

A Global Survey of the Views of Practicing Companion Animal Veterinarians on Their Undergraduate Curriculum and Their Access to Continuing Education Resources

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ABSTRACT

A global survey was developed to gain insight into the opinion of companion animal veterinarians about their undergraduate education and their access to continuing education on the following topics: client communication, animal welfare, surgical techniques, human–animal bond, dentistry, animal behavior, and zoonotic disease/epidemiology. In 2016, the survey was distributed via SurveyMonkey® in five languages to companion animal veterinarians around the world. A total of 1,167 respondents returned the survey. The distribution of survey responses differed by geographic region (number of respondents in parentheses; where respondents work/have been trained): Europa (including the Russian Federation, 359/423), Asia (311/205), North America (77/89), South America (24/16), Africa (46/41), and Oceania (147/167). The results were strongly influenced by a large number of respondents (in parentheses) who graduated in the Russian Federation (180/162), Australia (133/154), Israel (136/82), the Netherlands (64/64), the United Kingdom of Great Britain and Northern Ireland (36/46), and the United States of America (46/44). On the basis of the responses, all topics were poorly covered or not taught, except for surgical techniques and zoonotic disease/epidemiology, which were covered adequately or well. However, there were country and geographic regional differences. This was also true for continuing education resources, which were—in addition to countries and geographic regions—also influenced by the educational topic. As already stated by Dhein and Menon in 2003, time away from the practice, travel distance, and expense may be reasons why companion animal veterinarians do not follow continuing education. Online continuing education could fill in the gap and is more time and cost-efficient.

Key words: (companion animal) veterinary medical curriculum, continuing education, global impact, opinion-questionnaire-based survey, sources of information

INTRODUCTION

The veterinary professional has to have many skills; therefore, the World Organization for Animal Health (OIE [Office International des Épizooties]) defined the so-called Day One competencies. Included in the Day One competencies are the following topics relevant to this study: communication skills, animal welfare, zoonoses, and epidemiology.¹ Although clinical veterinary behavior is not included in the OIE recommendations,¹ it has also been referred to as a Day One competency.² Professional competencies are positively and significantly associated with employer satisfaction³ and are correlated with, and may be essential to, the economic and professional success of the individual veterinarian as well as the veterinary profession.^{4–7}

Communication skills are needed to build successful relationships with their clients,^{8,9} especially with regard to the human–animal bond. Various aspects of the human–animal bond have expanded within veterinary education over the last decennia.¹⁰ In the human–companion animal bond, pets may develop abnormal behavior.¹¹ Therefore, knowledge of veterinary behavioral medicine is also vital,¹² because practicing veterinarians are the primary source of information for most companion animal owners when it comes to behavioral issues

of their beloved pets.^{12,13} However, veterinary graduates feel ill-equipped to deal with these problems because of a lack of relevant undergraduate training.^{2,14,15}

To optimize animal welfare, pain management is essential. A very often overlooked area in this respect is dentistry. Untreated dental problems may lead to unrelenting pain and therefore affect the daily welfare of companion animals.¹⁶ According to recent studies, 90% of cats and dogs have a dental disease.¹⁷ While it is important that veterinary students receiving training in dental health,¹⁸ Anderson et al.¹⁹ found that veterinary undergraduates in the United States of America, Canada, and the Caribbean were not well-trained in dentistry when they entered small animal practice. This is probably a worldwide problem.

To optimize animal welfare, it is also necessary that veterinarians should be able to perform surgery. For instance, sterilization (desexing, spay, neuter, castration) is one of the oldest surgical procedures performed on dogs and cats²⁰ and is a routine undertaking in most veterinary clinics worldwide.²¹ However, over a lifespan, the welfare consequences of sterilization may be significant.²² Bowlt et al.²³ found that undergraduate veterinary students often lacked confidence and competence in basic surgical skills essential for the veterinary professional.

Undergraduate curricula do not devote enough time to the development of surgical skills and experience, which is why many veterinary schools give additional surgical training programs to improve students' clinical skills.²⁴

Veterinarians play an important role in the sustainable management of complex health problems arising from the interaction of animals, humans, and their environment, the so-called One Health concept.²⁵ Knowledge of One Health is becoming increasingly relevant because the health of animals and humans is affected by similar diseases, environmental changes, and the socioeconomic variables and is also a Day One competency.²⁶ Students lack relevant knowledge, especially about zoonoses.^{27–29} It is a challenge to include these Day One competencies, and others, in veterinary curricula without overloading the curriculum. Moreover, there appear to be substantial geographic regional differences in the level of education provided by different veterinary schools.¹⁹ However, as pointed out by Mossop,³⁰ *“the placement of a concept in a curriculum does not mean that the student will become competent in that area.”* Hodgson et al.⁷ suggested that surveys should be carried out to determine the types and frequency of teaching professional competencies in veterinary curricula.

There are a lot of reasons why advanced veterinary skills are not able to be addressed in the veterinary curriculum, for example, advances in techniques, increased veterinary medical content to address, and reduced class time. Thus, once graduated, it is important that veterinarians stay up-to-date with new developments in their field, especially as veterinary medicine is evolving rapidly,³¹ by reading veterinary journals or accessing online interactive courses.³² These sources of information may differ by country.³³ For instance, VandeWeerd et al.³⁴ found that veterinarians in a French-speaking part of Belgium (Europe) preferred to consult colleagues, the internet, and textbooks for information rather than peer-reviewed journals. Something similar was found in the US by McKenzie.³⁵ The choice of information source depends on when the information is required—it is easier to consult a colleague than to perform a literature search when treating a patient.

To gain insight into the content of veterinary medical curricula and continuing education on client communication, animal welfare, surgical techniques, human–animal bond, dentistry, animal behavior, and zoonotic disease/epidemiology, a global, questionnaire-based survey (see [Appendix 1, WSAVA Animal Welfare Survey](#)) was developed by the Animal Welfare Guidelines Group (AWGG) of the World Small Animal Veterinary Association (WSAVA), a sub-committee of WSAVA's Animal Welfare and Wellness Committee (AWWC). The target audience was companion animal veterinary alumni worldwide. We chose an online, questionnaire-based survey approach because this research format provides a relatively cheap, quick, and efficient way of obtaining large amounts of information from a large sample of people worldwide.

Of primary focus are the following research questions: (a) How do countries where the responding companion animal veterinarians have been trained impact their perspective of how well the selected topics (client communication, animal welfare, surgical techniques, human–animal bond, dentistry, animal behavior, and zoonotic disease/epidemiology) were covered in the veterinary curricula; (b) how do geographic regions where the responding companion animal veterinarians have been trained impact their perspective of how well the selected topics were covered in the veterinary curricula; (c) how

do countries where the responding companion animal veterinarians work differ from each other in where companion animal veterinarians obtained information after graduation on the selected topics; and (d) how do geographic regions, where the responding companion animal veterinarians work, differ from each other in where companion animal veterinarians obtained information after graduation on the selected topics.

The results of the four research questions will be presented and discussed here, except for the topic of animal welfare, which has been published elsewhere.³⁶ The COVID-19 pandemic manifested in health and socioeconomic crisis has also significantly impacted veterinary education (both undergraduate training and continuing education). For instance, the coronavirus pandemic has dramatically spurred the adoption of online learning.⁹ However, our questionnaire was distributed in 2016 and thus the results should be seen in the pre-pandemic context.

METHODS

Development of Questions

The survey questions (see [Appendix 1, WSAVA Animal Welfare Survey](#)) were developed by the AWGG of WSAVA to assess various issues that may affect companion animal welfare. The survey was divided into three parts. The first part (questions 1–5) included respondents' demographic information. The second part (questions 6–11) consisted of questions on animal welfare, of which the findings were recently reported.³⁷ The third part (questions 12–17) asked respondents whether they thought they had been taught about various topics when they were students (question 12), what resources they used for information on these topics (question 13), what resources on animal welfare they thought their clients used, whether they had access to continuing education on animal welfare, and whether continuing education was necessary for renewal of their veterinary license. In this paper, the results for questions 12 and 13 will be presented and discussed. For question 12 a weighted score for each topic was calculated. We present the results for client communication, surgical techniques, human–animal bond, dentistry, animal behavior, and zoonotic disease/epidemiology because the results for animal welfare have been published elsewhere.³⁶ For question 13 we present the results for all topics except for animal welfare, which has been published elsewhere.³⁶ The findings from questions 14–16 have been published elsewhere.³⁶

Recruiting Respondents to the Study

The Ethics Review Board of the Faculty of Social and Behavioural Sciences of Utrecht University approved the study. The survey was available in English, French, Chinese, Spanish, and Russian, and distributed through the SurveyMonkey® (San Mateo, CA, USA) platform in 2016. The target audience was companion animal veterinarians worldwide. The survey was advertised on the WSAVA website, and geographic region and country contacts of WSAVA were asked to publish the link to the survey on their local veterinary website.

