# *Job Analysis Report for the Neurology Examination*

**Conducted on behalf of**


**July 2023**

*Prepared by:*

PROMETRIC

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**Assessment Design Specialist**

# ACKNOWLEDGEMENTS

We would like to thank the many individuals who provided invaluable assistance throughout the conduct of the American College of Veterinary Internal Medicine (ACVIM) Neurology Examination Job Analysis Study.

Above all, we thank the many dedicated professionals who generously contributed their time and expertise. Over 125 individuals participated in different phases of the job analysis including, Task Force members, survey respondents, and Test Specifications members.

At ACVIM, Nicole Finn, Senior Director of Certification & Accreditation, provided excellent support throughout the project.

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# EXECUTIVE SUMMARY

"*The American College of Veterinary Internal Medicine (ACVIM) is a not-for-profit 501(c)(6) organization dedicated to improving the lives of animals and people through education, training and certification of specialists in veterinary internal medicine, discovery and dissemination of new medical knowledge, and increasing public awareness of advances in veterinary medical care.*

*The ACVIM is the international certifying organization for veterinary specialists in cardiology, large animal internal medicine, neurology, nutrition, oncology, and small animal internal medicine with over 3,000 members worldwide*."[1]

ACVIM requested a Job Analysis Study from Prometric for their Neurology exam. A job analysis study is designed to obtain descriptive information about the tasks performed on a job and the knowledge, skills, and abilities (KSAs) needed to adequately perform those tasks. The purpose of the job analysis study was to:

- validate the tasks and KSAs important for veterinarians specializing in Neurology; and
- update the test specifications for the Neurology exam.

### *Conduct of the Job Analysis Study*

The job analysis study consisted of several activities: background research, collaboration with subject matter experts (SMEs), survey development and dissemination, compilation of survey results, and test specifications development. The successful outcome of the job analysis study depended on the information provided by veterinarians throughout the project.

### *Survey Development*

Survey research is an effective way to identify the tasks and KSAs that are important for veterinarians specializing in internal medicine. The identified statements included on the survey covered a total of five domains of practice. The development of the survey was based on a draft of KSA statements developed from a variety of resources, but primarily on the previous job analysis conducted in 2019.

### *Survey Content*

The survey, disseminated in March of 2023, consisted of five sections. ACVIM distributed the survey to members with knowledge relevant to the field of neurology.

| Survey Sections |
|---|
| Section 1: Background & General Information |
| Section 2: Knowledge, Skills & Abilities (KSAs) |
| Section 3: Domain Weighting |
| Section 4: Additional Comments |
| Section 5: ACVIM Forum Registration Drawing |

[1] https://www.acvim.org/about-acvim retrieved May 2023.

## *Results*

### *Survey Response*

A total of 114 veterinary professionals submitted surveys complete enough for analysis. Based on the analysis of survey responses, a representative group of professionals completed the survey in sufficient numbers to meet the requirements for statistical analysis of the results. This is evidenced by review of the responses for each of the background and general information questions with confirmation by the Test Specifications Committee.

### *Survey Ratings*

Participants were asked to rate the KSA statements by their importance for "*an individual specializing in veterinary neurology*" using a five-point scale (*0 = Of No Importance* to *4 = Very Important*). Participants were also asked to rate the frequency with which they performed or utilized each KSA statement during the past 12 months using a five-point scale (*0 = Never (on no occasion)* to *4 = Very Frequently (daily*)).

### *Content Coverage*

Evidence was provided for the comprehensiveness of the content covered within the domains. If the statements within a domain are adequately defined, then it should be judged as being well covered. Respondents indicated that the content within each domain was adequately to well covered, thus supporting the comprehensiveness of the defined domains.

### *Test Specifications Development*

In May of 2023, a Test Specifications Committee convened to review the results of the job analysis and to update the test content outline that will guide future development for the Neurology exam.

**RESULTS AT A GLANCE**

**WHO COMPLETED THE SURVEY**

*A total of 114 responses were used for analysis. The majority of respondents had 11 or more years of experience, performed neurosurgery, worked in a clinical private practice setting, and devoted 76% or more of their time to clinical work.*

**IMPORTANCE RATINGS**

*100 out of the 138 KSA statements included in the survey achieved high importance ratings for the overall group.*

### *Summary*

In summary, this study used a multi-method approach to identify the tasks and KSAs that are important to competent performance of veterinarians specializing in neurology. The job analysis process allowed for input from a representative group of veterinary professionals and was conducted within the guidelines of professionally sound practice. The results of the job analysis can be used by ACVIM to guide development for the Neurology exam.

# INTRODUCTION

"*The American College of Veterinary Internal Medicine (ACVIM) is a not-for-profit 501(c)(6) organization dedicated to improving the lives of animals and people through education, training and certification of specialists in veterinary internal medicine, discovery and dissemination of new medical knowledge, and increasing public awareness of advances in veterinary medical care.*

*The ACVIM is the international certifying organization for veterinary specialists in cardiology, large animal internal medicine, neurology, nutrition, oncology, and small animal internal medicine with over 3,000 members worldwide*."[2]

ACVIM requested a Job Analysis Study from Prometric for their Neurology exam. A job analysis study is designed to obtain descriptive information about the tasks performed on a job and the knowledge, skills, and abilities (KSAs) needed to adequately perform those tasks. This report describes the job analysis study including the:

- rationale for conducting the job analysis study;
- methods used to define tasks and KSAs;
- types of data analyses conducted and their results; and
- results and conduct of the test specifications meeting.

### *Job Analysis Study & Adherence to Professional Standards*

A job analysis study refers to procedures designed to obtain descriptive information about the tasks performed on a job and the knowledge, skills, or abilities (KSAs) requisite to the performance of those tasks. The specific type of information collected during a job analysis study is determined by the purpose for which the information will be used.

For purposes of developing a credentialing examination, the job analysis study should identify tasks, knowledge, skills, and/or abilities deemed important for individuals practicing in that area.

The use of a job analysis study (also known as a practice analysis, role and function study, or role delineation) to define the content domain(s) is a critical component in establishing the content validity of a certification. Content validity refers to the extent to which the content covered by an examination is representative of a job (tasks, knowledge, skills, or abilities).

A well-designed job analysis study should include the participation of a representative group of subject matter experts (SMEs) who reflect the diversity within the profession. Diversity refers to regional or job context factors and to factors such as experience, gender, and race/ethnicity. Demonstration of content validity is accomplished through the judgments of SMEs. The process is enhanced by the inclusion of large numbers of experts who represent the diversity of the relevant areas of expertise.

*The Standards for Educational and Psychological Testing*[3] (2014) (*The Standards)* is a comprehensive technical guide that provides criteria for the evaluation of tests, testing practices, and the effects of test use. It was developed jointly by the American Psychological Association (APA), the American Educational Research Association (AERA), and the National Council on Measurement in Education (NCME). The guidelines presented in *The Standards*, by professional consensus, have come to define the necessary components of quality testing. As a consequence, a testing program that adheres to *The Standards* is more likely to be judged to be valid and defensible than one that does not.

[2] https://www.acvim.org/about-acvim retrieved May 2023.

[3] American Educational Research Association, American Psychological Association, National Council on Measurement in Education (2014). *The Standards for Educational & Psychological Testing*. Washington, DC: American Psychological Association.

As stated in Standard 11.13,

> "*The content domain to be covered by a credentialing test should be defined clearly and justified in terms of the importance of the content for credential-worthy performance in an occupation or profession. A rationale and evidence should be provided to support the claim that the knowledge or skills being assessed are required for credential-worthy performance in that occupation and are consistent with the purpose for which the credentialing program was instituted... Typically, some form of job or practice analysis provides the primary basis for defining the content domain…*"
> (pgs 181-182)

The job analysis study for the Neurology exam was designed to follow the guidelines presented in *The Standards* and to adhere to accepted professional practice.

# METHOD

The job analysis study for the Neurology exam involved a multi-method approach that included meetings with SMEs and a survey. This section of the report describes the activities conducted for the job analysis study.

First, experts identified the tasks and KSAs they believed were important to veterinary practice in the area of neurology. Then, a survey was developed and disseminated to ACVIM veterinarians and related professionals. The purpose of the survey was to obtain verification (or refutation) that the KSA statements identified by the experts are important to the work of veterinarians specializing in neurology.

