attempted to respond for their college rather than for their own individual courses or teaching. We sought to clarify this situation by asking AAVMC to send out a second announcement specifying that deans distribute the survey link to teaching faculty, but we do not know the extent to which this happened.

Another limitation was that not all invited schools of veterinary medicine responded. While the response rate for the survey was not as high as we had hoped, we believe that responses from 22 out of 35 colleges (63%) provided enough information to create an adequate snapshot of the current status of EBVM teaching in the US and Canada. Some of the major themes emerging from the responses have been informative in determining where we are now and how we can improve in the future.

CONCLUSIONS

EBVM is not currently being taught consistently within US and Canadian schools of veterinary medicine. This study demonstrates that existing limitations in teaching EBVM in veterinary medical curricula include time available for teaching these skills and limited quantity and quality of evidence. These can be overcome through collaborations between teaching faculty and librarians, use of free online resources both for teaching and application of EBVM, development of further sources of evidence, and integration of evidence into electronic health records both in teaching hospitals and community-based practices. These can also be overcome by explicit inclusion of the competencies needed to practice EBVM among the expectations of new graduates, whether within a college of veterinary medicine or at the national level such as through accrediting bodies. This work establishes a baseline for future educational initiatives.

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