As the number of companion animal veterinarians who read the advertisement is not known, it was not possible to determine the response rate. The questionnaires were returned from March 24 to June 18, 2016. The results were obtained and processed anonymously. Some respondents did not answer all the questions. Further details can be found in Enderburg et al.³⁶

Grouping of Respondents

As stated by Endenburg et al.,³⁶ there are several ways to divide the respondents of this global, opinion-questionnaire-based survey into groups. Based on where they work and/or have been trained, the respondents were divided into six geographic regions: Europe (including Russian Federation), Asia, North America, South America, Africa, and Oceania. As it seemed that the results were highly influenced by the large numbers of respondents from the Russian Federation, Australia, Israel, the Netherlands, the United Kingdom of Great Britain and Northern Ireland (UK), or the US (Figure 1), these six countries were compared with each other.³⁶ The answers to question 12 were based on where (country or geographic region) respondents have been trained, whereas the answers to question 13 were based on where (country or geographic region) respondents work.

Statistical Analysis

All statistical analyses were carried out using IBM® SPSS® Statistics for Windows (version 24.0) computer program (IBM Corp., Armonk, NY, USA) and according to Field.³⁸

The hypothesis that the probabilities of choosing the categories of the questions were the same for the various groups was tested using the likelihood ratio test (G-test of goodness-of-fit). Post hoc comparisons for these data were performed also with the likelihood ratio test.

To account for the greater probability of a false positive finding due to multiplicity, a more stringent criterion was used for statistical significance. The adjusted α -value for the various tests can be found in Endenburg et al.³⁶ Significant p values are marked with an asterisk (*).

Statistical significance represented by p values may not necessarily confirm practical importance and so we looked at effect sizes (w). The following standard cut-offs for w were used:³⁹ zero or nearly zero effect, $0 \leq w < 0.1$; small effect, $0.1 \leq w < 0.3$; moderate effect, $0.3 \leq w < 0.5$; and large effect, $w \geq 0.5$.

RESULTS

Demographics

Overall, 1,167 surveys were returned and 1,052 respondents reported where they had trained. Veterinary and allied degrees were awarded by 201 different universities, institutes, academies, colleges, and schools in 63 different countries. The number of institutions per country ranged from 1 (38 countries) to 29 (one country: Russian Federation). Twenty-one institutions (10.4%) had 10 or more responding alumni. A total of 941 and 964 respondents answered questions 12 and 13, respectively. Of the respondents (from 67 different countries; see Appendix Figure A1) who completed questions 12 and 13, 35.6% were male and 64.4% were female. About 87% of the respondents

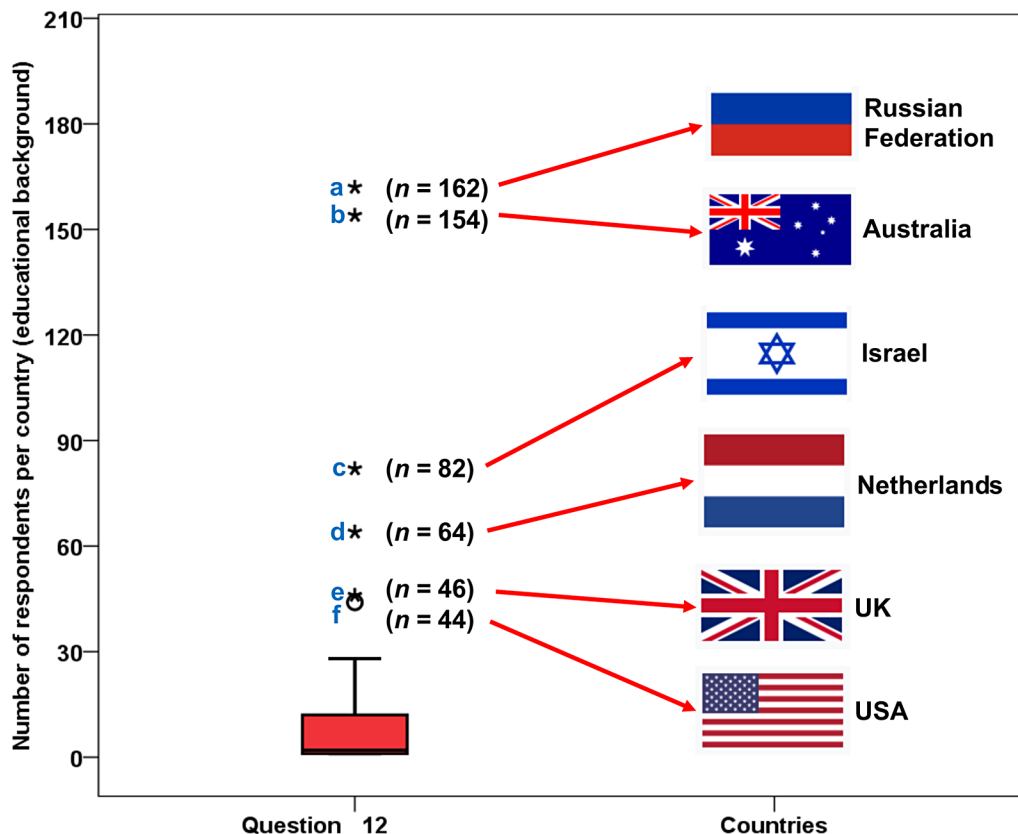


Figure 1: Number of respondents (n) per country, that is, the country where the respondents obtained their primary veterinary degree. Results are presented as box-and-whisker plots showing median values with interquartile range, highest and lowest non-outlying values (i.e., values up to 1.5 box lengths from the upper or lower edge of the box). (Mild) outliers (i.e., cases with values between 1.5 and 3 box lengths from the upper or lower edge of the box; \circ) and extreme cases (i.e., cases with values more than 3 box lengths from the upper or lower edge of the box; $*$) are also indicated. Countries: a = Russian Federation; b = Australia; c = Israel; d = Netherlands; e = United Kingdom of Great Britain and Northern Ireland (UK); f = United States of America (US).

were practicing veterinarians; 13% were non-practitioners. 73.3% of the respondents are working in the same country where they got their degree; 80.9% of the respondents are working in the same geographic region where they got their degree. Further details on demographics can be found in Endenburg et al.^{36,37}

Topics Taught in the Veterinary Curriculum

General

The effect sizes (*w*) based on the omnibus tests for the six countries when compared with those for the six geographic regions are larger and might be more meaningful. Therefore, the results for the six countries and six geographic regions are presented in a figure (Figure 2) and a Supplementary table (Table S1), respectively.

Client Communication

Six Countries

Panel A from Figure 2 shows the results for the six countries. On the basis of responses, the veterinary curricula of the Russian Federation covered client communication less well than those of Australia ($p < .001^*$, large effect), Israel ($p < .001^*$, moderate effect), the Netherlands ($p < .001^*$, large effect), the UK ($p < .001^*$, large effect), and the US ($p < .001^*$, large effect). Moreover, survey respondents indicated that client communication issues were covered less well in the veterinary curricula of Israel than in the curricula of Australia ($p < .001^*$, moderate effect), the Netherlands ($p < .001^*$, moderate effect), the UK ($p < .001^*$, moderate effect), and the US ($p < .001^*$, moderate effect).

Geographic Regions

On the basis of the responses, client communication was poorly covered or not taught in veterinary medical curricula worldwide, but especially in Europe and South America (Supplementary Table S1). In the opinions of the respondents, client communication was taught marginally, but significantly, worse in Europe than in Asia ($p < .001^*$, small effect), North America ($p < .001^*$, small effect), and Oceania ($p < .001^*$, small effect).

Surgical Techniques

Six Countries

On the basis of responses, the veterinary curricula of the Russian Federation covered surgical techniques less well than those of Australia ($p < .001^*$, large effect), Israel ($p < .001^*$, large effect), the UK ($p < .001^*$, moderate effect), and the US ($p < .001^*$, large effect). Moreover, the responding alumni were of the opinion that surgical techniques issues were covered less well in the veterinary curricula of the Netherlands than in the curricula of Australia ($p < .001^*$, large effect), Israel ($p < .001^*$, large effect), and the UK ($p < .001^*$, moderate effect) (Figure 2, panel B).