**STEPS OF THE JOB ANALYSIS STUDY**

1. Conduct of a planning meeting
2. Development of the survey instrument
3. Dissemination of the survey
4. Analysis of the survey data
5. Development of the test specifications

Survey research functions as a "check and balance" on the judgments of the experts and reduces the likelihood that unimportant areas will be considered in the development of the test specifications. The use of a survey is also an efficient and cost-effective method of obtaining input from large numbers of experts and makes it possible for analysis of ratings by appropriate subgroups of respondents.

The survey results provide information to guide the development of test specifications and content-valid examinations. What matters most is that a certification examination covers the important knowledge, skills, and abilities needed to perform job activities.

The steps of the job analysis study are described in detail below:

### *1. Conduct of a Planning Meeting*

In December of 2022, ACVIM representatives and the Prometric staff responsible for the conduct of the job analysis held a planning meeting via web conference. During the planning meeting, the selection of the Task Force Committee members and Test Specifications Committee members, meeting dates and logistics, and survey delivery were topics of discussion.

### *2. Development of the Survey*

#### *Conduct of the Job Analysis Study Task Force Meeting*

The Task Force Committee consisted of a representative group of veterinary professionals specializing in neurology. In total, eleven subject matter experts comprised the committee. A list of the Committee members appears in Appendix A.

The Task Force meeting was conducted on January 21 & 22, 2023, in Greenwood Village, CO. The purpose of the meeting was to develop the survey content. Prometric staff facilitated the meeting and sent a pre-meeting document to the Committee that included the meeting agenda and what to expect during the meeting.

Activities conducted during the meeting included reviewing and, as needed, revising the major domains, tasks, and KSAs necessary for competent performance as a neurology veterinarian. The draft list presented to the Task Force was developed using the results of the 2019 Job Analysis. Survey rating scales and background and general information questions were presented, discussed, and revised as needed.

## *Survey Construction & Review Activities*

### *Survey Construction*

Upon the completion of the Task Force Meeting, Prometric staff constructed the draft survey. The survey covered the following domains:

1. General Knowledge
2. Medical Neurology
3. Surgical Neurology
4. Neuroradiology
5. Neuropathology

### *Survey Review by Task Force Committee*

Each Task Force member received a copy of the draft survey. The purpose of the review was to provide the Committee with an opportunity to view their work and recommend any revisions.

Comments provided by the Task Force Committee for the online survey were compiled by Prometric staff and reviewed with the Committee via web conference on February 10, 2023. Refinements, as recommended by the Committee, were incorporated into the online survey in preparation for a pilot test.

### *Survey Pilot Test*

The purpose of the small-scale pilot test was to have professionals in the field who had no previous involvement in the development of the survey, review and offer suggestions to improve the instrument. Eighteen participants received the survey link, eight of whom completed the survey.

Pilot participants reviewed the survey for clarity of wording, ease of use, and comprehensiveness of content coverage. Comments were compiled by Prometric staff and reviewed with the Task Force Committee via web conference on March 3, 2023. The Committee revised and finalized the survey based on the review of the pilot test comments.

### *Final Version of the Survey*

The final version of the online survey consisted of five sections: Section 1: *Background & General Information*, Section 2: *Knowledge, Skills & Abilities (KSAs)*, Section 3: *Domain Weighting*, Section 4: *Additional Comments*, and Section 5: *ACVIM Forum Registration Drawing*.

In Section 1: *Background & General Information*, survey participants responded to general and background information about themselves and their professional activities.

In Section 2: *Knowledge, Skills & Abilities (KSAs)*, survey participants rated statements using the importance scales shown below.

| Knowledge, Skill & Ability (KSA) Ratings | |
|---|---|
| **How important is each knowledge, skill, or ability (KSA) statement for an individual specializing in veterinary neurology?** | **How frequently did you perform or utilize each knowledge, skill, or ability (KSA) statement during the past 12 months?** |
| 0 = Of No Importance | 0 = Never (on no occasion) |
| 1 = Of Little Importance | 1 = Rarely (quarterly to annually) |
| 2 = Of Moderate Importance | 2 = Occasionally (once a month) |
| 3 = Important | 3 = Frequently (once a week) |
| 4 = Very Important | 4 = Very Frequently (daily) |

Survey participants were also asked to provide a rating measuring the representativeness of each domain. Respondents made their judgments using the five-point rating scale shown below.

| Content Coverage |
| --- |
| **How well do the statements in Domain [#] cover important aspects of [the domain]?** |
| 0 = Very Poorly |
| 1 = Poorly |
| 2 = Adequately |
| 3 = Well |
| 4 = Very Well |

Respondents could note any topics that were not covered within a specific domain in an open response field.

In Section 3: *Domain Weighting*, survey participants indicated the content weights that the areas below should receive on the exam:

1. General Knowledge
2. Medical Neurology
3. Surgical Neurology
4. Neuroradiology
5. Neuropathology

This was accomplished by distributing 100 percentage points across the nineteen domains. These distributions represented the allocation of examination items survey participants believed should be devoted to each area.

Survey Participants were also asked to indicate what percentage of the exam should focus on each of the following animals:

1. Equine
2. Food/Fiber
3. Small Animals

In Section 4: *Additional Comments*, survey respondents were given the opportunity to answer open-ended questions. Participants were asked, "*What additional professional development and/or continuing education could you use to improve your performance in your current work role?*", "*How do you expect your work role to change over the next five years? What tasks will be performed and what knowledge will be needed to meet changing job demands?*" and "*Do you have any other comments or thoughts regarding the survey and/or the* Neurology *exam blueprint/test specifications?*".

In Section 5: *ACVIM Forum Registration Drawing*, survey respondents had the option of providing their name and email address to be entered into a drawing for one free full registration for the 2023 ACVIM Forum taking place in Philadelphia, PA from June 15-17.

### *3. Dissemination of the Survey*

ACVIM distributed the survey to members on March 13, 2023. The invited survey participants received two reminder emails prior to the survey's close on April 17, 2023. Appendix B contains a copy of the online survey.

### *4. Analysis of the Survey Data*

As previously noted, the purpose of the survey was to validate the tasks and KSAs that relatively large numbers of veterinary professionals judged to be relevant (verified as important) for work in neurology. This objective was accomplished through an analysis of the mean importance ratings for KSA statements. The derivation of test specifications from those statements verified as important by the surveyed ACVIM members provides a substantial evidential basis for the content validity of the credentialing examination.

Based on information obtained from the survey, data analyses by respondent subgroups (e.g., practice setting) are possible when sample size permits. A subgroup category is required to have at least 30 respondents to be included in the mean analyses. This is a necessary condition to ensure that the mean value based upon the sample of respondents is an accurate estimate of the corresponding population mean value.

The following quantitative data analyses were produced:

- Means, standard deviations, and frequency (percentage) distributions for KSA and content coverage ratings
- Means, standard deviations, and frequency (percentage) distributions for KSA frequency ratings
- Means and standard deviations for test content recommendations
- Index of agreement values for designated subgroups

### *Criterion for Interpretation of Mean Importance Ratings*

Since a major purpose of the survey is to ensure that only validated task statements are included in the development of test specifications, a criterion (cut point) for inclusion needs to be established.

A criterion used in similar studies is a mean importance rating that represents the midpoint between moderately important and important. For the importance rating scale used across many studies, the value of this criterion is 2.50.

***Definition of Pass, Borderline & Fail Categories for KSA Importance Mean Ratings***

| | Means |
|---|---|
| **Pass:** | **At or above 2.50** |
| **Borderline:** | **2.40 to 2.49** |
| **Fail:** | **Less than 2.40** |

This criterion is consistent with the intent of content validity. Therefore, for this job analysis, Prometric recommended the value of this criterion should be set at 2.50. Accordingly, the KSA statements were grouped into one of three categories: Pass, Borderline, or Fail, as determined by their mean importance ratings.

- The Pass Category contains those statements whose mean ratings are at or above 2.50 and are eligible for inclusion in the development of test specifications.
- The Borderline Category contains those statements whose mean ratings are between 2.40 and 2.49. The Borderline Category is included to provide a point of discussion for the Test Specifications Committee to determine if the statement(s) warrant(s) inclusion in the test specifications.
- The Fail Category contains those statements whose mean ratings are less than 2.40. It is recommended that statements in the Fail Category be excluded from consideration in the test specifications.