Geographic Regions

Worldwide and according to companion animal veterinarians, surgical techniques appeared to have been covered adequately in veterinary curricula. On the basis of responses, surgical techniques were covered marginally (small/moderate effect), but significantly ($p < .001^*$), less well in veterinary schools in Europe than in veterinary schools in Asia, North America, Africa, and Oceania. In the opinions of the responding alumni, the topic was covered less well in Asia than in Africa ($p < .001^*$, small effect) (Supplementary Table S1).

Human–Animal Bond

Six Countries

On the basis of responses, the veterinary curricula of the Russian Federation covered human–animal bond less well than those of Australia ($p < .001^*$, moderate effect), the Netherlands ($p < .001^*$, moderate effect), and the US ($p < .001^*$, small effect) (Figure 2, panel C).

Geographic Regions

Overall, the respondents thought that the education on the human–animal bond was poor, but there were significant geographic regional differences. Education in this topic appeared to be poorer in Europe than in North America ($p < .001^*$, small effect), and Oceania ($p < .001^*$, small effect) (Supplementary Table S1).

Dentistry

Six Countries

On the basis of responses, the veterinary curricula of the Russian Federation covered dentistry less well ($p < .001^*$) than those of Australia (large effect), Israel (large effect), the Netherlands (moderate effect), the UK (moderate effect), and the US (large effect) (Figure 2, panel D).

Geographic regions

In the opinions of the respondents, dentistry was poorly covered in veterinary curricula, with education in dentistry being covered marginally, but significantly, better (small effect) in Europe than in Asia ($p < .001^*$), North America ($p < .001^*$), Africa ($p < .001^*$), and Oceania ($p < .001^*$) (Supplementary Table S1).

Animal Behavior

Six Countries

On the basis of responses, the veterinary curricula of the Russian Federation covered animal behavior less well than those of Australia ($p < .001^*$, moderate effect), Israel ($p < .001^*$, moderate effect), and the Netherlands ($p < .001^*$, moderate effect) (Figure 2, panel E).

Geographic Regions

Respondents thought that overall, animal behavior was poorly/adequately covered, but there were some small, but significant, geographic regional differences. In the opinions of the responding alumni, the topic was covered less well in South America than in Asia ($p < .001^*$, small effect) and Africa ($p < .001^*$, large effect) (Supplementary Table S1).

Zoonotic Disease/Epidemiology

Six Countries

On the basis of responses, there was a significant difference in how well zoonotic disease/epidemiology was covered in the veterinary curricula of the six countries ($p < .004^*$, small effect). However, these differences did not reach the level of statistical significance ($p > .002$) in the post hoc comparisons (Figure 2, panel F).

Geographic Regions

In the opinions of the respondents overall, zoonotic disease/epidemiology was covered adequately/well in veterinary curricula, but the best coverage was in Africa. Survey respondents indicated that this topic was covered significantly less well

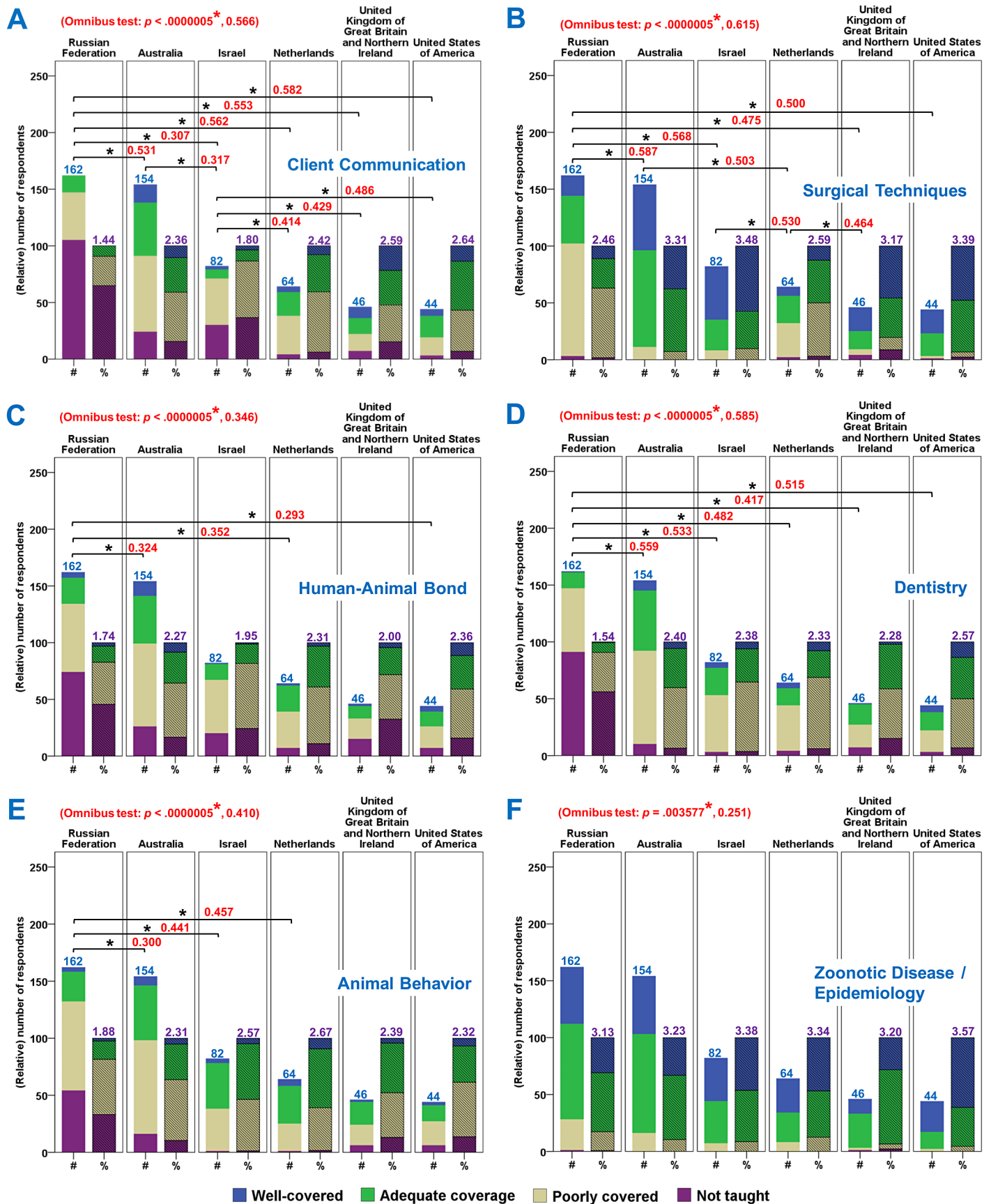


Figure 2: Coverage of different topics during undergraduate veterinary training according to companion animal veterinarians with their educational background in the Russian Federation, Australia, Israel, Netherlands, United Kingdom of Great Britain and Northern Ireland (UK), or United States of America (US). Panel A: client communication; Panel B: surgical techniques; Panel C: human-animal bond; Panel D: dentistry; Panel E: animal behavior; Panel F: zoonotic disease/epidemiology. Left and right bars represent scores (number of respondents, #) and relative scores (%), respectively. Solid colored stacked bars = #; solid colored stacked bars with black diagonal lines and borders = %. The (blue) numbers above the left bars are number of respondents. The (purple) numbers above the right bars are weighted scores. The (red) value of the effect size w is shown to the right of the asterisks. *(red) = significant difference ($p < .007$) in omnibus test. *(black) = significant difference ($p < .001$) in post hoc comparison.

in the curricula of Europe ($p < .001^*$, *small* effect) or Oceania ($p < .001^*$, moderate effect) than in the curricula of Africa (Supplementary Table S1).

Sources of Information

General

The effect sizes (w) based on the omnibus tests for the six countries when compared with those for the six geographic regions are larger and might be more meaningful. Therefore, the results for the six countries and six geographic regions are presented in a figure (Figure 3) and a Supplementary table (Table S2), respectively.

Client Communication

Six Countries

On the basis of responses, there was a significant difference between the respondents who work in the Russian Federation and those who work in Australia ($p < .001^*$, *small* effect), Israel ($p < .001^*$, moderate effect), and the Netherlands ($p < .001^*$, *small* effect). Many companion animal veterinarians who work in Australia (20.5%), Israel (26.6%), or the Netherlands (20.7%) did not search for information on this topic at all, whereas only 10.4% of veterinarians working in the Russian Federation did not look for relevant information (Figure 3, panel A).

Geographic Regions

Worldwide and according to respondents, companion animal veterinarians reported obtaining information on client communication from veterinary conferences/meetings (29.5%), the Internet (23.8%), and veterinary journals (17.9%) (Supplementary Table S2). On the basis of responses, there was a significant difference ($p = .004^*$, *small* effect) between the six geographic regions where companion animal veterinarians obtained information on client communication, but none of the 15 post hoc comparisons were statistically significant ($p > .002$).

Surgical Techniques

Six Countries

According to respondents, there was a significant difference ($p < .001^*$, *small* effect) between the six countries with regard to which resources companion animal veterinarians used to gain relevant information on surgical techniques. There was a significant difference between the respondents who work in Israel and those who work in the Russian Federation ($p < .001^*$, *small* effect). Many companion animal veterinarians who work in Israel (28.6%) obtained information on surgical techniques by means of local continuing education, whereas only 13.1% of veterinarians working in the Russian Federation got information via this source (Figure 3, panel B).

Geographic Regions

Responding companion animal veterinarians reported obtaining information on surgical techniques at veterinary conferences/meetings (30.7%), from veterinary journals (23.6%), and from local veterinary education (21.8%) (Supplementary Table S2). Survey respondents indicated that there was a significant difference between Asia and Europe ($p < .001^*$, *small* effect) or North America ($p < .001^*$, *small* effect). In Asia, companion animal veterinarians more often obtained information by means of local veterinary education (27.2%) and veterinary conferences/meetings (28.6%), while in Europe and North America, veterinarians got information from veterinary journals (26.2%

and 23.8%, respectively) and veterinary conferences/meetings (31.3% and 35.4%, respectively).

Human–Animal Bond

Six Countries

On the basis of responses, the resources used by companion animal veterinarians differed between the six countries ($p < .001^*$, *small* effect) (Figure 3, panel C). There was a significant difference between the respondents who work in Australia ($p < .001^*$, *small* effect) or Israel ($p < .001^*$, *small* effect) and those who work in the Russian Federation. In Australia and Israel, 23.5% and 27.8%, respectively, did not search for information on human–animal bond, compared with 11.9% of respondents from the Russian Federation. Furthermore, and based on the opinions of the respondents, more companion animal veterinarians in the Russian Federation than in Australia or Israel got relevant information from the Internet (37.1% vs. 21.0% or 29.3%, respectively). There also was a significant difference between the respondents who work in Israel and those who work in the US ($p < .001^*$, *small* effect). On the basis of responses, the highest answer category for this topic in Israel and the US is Internet and veterinary conferences/meetings, respectively (Figure 3, panel C).

Geographic Regions

Overall, responding companion animal veterinarians reported obtaining information on human–animal bonds from the Internet (28.7%), veterinary conferences/meetings (23.2%), and veterinary journals (19.1%) (Supplementary Table S2). On the basis of responses, there was a significant difference ($p = .002^*$, *small* effect) between the six geographic regions with regard to which resources were used, but none of the 15 post hoc comparisons were statistically significant ($p > .003$).

Dentistry

Six Countries

On the basis of responses, there was a significant difference ($p < .001^*$, *small* effect) in the resources on dentistry used by companion animal veterinarians in the six countries (Figure 3, panel D). There were significant differences between the respondents who work in the Russian Federation and those who work in Australia ($p < .001^*$, *small* effect), Israel ($p < .001^*$, *small* effect), and the Netherlands ($p < .001^*$, *small* effect). For instance, in the Russian Federation (6.4%) companion animal veterinarians were less likely to get information on dentistry through local veterinary education than were veterinarians in Australia (19.8%), Israel (25.9%), and the Netherlands (25.4%).

Geographic Regions

Responding companion animal veterinarians typically reported obtaining information on dentistry from veterinary conferences/meetings (30.3%), veterinary journals (23.4%), or the Internet (20.5%) (Supplementary Table S2). On the basis of responses, there was a significant geographic regional difference ($p < .001^*$, *small* effect). In Asia and according to respondents, veterinarians obtained information from veterinary conferences/meetings (28.6%) and local veterinary education (24.8%), while in Europe companion animal veterinarians went to veterinary conferences and meetings (30.6%) and consulted veterinary journals (27.0%) ($p < .001$, *small* effect).

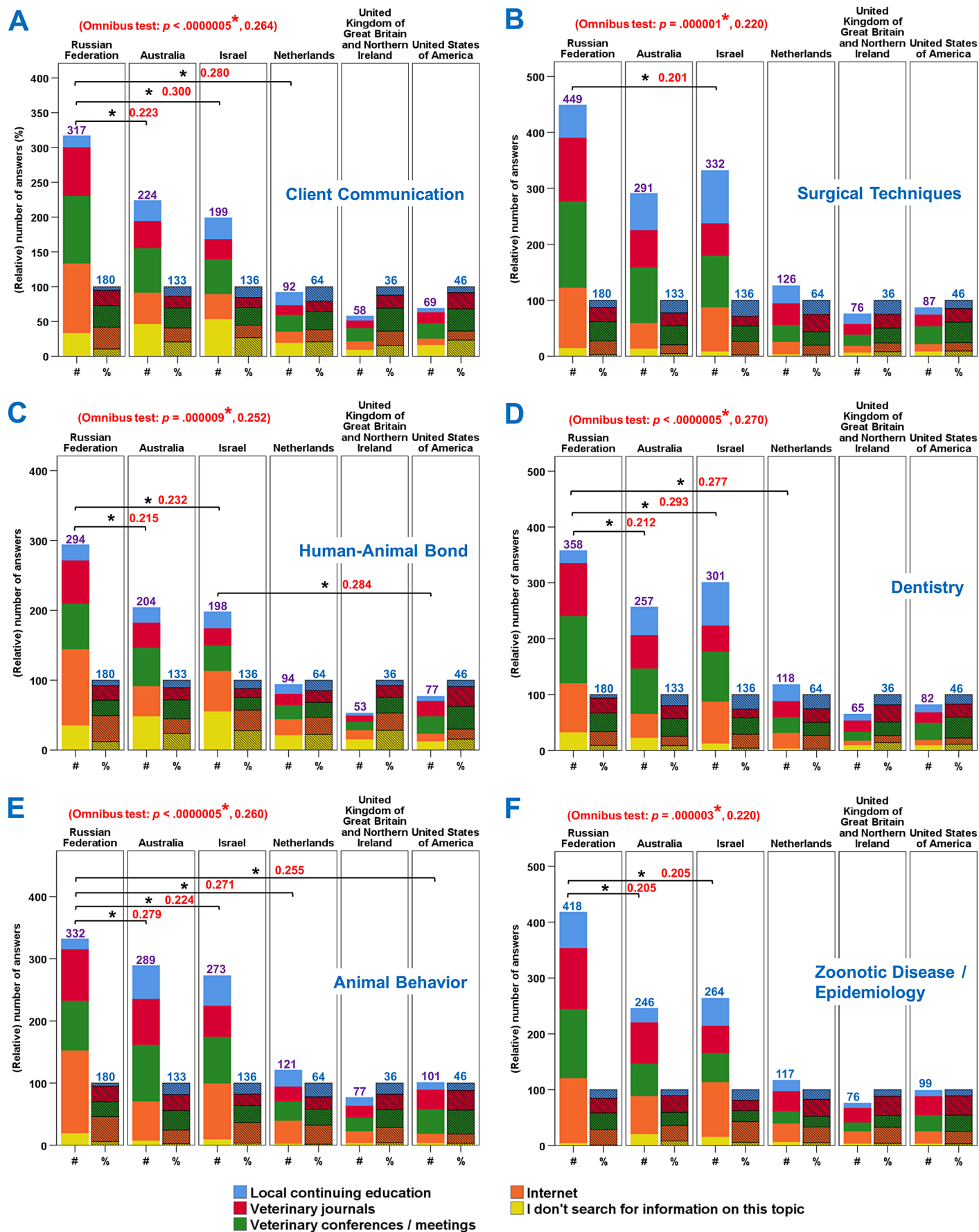


Figure 3: Sources of information on different topics used by companion animal veterinarians working in Russian Federation, Australia, Israel, Netherlands, United Kingdom of Great Britain and Northern Ireland (UK), or United States of America (US). Panel A: client communication; Panel B: surgical techniques; Panel C: human -animal bond; Panel D: dentistry; Panel E: animal behavior; Panel F: zoonotic disease/epidemiology. Left and right bars represent scores (number of answers, #) and relative scores (%), respectively. Solid colored stacked bars = #; solid colored stacked bars with black diagonal lines and borders = %. The (purple) numbers above the left solid colored stacked bars are total number of answers. The (blue) numbers above the right solid colored stacked bars are total number of respondents. The (red) value of the effect size w is shown to the right of the asterisks. *(red) = significant difference ($p < .007$) in omnibus test. *(black) = significant difference ($p < .001$) in post hoc comparison.