## *5. Development of the Test Specifications*

On May 20 & 21, 2023, Prometric staff facilitated a meeting to develop test specifications for the Neurology exam based on the job analysis results. A total of eleven subject matter experts comprised the Test Specifications Committee. The meeting focused on:

- finalizing the KSA statements for inclusion based on the survey results; and,
- establishing the percentage test content weights for each area on the examination.

These percentage test weights guide examination development activities.

# RESULTS

### *Survey Responses*

A total of 151 participants started the survey. Of those surveys 114 responses were considered complete enough for full analysis. Based on the analysis of survey responses, a representative group of veterinary professionals completed the survey in sufficient numbers to meet the requirements to conduct statistical analysis. This was evidenced by the distribution of responses for each of the background information questions and was confirmed through discussion with the Test Specifications Committee.

### *Demographic Characteristics of Survey Respondents*

The profile of survey respondents is below. All responses to the background and general information section of the survey are provided in Appendix C1. Write in responses to "*Other (please specify)*" and "*Not listed (please indicate)*" options are provided in Appendix C2.

**Figure 1.** Demographic Question 1

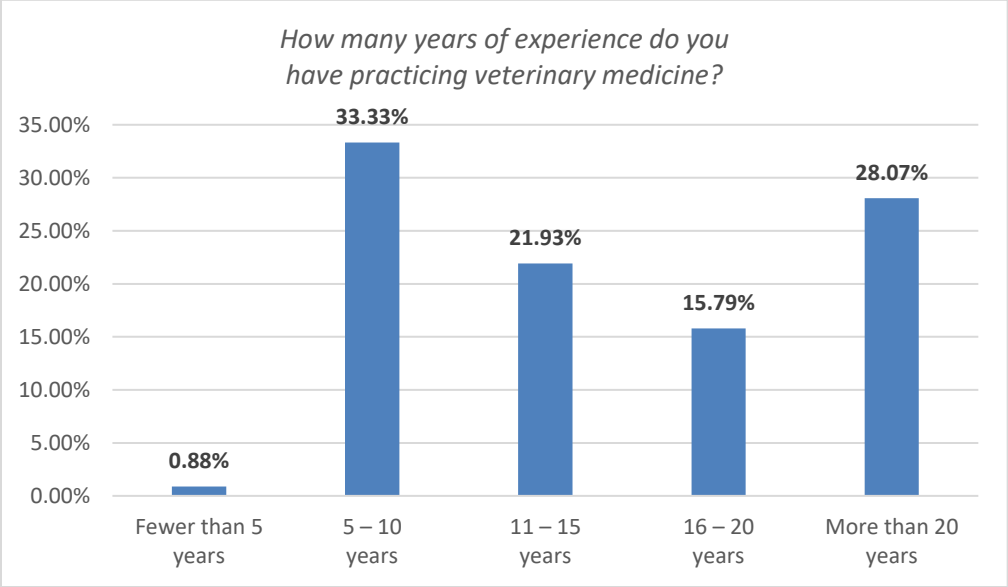



**Figure 2.** Demographic Question 2

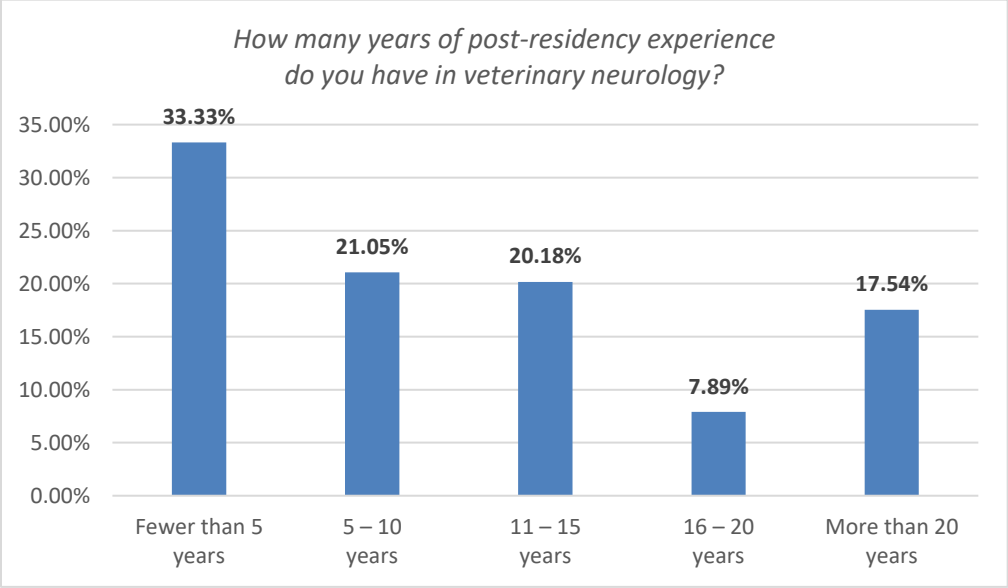


**Figure 3.** Demographic Question 3

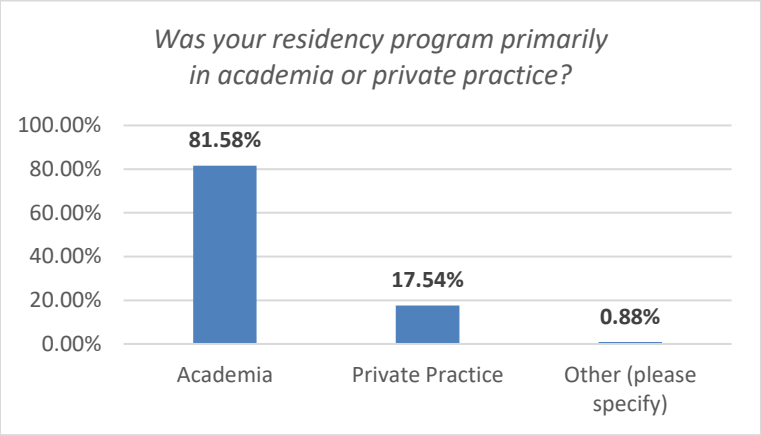



**Figure 4.** Demographic Question 4

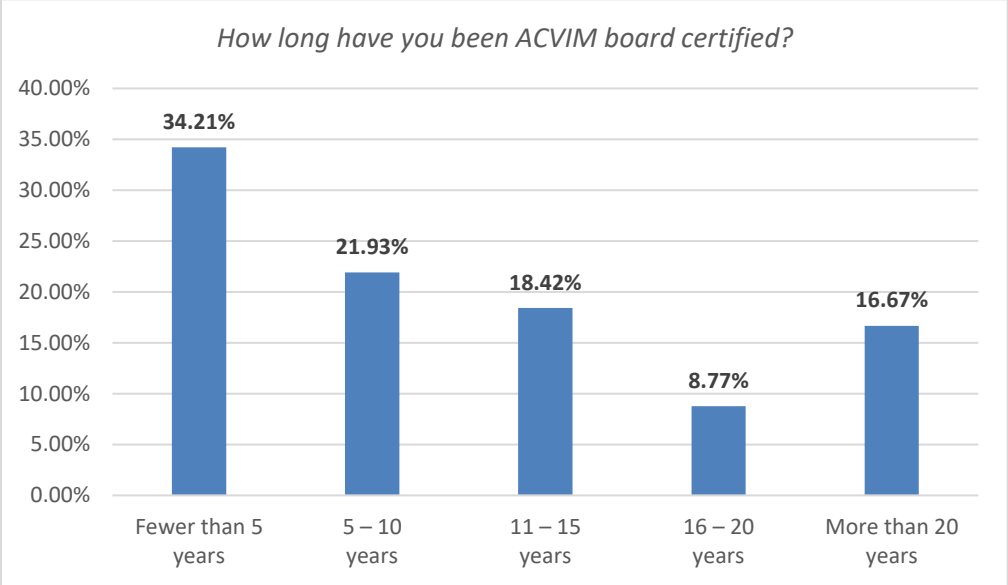


**Figure 5.** Demographic Question 5

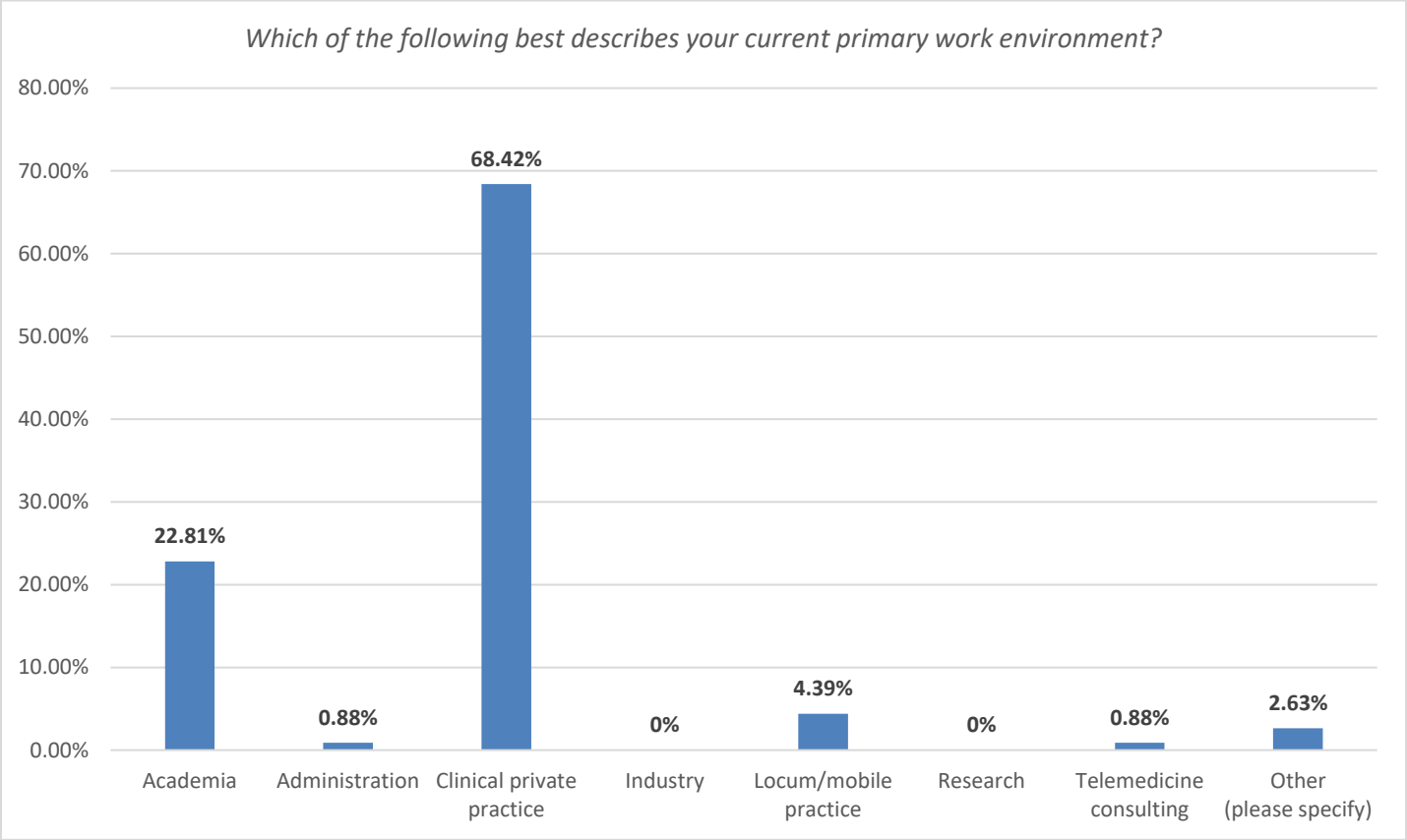



**Figure 6.** Demographic Question 6

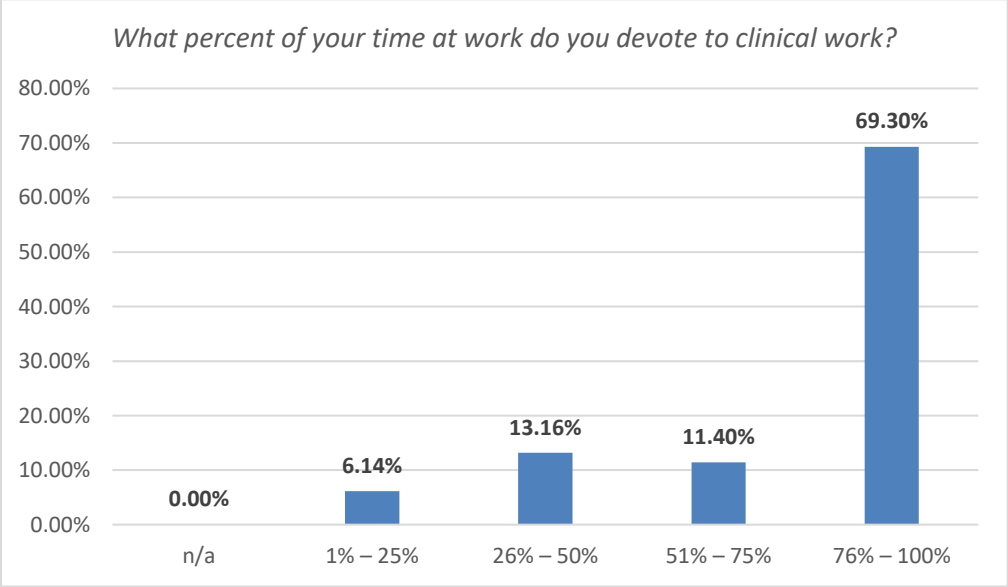
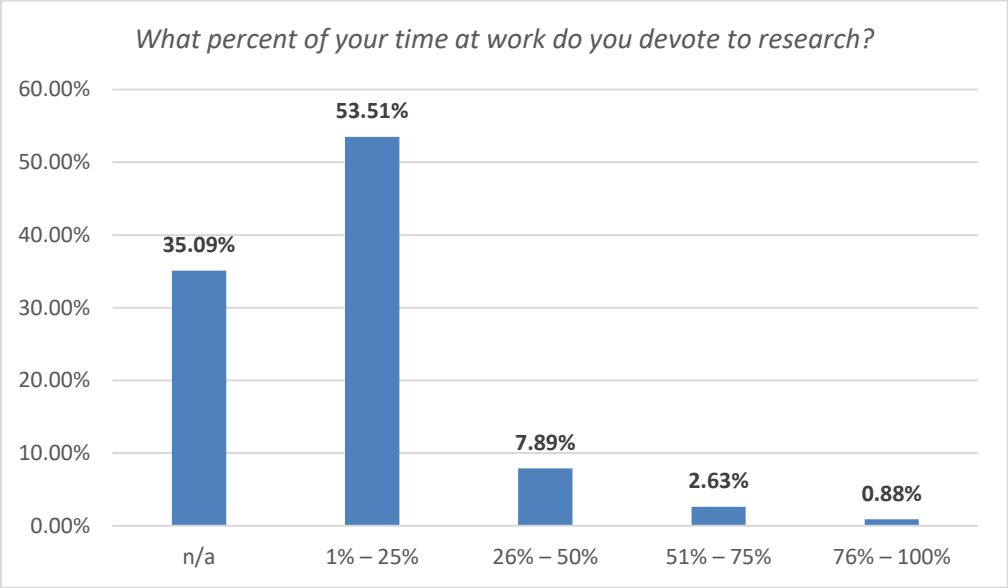


**Figure 7**. Demographic Question 7

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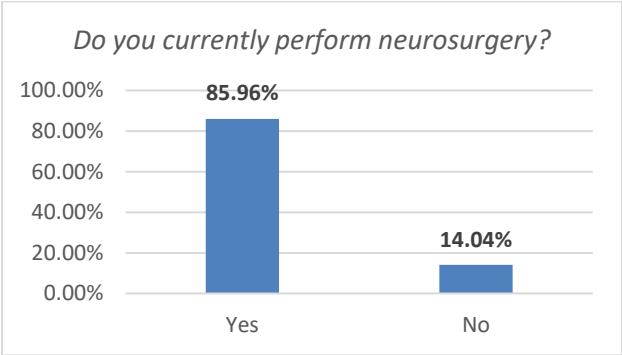