Animal Behavior

Six Countries

On the basis of responses, there was a significant difference ($p < .001^*$, *small effect*) in the resources on animal behavior used by companion animal veterinarians in the six countries (Figure 3, panel E). Respondents who work in the Russian Federation used different resources from those used by respondents who work in Australia ($p < .001^*$, *small effect*), Israel ($p < .001^*$, *small effect*), the Netherlands ($p < .001^*$, *small effect*), and the US ($p < .001^*$, *small effect*). Responding companion animal veterinarians who work in the Russian Federation reported obtaining information on animal behavior from the Internet (39.6%) and veterinary journals (24.8%). Responding companion animal veterinarians who work in Israel or the Netherlands typically reported obtaining information from the Internet (33.0% and 30.6%, respectively) and from veterinary conferences/meetings (27.5% and 25.6%, respectively). Respondents who work in Australia or the USA often got information on animal behavior primarily from veterinary conferences/meetings (31.5% and 38.6%, respectively) and veterinary journals (25.6% and 31.7%, respectively).

Geographic Regions

Companion animal veterinarians typically reported obtaining information on animal behavior from the Internet (29.4%), veterinary conferences/meetings (28.0%), or veterinary journals (23.9%) (Supplementary Table S2). Survey respondents indicated that there was a significant difference ($p = .005^*$, zero or nearly zero effect) in the resources used to obtain this information. In Europe, companion animal veterinarians primarily used the Internet, whereas the respondents from Oceania typically obtained this information from veterinary conferences ($p < .001^*$, *small effect*).

Zoonotic Disease/Epidemiology

Six Countries

On the basis of responses, there was a significant difference ($p < .001^*$, *small effect*) in resources on zoonotic disease/epidemiology used by companion animal veterinarians in the six countries (Figure 3, panel F). Respondents who work in the Russian Federation used different resources from those used by respondents who work in Australia ($p < .001^*$, *small effect*) and Israel ($p < .001^*$, *small effect*). On the basis of responses, more companion animal veterinarians from the Russian Federation got information on zoonotic disease/epidemiology from veterinary conferences/meetings (29.7%) than did veterinarians from Australia (23.6%) and Israel (19.7%).

Geographic Regions

Overall, responding companion animal veterinarians typically reported obtaining information on zoonotic disease/epidemiology from the Internet (27.6%), veterinary journals (26.9%), or veterinary conferences/meetings (25.5%) (Supplementary Table S2). Survey respondents indicated that there was a significant geographic regional difference in the resources used ($p < .001^*$, *small effect*), but none of the 15 post hoc comparisons were statistically significant ($p > .001$).

DISCUSSION

Topics Taught in the Veterinary Curriculum

One of the aims of this survey was to find out whether companion animal veterinarians worldwide considered that they

had received education in client communication, animal welfare (discussed in Endenburg et al.),³⁶ surgical techniques, human–animal bond, dentistry, animal behavior, and zoonotic disease/epidemiology during their undergraduate training at veterinary school. Worldwide and on the basis of responses, client communication, human–animal bond, dentistry, and animal behavior appear to have been covered poorly in veterinary curricula, whereas surgical techniques and zoonotic disease/epidemiology were covered adequately/well (Supplementary Table S1). The 2011 North American Veterinary Medical Education Consortium report identifies One Health as a core competence of all graduating veterinarians.⁷ Zoonotic disease, a One Health issue,⁴⁰ seems to have been covered best according to the respondents. It is disappointing that not only soft skills such as client communication and human–animal bond but also dentistry and animal behavior were poorly covered. With regard to animal behavior, our results are in line with those of Kogan et al.⁴¹ They also found that, despite the fact that veterinarians need to be educated in animal behavior and that it helps owners to prevent and solve behavioral problems of their companion animals, current training opportunities in behavioral medicine at US veterinary colleges are limited.

Although there are country and geographic regional differences in how well alumni thought that they had been taught the different topics (Figure 2 and Supplementary Table S1), in general, the results suggest that there is room for improvement. McDemott et al.⁴² suggested that, during the veterinary school recruitment process, the communication skills of applicants should be assessed, together with their motivation and intellectual ability. This could prevent disappointment in the future. This procedure is already in practice in some veterinary and medical schools.^{43–45}

It would seem that veterinary curricula do not allow enough time or have enough appropriate cases to teach these skills and to allow students enough practice to enable them to feel confident when they enter veterinary practice. Online teaching could help overcome this problem. For instance, surgical skills can be acquired by using virtual simulation techniques.⁴⁶ An advantage of these techniques is that fewer animals are needed for educational purposes. E-learning has its drawbacks. The student–teacher relationship has a direct influence on student learning and this interaction is reduced with online teaching. Also, the social support students give each other in a group learning process may be less with online teaching. Thus, the loss of the collaborative experience for students as well as real-time feedback and a sense of community is a major disadvantage.⁹ Furthermore, simulation cannot fully replace live animals, because animals can be unpredictable.⁴⁶

The implemented restrictions because of the fast spread of COVID-19 forced higher education institutions to rely—in most cases—solely on online teaching. Many institutions were however not prepared to move online and had to close their campuses.⁴⁷ Furthermore, since different pedagogy is required for distance teaching, for many faculty teachers it was difficult to transition to online teaching. They were not prepared and often lacked technological skills. The quality of learning and the effectiveness of teaching online depends also on the field of study. For example, for veterinary studies, actual practice cannot be easily replaced by distance learning.⁴⁷ Thus, although there are nowadays a lot of online options, online undergraduate teaching is not a panacea.

Furthermore, our results are consistent with those of national studies. McDermott et al.⁴⁸ found that even among recent graduates, the training of communication skills, a core skill of veterinary practitioners, during veterinary school did not prepare them sufficiently for communicating with clients. This aspect should be integrated better into curricula.

The OIE has taken important steps to harmonize and improve veterinary education around the world. For this purpose, the OIE has published two guides: (a) OIE Recommendations on the Competencies of Graduating Veterinarians (“Day 1 Graduates”) to Assure National Veterinary Services of Quality;¹ and (b) Veterinary Education Core Curriculum OIE Guidelines.⁴⁹ Not unexpectedly, there were differences between countries (such as Russian Federation, Australia, Israel, the Netherlands, the UK, and the US; which are all OIE member countries) in how veterinary curricula covered the six topics investigated in this paper (Figure 2) and animal welfare (see³⁶). For the seven topics together (i.e., including the published results for the topic of animal welfare;³⁶) the total coverage during undergraduate training, according to responding companion animal veterinarians, in the Russian Federation, Australia, Israel, the Netherlands, UK, or US was compared (Figure 4). Taken together, in the opinion of the respondents these topics were covered less well in the Russian Federation than in Australia, Israel, the Netherlands, the UK, or the US, and less well in Israel than in the Netherlands or the UK. An explanation for this might be the number of veterinary institutions in a country accredited by the relevant authorities. Accreditation agencies develop evaluation criteria and conduct peer evaluations of all the institutions they oversee to assess whether or not those criteria are met. Being accredited by such an authority ensures minimum standards in terms of the quality of curriculum content. In Australia, Europe, and the US, the accreditation authorities are the Veterinary Schools of Australia and New Zealand (VSANZ), the European Association of Establishments for Veterinary Education (EAEVE), and the American Association of Veterinary Medical Colleges (AAVMC), respectively. The Saint Petersburg State Academy of Veterinary Medicine (Russian Federation), the Moscow State Academy of Veterinary Medicine and Biotechnology (Russian Federation), and the Hebrew University of Jerusalem—Koret School of Veterinary Medicine (Israel) are the only candidate members of EAEVE. In contrast, the veterinary schools in Australia, the Netherlands, the UK, and the US are members of one or two accreditation authorities. The other veterinary institutions in the Russian Federation are not members of EAEVE, VSANZ, or AAVMC (Supplementary Table S3).

Another reason for the difference in coverage of the seven topics during undergraduate training (Figures 2 and 4) might be the duration of veterinary training, on the assumption that less material can be covered in a shorter curriculum than in a longer curriculum. The veterinary course in the Russian Federation takes 5 years to complete.^{50,51} The minimum length of veterinary courses offered that enable Australian graduates to be registered under state legislation is 5 years of university education, but the minimum course length is up to 6 years at some schools.⁵² In Israel, veterinary students train for 7 years.⁵³ The only Dutch veterinary school offers a 6-year veterinary course (<https://www.uu.nl/en/organisation/faculty-of-veterinary-medicine/education/veterinary-programmes>). In the UK, veterinary education is generally a 5-year course, except

at the University of Cambridge, which has a 6-year course.⁵¹ In the US veterinary students train for 6–8 years.^{51,54} Supplementary Table S4 gives an overview of the veterinary academic institutions in the six countries, course length, and academic degrees awarded. The veterinary institutions in the Russian Federation, when compared with those in the other five countries, have the shortest veterinary courses.