**Figure 9.** Demographic Question 9

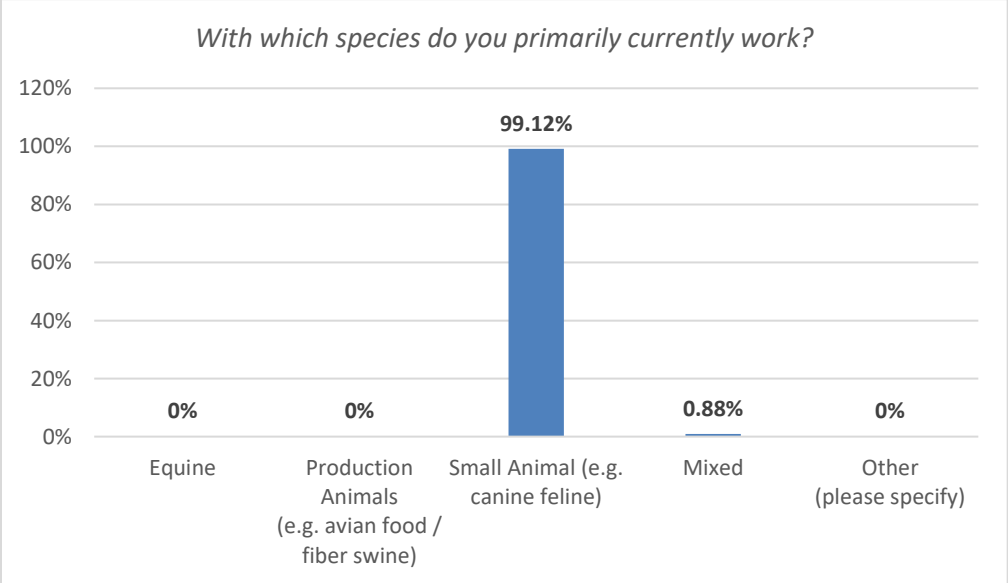


**Figure 10.** Demographic Question 10

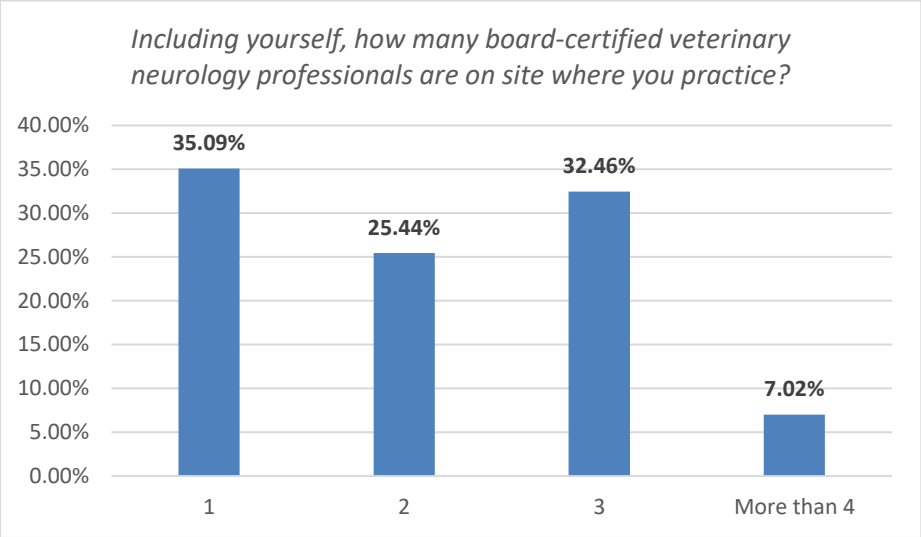



**Figure 11.** Demographic Question 11

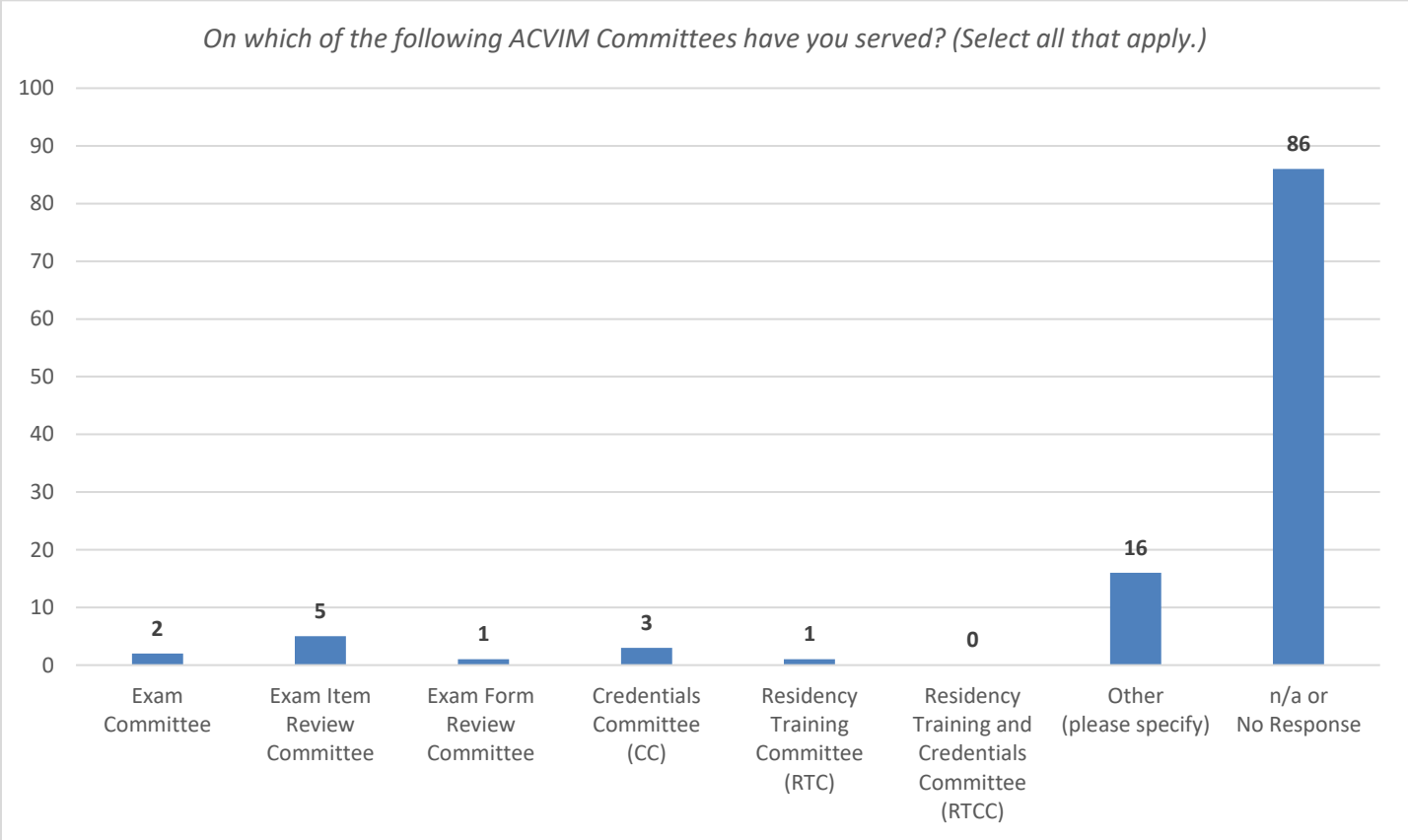


**Figure 12.** Demographic Question 12

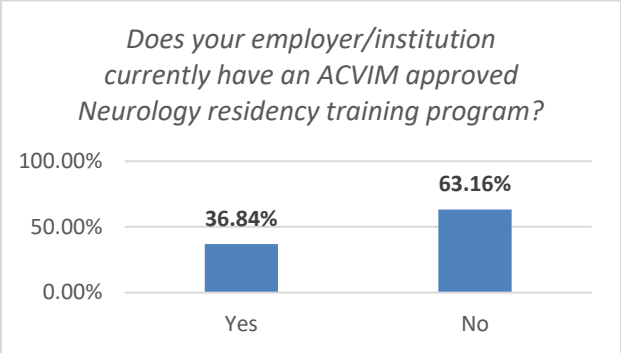