Furthermore, in recent decades the veterinary medical profession has undergone a profound shift in focus from agricultural animals to companion animals in Western countries (such as Australia, Israel, the Netherlands, the UK, or the US). This shift has had major implications on the veterinary educational program. In contrast, many veterinarians in the Russian Federation have been educated purely in agricultural medicine.⁵⁰ Thus, Russian veterinarians have been taught less about the topics studied here—except for zoonotic disease/epidemiology—when compared with veterinarians trained in Western veterinary schools (Figures 2 and 4).

Sources of Information

On the basis of responses, we also investigated which resources practicing veterinarians used to acquire information on these topics. This has been studied previously in individual countries,^{32,33} but not worldwide. As stated by Gates et al.⁵⁵, continuing education is important for professional development, protecting the reputation of the veterinary profession, and raising standards of care. We found not only country and geographic regional differences in the resources used for continuing education (local continuing education, veterinary journals, veterinary conferences/meetings, Internet, or I don’t search for information), but also differences depending on the topic studied (Figure 3 and Supplementary Table S2).

We have also taken the seven topics together for the comparison of the six countries with regard to where responding companion animal veterinarians obtained the information after graduation (Figure 5). On the basis of responses, companion animal practitioners who work in the Russian Federation made less use of local continuing education opportunities than their counterparts who work in Australia, Israel, the Netherlands, the UK, or the US. The availability of continuing education is limited in the Russian Federation, mainly because of its cost.⁵⁰ Furthermore, companion animal veterinarians who work in the Russian Federation, Israel, or the Netherlands reported obtaining information primarily from the Internet (Figure 5). In contrast, the respondents who work in the three English-speaking countries reported obtaining information primarily from conferences/meetings. Wales⁵⁶ reported that UK veterinary practitioners used conventional journals, textbooks, and conferences as sources of veterinary knowledge, whereas Meehan and Harburg⁵⁷ found that Australian veterinary practitioners used textbooks, conservation with colleagues, and also conferences as the most common sources of veterinary knowledge.

Survey respondents indicated that companion animal veterinarians from Asia get information on surgical techniques mainly from local veterinary education and veterinary conferences, whereas companion animal veterinarians from North America and Europe mainly access veterinary journals and conferences. The same is true for dentistry, but there was only a significant difference between Asia and Europe. Companion animal veterinarians from Europe access information about animal behavior from the Internet whereas their counterparts

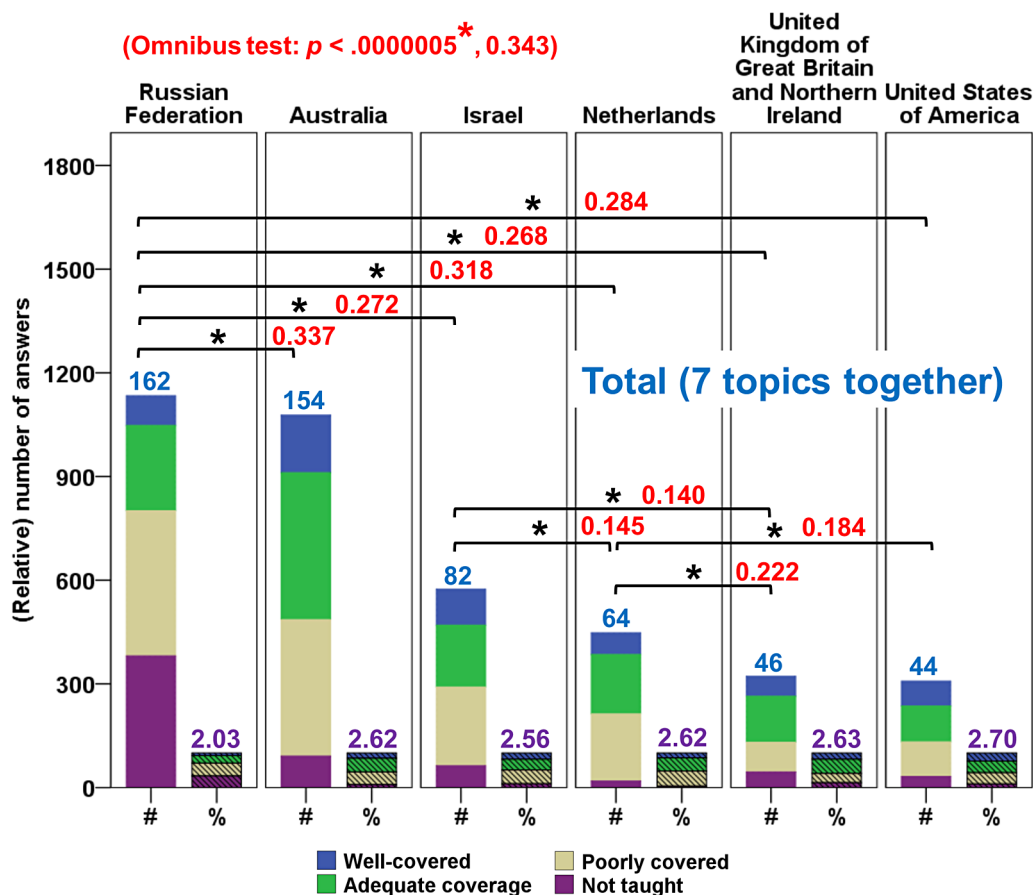


Figure 4: Coverage of the seven topics together (total) during undergraduate veterinary training according to companion animal veterinarians with their educational background in the Russian Federation, Australia, Israel, Netherlands, United Kingdom of Great Britain and Northern Ireland (UK), or United States of America (US). Left and right bars represent scores (number of answers, #) and relative scores (%), respectively. Solid colored stacked bars = #, solid colored stacked bars with black diagonal lines and borders = %. The (blue) numbers above the left bars are number of respondents. The (purple) numbers above the right bars are weighted scores. The (red) value of the effect size w is shown to the right of the asterisks. *(red) = significant difference ($p < .007$) in omnibus test. *(black) = significant difference ($p < .001$) in post hoc comparison.

in Oceania go to veterinary conferences (Supplementary Table S2). The reason for these geographic regional differences remains unclear.

McDermott et al.⁴² found that there was little interest in continuing education on communication skills, mainly because of a lack of money and time, and a possible lack of support from superiors. Dhein and Memon⁵⁸ also found time away from practice, travel distance, and expense to be reasons why veterinarians do not participate in continuing education. Online continuing education could fill in the gap and is more time and cost-efficient.^{58,59} Not only is information continually updated, but e-learning has a positive impact on the ability to learn and fix knowledge in the long term, as well as accelerating the learning curve.⁵⁹ Thus, online continuing education for getting information could be an option, but not all the respondents say they use it when looking for information. In low-medium income countries, Internet connectivity and access to computers could be a problem,⁹ and thus this is not always an appropriate way to deliver continuing education. Internet connectivity and stability can also be a problem in high-income countries. Virtual simulation can be used to maintain or train certain skills, particularly surgical skills,⁴⁶ with the advantage, that fewer

animals will be needed for training, as well as lower costs of consumables (plates, sutures, etc.).^{46,59} Even verbal communication skills can be practiced with online role-play. However, non-verbal skills are more difficult to practice without being face to face.⁹ Like all professionals, veterinarians like to meet each other at veterinary conferences, and COVID-19 made it clear that online meetings are less stimulating than 'live' meetings. Furthermore, it is good to realize that our questionnaire was distributed in 2016 and thus before the COVID-19 pandemic, which brought on the widespread use of online methods for teaching and learning.⁹ Thus, the findings regarding which resources veterinary practitioners used to acquire information on the topics may not reflect companion animal veterinarians' current preferences.