**Figure 13.** Demographic Question 13

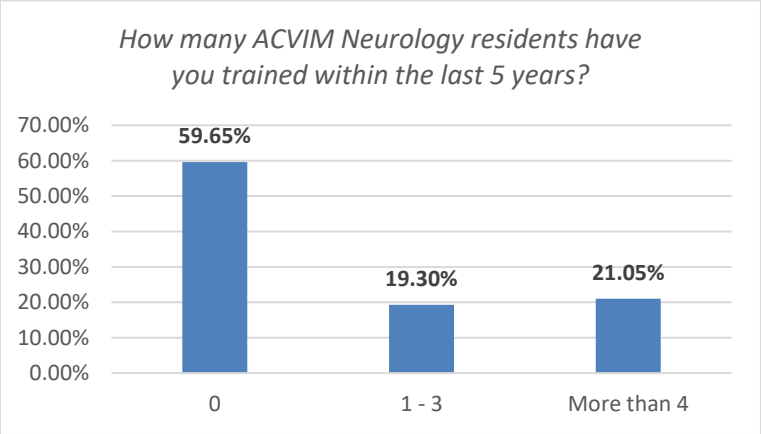



**Figure 14.** Demographic Question 14

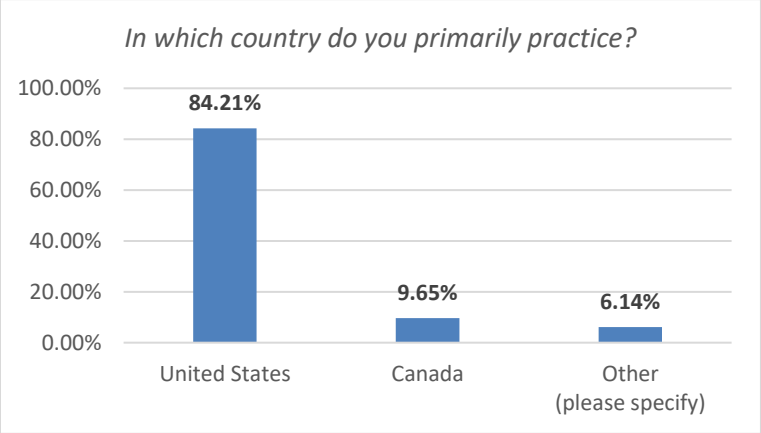


**Figure 15.** Demographic Question 15A

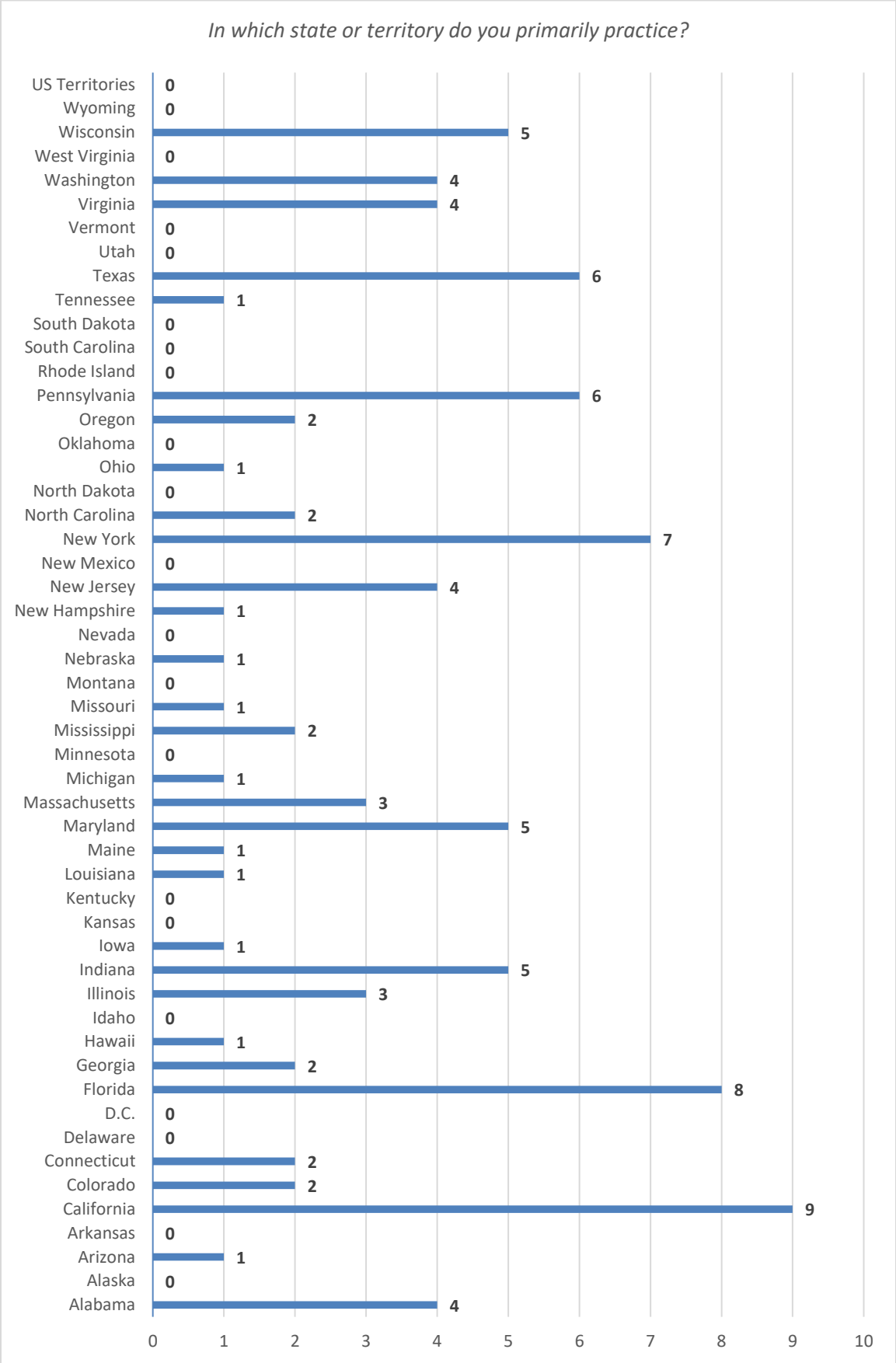