Some respondents did not look for continuing education on core competencies after graduation (Figure 3 and Supplementary Table S2). The Dunning-Kruger effect is a psychological phenomenon. It occurs when people do not know in which field of expertise they are incompetent and therefore do not follow relevant continuing education.⁶⁰ Veterinary licensing bodies should place more emphasis on continuing education, but it must be recognized that completion of con-

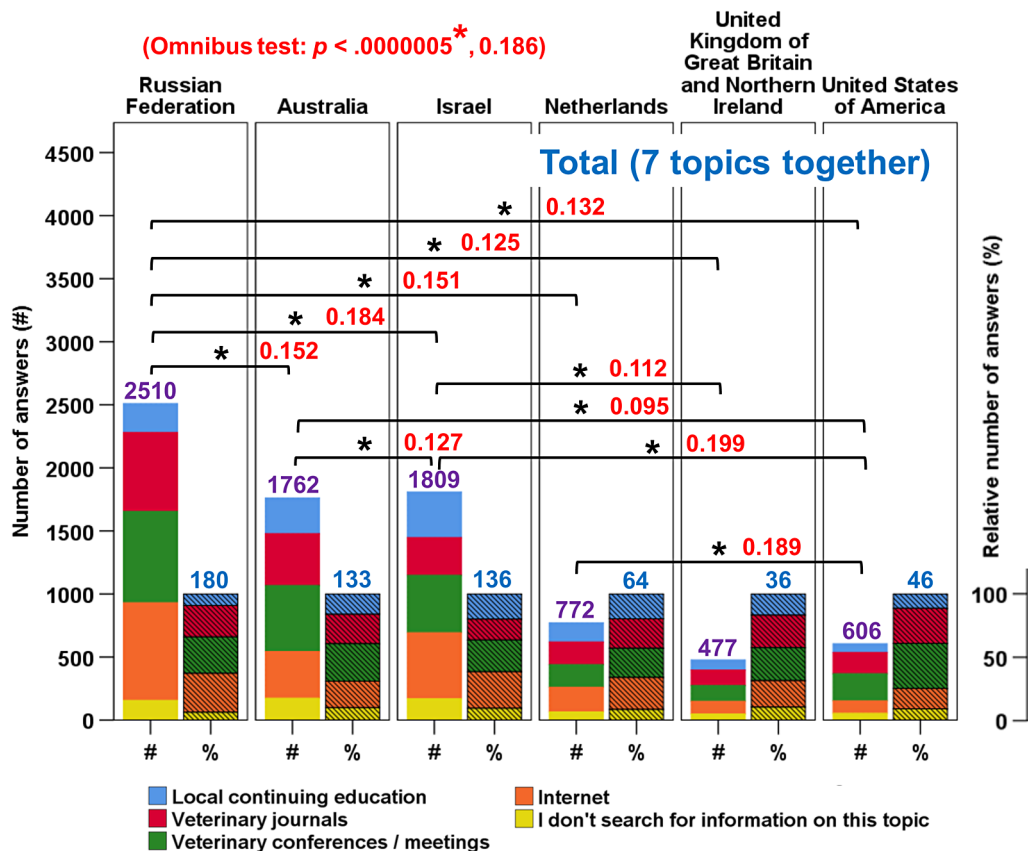


Figure 5: Sources of information on the seven topics together (total) used by companion animal veterinarians working in Russian Federation, Australia, Israel, Netherlands, United Kingdom of Great Britain and Northern Ireland (UK), or United States of America (US). Left and right bars represent scores (number of answers, #; left y axis) and relative scores (%; right y axis), respectively. Solid colored stacked bars = #; solid colored stacked bars with black diagonal lines and borders = %. The (purple) numbers above the left solid colored stacked bars are number of answers. The (blue) numbers above the right solid colored stacked bars are number of respondents. The (red) value of the effect size w is shown to the right of the asterisks. *(red) = significant difference ($p < .007$) in omnibus test. *(black) = significant difference ($p < .001$) in post hoc comparison.

tinuing education courses is no guarantee of competence in practice.⁵⁵

Limitations of the Study

Non-Uniformly Distribution

The respondents were not uniformly distributed over the six geographic regions, with most countries (45 out of 67) having fewer than five respondents. This makes statistical comparisons between most countries underpowered and necessitated grouping countries by geographic region (Supplementary Tables S1 and S2). Some countries, namely, the Russian Federation and Australia, had more than a hundred respondents each so these countries had a substantial influence on the findings for their geographic regions. Furthermore, given the large number of respondents who work and/or are trained in the Russian Federation, Australia, Israel, the Netherlands, the UK, and the US, we compared these six countries (Figures 2 and 3).

Not a Representative Global, Opinion-Questionnaire-based Survey

Of course, our global survey is not representative of the opinions of companion animal veterinarians worldwide. For instance, in Europe, there were an estimated 309,114 active vet-

erinarians in 2018, of which 67% had specialized in companion animals.⁶¹ In the present survey, only 359 companion animal veterinarians who work in Europe responded to the survey (suggesting a low response), 68% of whom worked in the Russian Federation or the Netherlands. The responses from the Russian Federation were dominated by respondents who trained at two institutions: the State Academy of Veterinary Medicine in Saint Petersburg and the State Academy of Veterinary Medicine and Biotechnology in Moscow.³⁶ There is only one veterinary school in the Netherlands, at Utrecht University. Together, these three institutions accounted for 40% of the European responses, which would have skewed the results for Europe. There are more than 56,000 companion animal practitioners in the US⁶² and yet there were only 46 respondents (suggesting a low response). Although the country has more than 30 veterinary colleges (i.e., accredited by the AVMA),⁶³ the respondents came from 20 veterinary colleges. This means that our findings are probably not representative of the US or, indeed, of North America.

Veterinarians are Low Responders

Veterinarians are usually low responders to surveys.^{64,65} This, however, cannot be prevented, because filling in a questionnaire is voluntary. Thus, also for this reason, the results may

not be representative of all companion animal veterinarians. The questionnaire was distributed electronically through the website of WSAVA and member organizations. Studies have shown that the response rate to electronic surveys is lower and that there is a higher percentage of item non-response compared with traditional paper surveys.⁶⁶ However, it was impossible to question companion animal veterinarians worldwide about topics in any other way.

Other Species-Specialized Veterinarians

Veterinarians and their practices may be specialized in certain areas of veterinary medicine, but the majority of them focus on companion animals. For instance, in Europe⁶¹ and the USA⁶² almost two-thirds of veterinarians focus on companion animals. This survey was developed by the AWGG of WSAVA, with companion animal veterinarians as the target audience. It would be interesting to distribute this survey to other species-specialized veterinarians (e.g., food-animal veterinarians, equine veterinarians, avian veterinarians) around the world.

Effect of Graduation Year

As veterinary medical curricula evolve⁶⁷ coverage of the topics in the curricula may vary when respondents graduated from veterinary school. Unfortunately, we did not ask how long respondents had been practicing veterinary medicine or when they graduated. However, we did ask about the age of the respondents. The age of the responding alumni is more or less a reflection of when they completed their veterinary undergraduate education. The worldwide distribution of age of the respondents (mean age is 40 years with a standard deviation of 12 years) was divided into tertiles (of about an equal number of respondents) and these three age groups were compared for how well the selected topics were covered in the veterinary curricula according to the respondents. The three age categories were: age \leq 33 years, 33 years $<$ age \leq 44 years, and age $>$ 44 years. On the basis of responses, there were significant ($p < .001^*$) effects of age category for the topics such as client communication, animal welfare, and surgical techniques. Worldwide, survey respondents indicated that younger respondents compared with older respondents had better coverage regarding client communication and animal welfare. Globally and in the opinions of the responding alumni, surgical techniques were better covered in old respondents (Supplementary Table S5). For the topic of client communication, these findings are in line with the results from a study by McDermott et al.⁴⁸ younger UK and US practitioners were significantly more likely to have received communication skills training in veterinary school.

Recall Bias

One aim of this survey was to find out whether and to what extent these topics were taught—in the opinions of the responding alumni—in the curriculum of companion animal veterinarians worldwide during their veterinary training. The topics we discussed are not taught in a standard manner in veterinary schools, and there is a diversity in the content and method of delivery in veterinary curricula worldwide. It should be noted that we did not check the content of the curriculum at the respective veterinary schools at the time the alumni were students. We only asked the respondents

whether they thought they had received adequate instruction (i.e., historical recall of content). A survey among the participating institutions, including what was taught, would be of added value—like De Briyne et al.⁶⁸ did for the topic of animal welfare among 57 European veterinary schools—but it was not realistic to retroactively receive this information from the 201 different institutions for different years in the past.