**Figure 16.** Demographic Question 15B

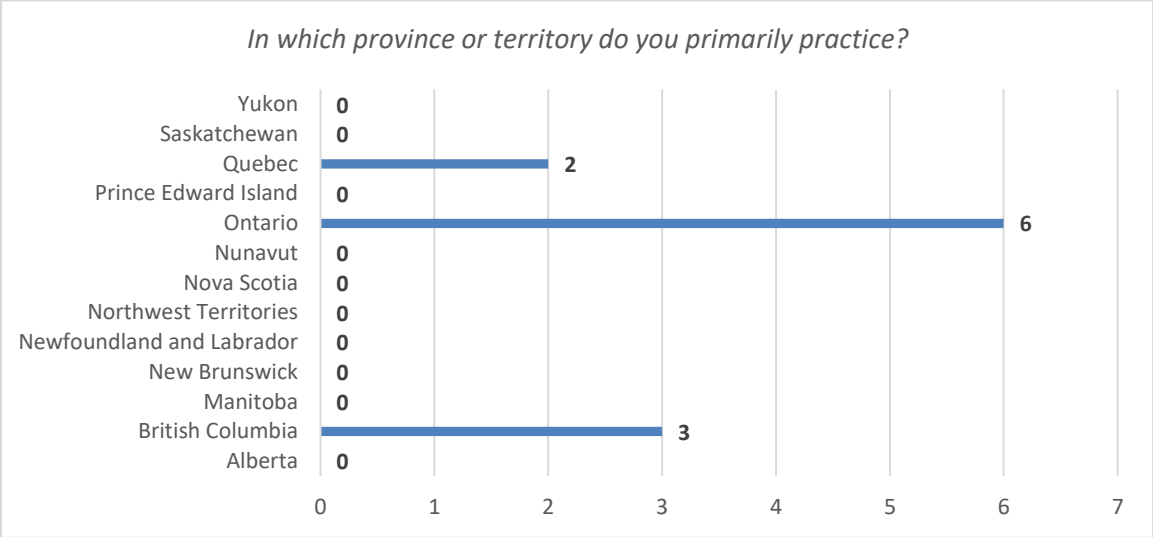



**Figure 17.** Demographic Question 16

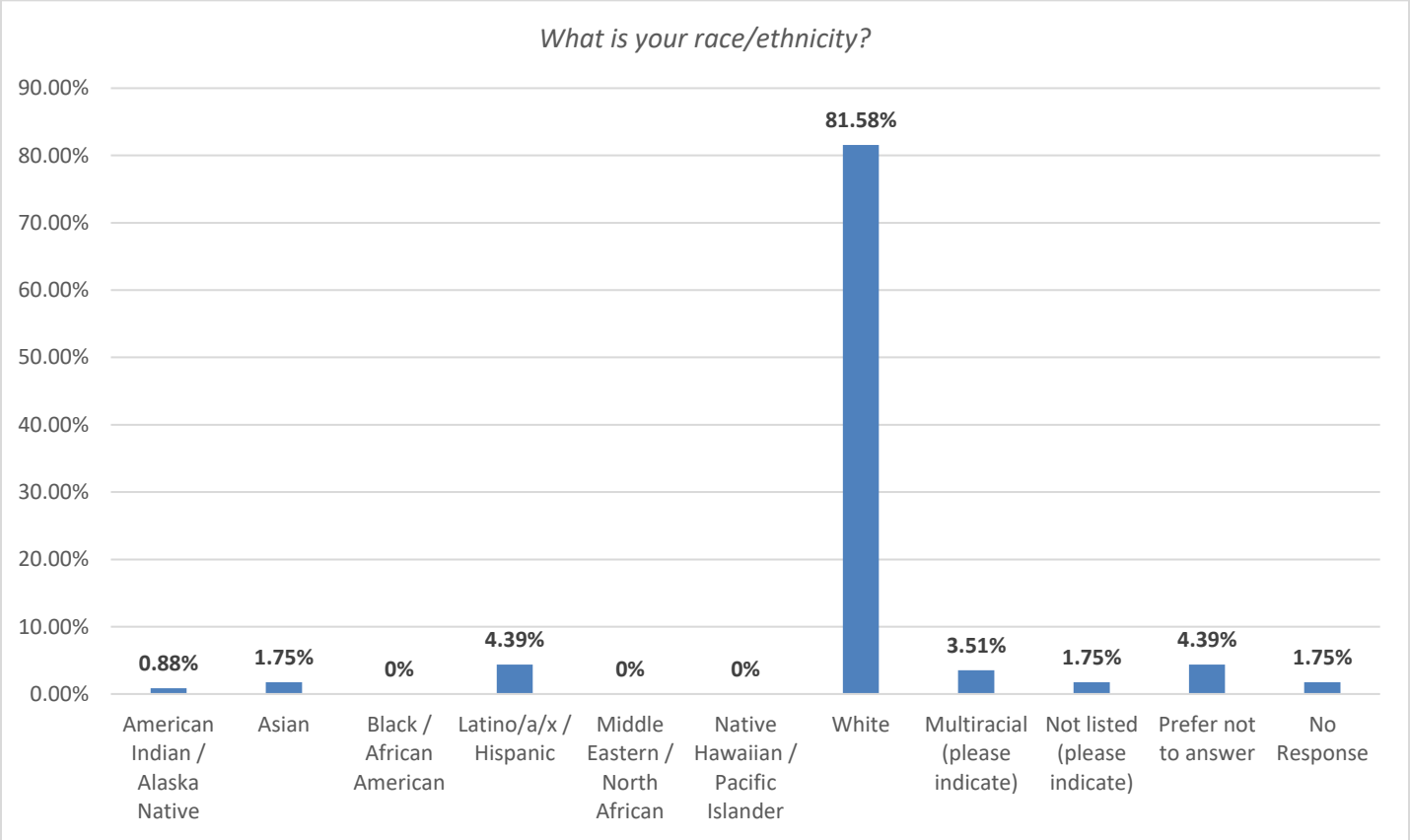


**Figure 18.** Demographic Question 17

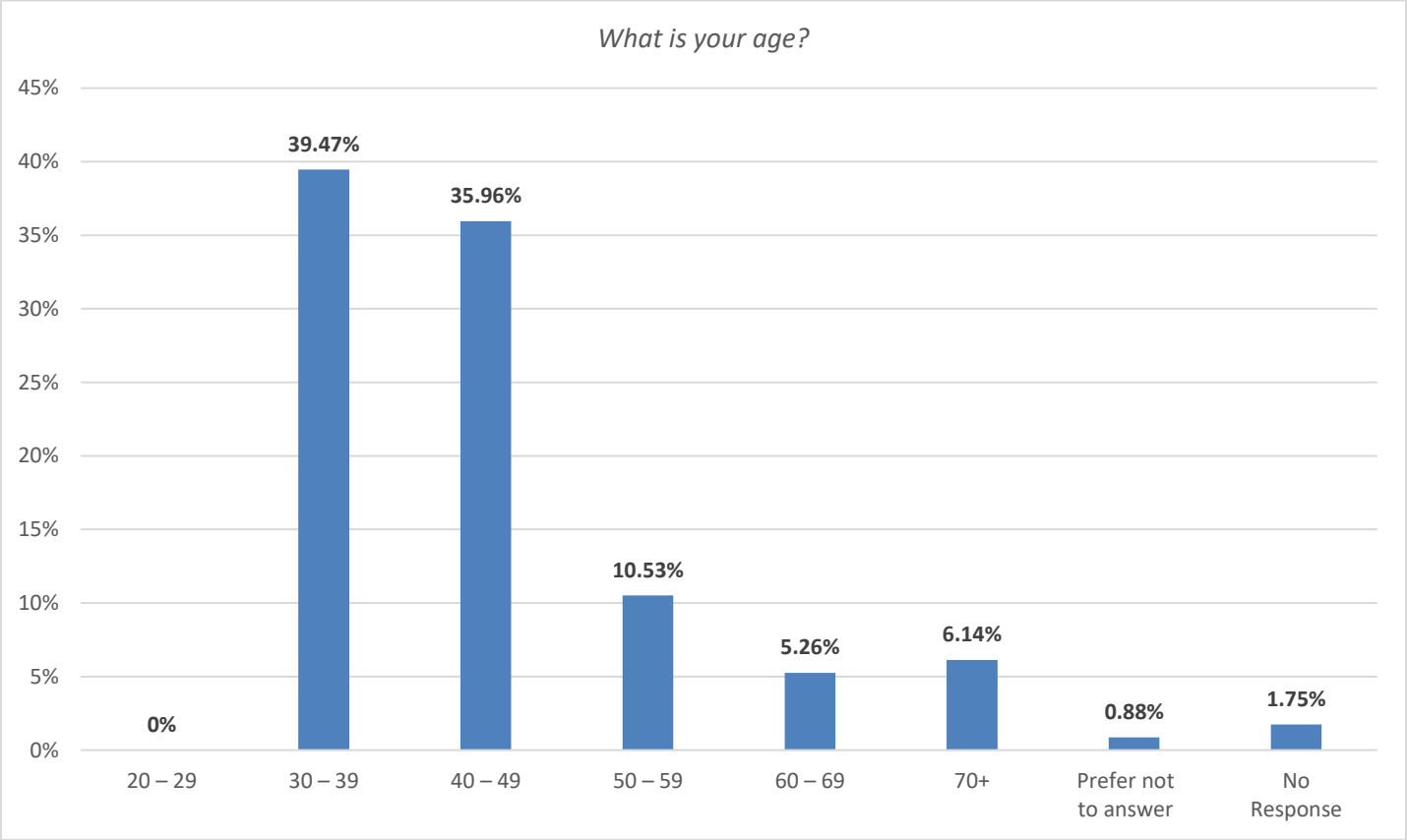
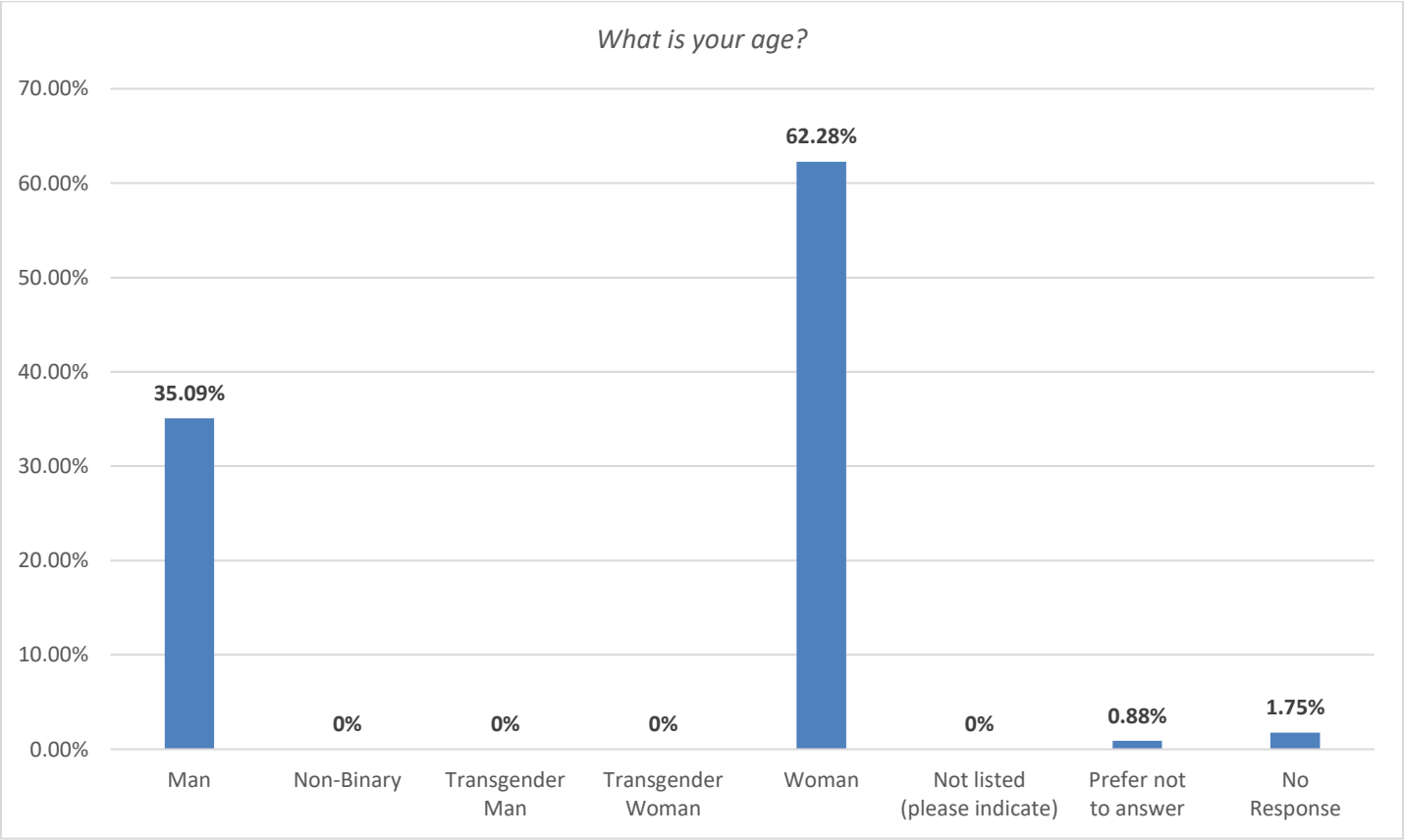