Of course, the data presented in Figure 2 and Supplementary Table S1 are subject to recall bias. This type of error is bias caused by the inaccurate or incomplete recollection of events by the respondent and it is a particular concern for retrospective survey questions.⁶⁹ Cognitive psychologists have warned that human memory is fallible⁷⁰ and thus asking companion animal veterinarians to indicate how well the selected topics were covered during their undergraduate training poses potential problems: they may not remember or they may not report it accurately. Unfortunately, recall bias is difficult to avoid and cannot be corrected after a survey has been completed. It gets worse as the time between the surveyed event and survey time increases.⁶⁹ However, we tried to reduce this type of bias by making sure that respondents understood what is being asked. For this reason, the English version of the survey was piloted with companion animal practitioners in the practices of some of the members of the AWGG. Only minor differences in wording were made and pre-testing showed that it was not necessary to further adjust the survey questions.³⁶

CONCLUSIONS

This was the first worldwide study to investigate to what extent client communication, animal welfare (discussed in³⁶), surgical techniques, human–animal bond, dentistry, animal behavior, and zoonotic disease/epidemiology are taught—according to the opinion of responding alumni—in the curriculum of companion animal veterinarians during their veterinary training and the availability of continuing education on the same topics.

With the exception of surgical techniques and zoonotic disease/epidemiology, the respondents considered that these topics were poorly covered or not taught at all when they were students, although there were country and geographic regional differences. Although there were country and geographic regional differences, overall the results suggest, that is, according to the responding alumni, that not enough time is devoted to these topics in veterinary curricula.

Practicing companion animal veterinarians get information on the aforementioned topics in different ways, and also there are country and geographic regional differences. But it also depends on the topic. The reasons for these differences remain unclear. Financial reasons do not appear to be the reason why companion animal veterinarians prefer local continuing education to other further education options. Online continuing education is more a cost-effective and time-saving option, but this option was not mentioned very often. Worldwide, there is little interest in continuing education on communication skills.

In conclusion, our findings suggest that there is a need to improve education on client communication, animal welfare (discussed in Endenburg et al.³⁶), surgical techniques, human–

animal bond, dentistry, and animal behavior in veterinary curricula and the provision of relevant continuing education, so that companion animal practitioners can keep abreast of developments and societal expectations.

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APPENDIX I

WSAVA Animal Welfare Survey

Demographic information

1. Are you male or female?

- 0 Male
- 0 Female

2. What is your age?

.....years

3. In what country do you work?

.....

4. Where did you obtain your primary veterinary degree?

.....

Name of veterinary school, institution or university?

.....

5. What is your primary veterinary role?

- 0 Veterinary practitioner
- 0 Non-Practitioner (please describe)

.....

WSAVA Animal Welfare Survey

Animal welfare issues in practice in your country/region

6. Following are 6 questions about potential animal welfare issues seen at your veterinary practice. Firstly, animal health-related issues - please indicate degree of importance:

| | Very important | Important | Variable importance | Not very important | Not important |
|---|----------------|-----------|---------------------|--------------------|---------------|
| | (1) | (2) | (3) | (4) | (5) |
| a. Incorrect (over/under feeding) or inappropriate nutrition | 0 | 0 | 0 | 0 | 0 |
| b. Genetic or breed-related health issues | 0 | 0 | 0 | 0 | 0 |
| c. Lack of routine prophylaxis (e.g. vaccinations, anti-parasitics) | 0 | 0 | 0 | 0 | 0 |
| d. Obesity | 0 | 0 | 0 | 0 | 0 |
| e. Age-related issues (e.g. osteoarthritis) | 0 | 0 | 0 | 0 | 0 |

7. Secondly, potential behavioral-related issues—please indicate degree of importance:

| | Very important | Important | Variable importance | Not very important | Not important |
|--|----------------|-----------|---------------------|--------------------|---------------|
| | (1) | (2) | (3) | (4) | (5) |
| a. Aggression | 0 | 0 | 0 | 0 | 0 |
| b. Separation related behavior (e.g. separation anxiety) | 0 | 0 | 0 | 0 | 0 |
| c. Lack of socialization/poor social skills | 0 | 0 | 0 | 0 | 0 |
| d. Disobedience | 0 | 0 | 0 | 0 | 0 |
| e. Inappropriate elimination (soiling) | 0 | 0 | 0 | 0 | 0 |

8. Third, owner-related issues—please indicate degree of importance:

| | Very important | Important | Variable importance | Not very important | Not important |
|----------------------------------|----------------|-----------|---------------------|--------------------|---------------|
| | (1) | (2) | (3) | (4) | (5) |
| a. Delay or refusal to euthanize | 0 | 0 | 0 | 0 | 0 |
| b. Lack of knowledge | 0 | 0 | 0 | 0 | 0 |

| | | | | | | |
|----|---------------------|---|---|---|---|---|
| c. | Animal abuse | 0 | 0 | 0 | 0 | 0 |
| d. | Non-compliance | 0 | 0 | 0 | 0 | 0 |
| e. | Anthropo-morphizing | 0 | 0 | 0 | 0 | 0 |

9. Fourth, social-related issues—please indicate degree of importance:

| | Very important | Important | Variable importance | Not very important | Not important | |
|----|------------------------------------|-----------|---------------------|--------------------|---------------|---|
| | (1) | (2) | (3) | (4) | (5) | |
| a. | Confinement/lack of exercise | 0 | 0 | 0 | 0 | 0 |
| b. | Refusal of treatment | 0 | 0 | 0 | 0 | 0 |
| c. | Treatment by non-qualified persons | 0 | 0 | 0 | 0 | 0 |
| d. | Convenience euthanasia | 0 | 0 | 0 | 0 | 0 |
| e. | Uncontrolled or over-breeding | 0 | 0 | 0 | 0 | 0 |

10. Of all issues mentioned above which are the top three of all animal welfare issues in your veterinary practice?

| | |
|--|---|
| 0 Lack of knowledge | 0 Confinement/lack of exercise |
| 0 Aggression | 0 Disobedience |
| 0 Uncontrolled or over-breeding | 0 Inappropriate elimination (soiling) |
| 0 Animal abuse | 0 Incorrect (over/under feeding) or inappropriate nutrition |
| 0 Obesity | 0 Refusal of treatment |
| 0 Delay or refusal to euthanize | 0 Genetic or breed-related health issues |
| 0 Separation-related behavior (e.g. separation anxiety) | 0 Lack of socialization/poor social skills |
| 0 Lack of routine prophylaxis (e.g. vaccinations, anti-parasitics) | 0 Anthropomorphizing |
| 0 Convenience euthanasia | 0 Treatment by non-qualified persons |
| 0 Non-compliance | 0 Age-related issues |

11. Are there other animal welfare issues in your veterinary practice that are not mentioned above?

.....

WSAVA Animal Welfare Survey

Animal welfare education

12. Please indicate how well the following topics were covered during your undergraduate veterinary training

| | Well-covered | Adequate coverage | Poorly covered | Not taught | |
|----|-------------------------------|-------------------|----------------|------------|---|
| | (4) | (3) | (2) | (1) | |
| a. | Client communication | 0 | 0 | 0 | 0 |
| b. | Animal welfare | 0 | 0 | 0 | 0 |
| c. | Surgical techniques | 0 | 0 | 0 | 0 |
| d. | Human–animal bond | 0 | 0 | 0 | 0 |
| e. | Dentistry | 0 | 0 | 0 | 0 |
| f. | Animal behavior | 0 | 0 | 0 | 0 |
| g. | Zoonotic disease/epidemiology | 0 | 0 | 0 | 0 |

13. Where do you source information on the following? (more than one answer is possible)

| | Local continuing education | Veterinary journals | Veterinary conferences/meetings | Internet | I don't search for information on this topic |
|----------------------------------|----------------------------|---------------------|---------------------------------|----------|--|
| a. Client communication | 0 | 0 | 0 | 0 | 0 |
| b. Animal welfare | 0 | 0 | 0 | 0 | 0 |
| c. Surgical techniques | 0 | 0 | 0 | 0 | 0 |
| d. Human-animal bond | 0 | 0 | 0 | 0 | 0 |
| e. Dentistry | 0 | 0 | 0 | 0 | 0 |
| f. Animal behavior | 0 | 0 | 0 | 0 | 0 |
| g. Zoonotic disease/epidemiology | 0 | 0 | 0 | 0 | 0 |

14. Where do your clients get information about animal welfare? (more than one answer is possible)

- 0 Veterinarians
 - 0 Animal welfare groups
 - 0 Government
 - 0 Internet
 - 0 Other (please specify)
-

15. Do you have the opportunity to access adequate Continuing Education content on animal welfare? (if no how could access be improved?)

- 0 Yes
 - 0 No
- Please indicate how access could be improved
-
-

16. Is Continuing Education required for the renewal of your veterinary license?

- 0 Yes
- 0 No

17. In your opinion which animal welfare issues are most pressing in your area (city, state &/or country)

.....

.....