**Figure 19.** Demographic Question 18



### *KSA Ratings*

Means and standard deviations for the KSA statements included on the survey are in Appendix D1. 100 of the 138 KSA statements achieved high importance means. Table 1 shows the delineation of tasks in Pass, Borderline, and Fail categories by domain.

**Table 1.** *KSA Statement Importance by Pass, Borderline & Fail categories*

| Domain | # of Task Statements | Pass (Mean 2.50 or Above) | Borderline (Mean 2.40 to 2.49) | Fail (Mean Less than 2.40) |
|---|---|---|---|---|
| 1. General Knowledge | 18 | 15 | | 3 |
| 2. Medical Neurology | 62 | 37 | | 25 |
| 3. Surgical Neurology | 29 | 21 | 3 | 5 |
| 4. Neuroradiology | 21 | 21 | | |
| 5. Neuropathology | 8 | 6 | | 2 |
| **Total** | **138** | **100** | **3** | **35** |
| **Percentage** | | **72.46%** | **2.17%** | **25.36%** |

Table 2 shows the number of KSA statements that were placed in each of the frequency categories from the secondary rating scale by domain. The median and standard deviations for this rating scale are provided in Appendix D2.

**Table 2.** *Frequency Modal Responses for KSAs by Category*

| Domain | 0 = Never (on no occasion) | 1 = Rarely (quarterly to annually) | 2 = Occasionally (once a month) | 3 = Frequently (once a week) | 4 = Very Frequently (daily) |
|---|---|---|---|---|---|
| 1. General Knowledge | 1 | 4 | 3 | 5 | 5 |
| 2. Medical Neurology | 25 | 6 | 11 | 5 | 15 |
| 3. Surgical Neurology | 8 | 13 | 0 | 1 | 7 |
| 4. Neuroradiology | 4 | 1 | 5 | 2 | 9 |
| 5. Neuropathology | 1 | 5 | 0 | 0 | 2 |
| **Total** | **39** | **29** | **19** | **13** | **38** |
| **Percentage** | **28.26%** | **21.01%** | **13.77%** | **9.42%** | **27.54%** |

### *Subgroup Analysis of KSA Ratings*

The index of agreement (IOA) is a measure of the extent to which subgroups of respondents agree on which KSA statements are important. Using the mean importance ratings for KSAs, indices of agreement were computed:

- If the subgroup means are above the critical importance value (mean ratings at or above 2.50), then they agree that the content is important.
- If the subgroup means are below the critical importance value (mean ratings less than 2.50), then the subgroups agree that the content is considered less important.
- By contrast, if one subgroup's (for example, female) mean ratings are above the critical importance value and another subgroup's (for example, male) means are below the critical importance value then the subgroups are in disagreement as to whether the content is important.

The index of agreement provides a method of computing the similarity in judgments between groups and is tailored to the purpose of a job analysis study more than the correlation coefficient. Although the correlation coefficient measures the tendency toward agreement along the full range of possible ratings, the agreement index focuses on whether two groups agree that the content should (or should not) be included in an examination.

As one of the major purposes of this job analysis study is to identify appropriate test content, the agreement index provides a statistical method to address this question at the subgroup level. Furthermore, the agreement index requires only 30 respondents per subgroup for computation, whereas the correlation coefficient requires at least 100 respondents per subgroup to provide a reliable measure of agreement.

An illustrative example for two groups on a survey with 100 task statements shows how to compute the index. If two groups passed the same 96 task statements and failed the same 2 task statements (out of the 100 total task statements in the survey), the consistency index would be computed as *Agreement* = (96 + 2)/100 = 0.98. Values of 0.80 or less show less than optimal agreement and therefore require additional mean analyses.

The index of agreement coefficients for KSAs are in Appendix E. Agreement coefficients were produced on the following background questions:

- How many years of experience do you have practicing veterinary medicine?
- Which of the following best describes your current primary work environment?
- What percent of your time at work do you devote to clinical work?
- Including yourself, how many board-certified veterinary neurology professionals are on site where you practice?
- Does your employer/institution currently have an ACVIM Neurology approved residency training program?

Agreement coefficients for the task statements ranged from 0.88 to 0.96. Since the agreement coefficients for all questions were greater than 0.80, no additional mean analysis was required.

### *Content Coverage Ratings*

The survey participants indicated how well the KSA statements within each of the domains covered important aspects of that area. These responses provide an indication of the comprehensiveness of the survey content.

The five-point rating scale included *0 = Very Poorly*, *1 = Poorly*, *2 = Adequately*, *3 = Well*, and *4 = Very Well*. The means and standard deviations for the KSA ratings are provided in Table 2. The means ranged from 2.82 to 3.05. These means provide evidence that domains on the survey were adequately to well covered.

**Table 3.** *Mean, Standard Deviation & Frequency Distribution Percentage of KSA Content Coverage*

| Domain | Content Coverage | | | | | | |
|---|---|---|---|---|---|---|---|
| | Mean | SD | Frequency Percentage | | | | |
| | | | 0 = Very poorly | 1 = Poorly | 2 = Adequately | 3 = Well | 4 = Very well |
| 1. General Knowledge | 2.82 | 0.80 | 0% | 2.63% | 33.33% | 41.23% | 21.05% |
| 2. Medical Neurology | 2.96 | 0.76 | 0% | 1.75% | 24.56% | 47.37% | 24.56% |
| 3. Surgical Neurology | 2.91 | 0.75 | 0% | 0% | 31.58% | 42.11% | 22.81% |
| 4. Neuroradiology | 3.05 | 0.78 | 0% | 0.88% | 24.56% | 40.35% | 31.58% |
| 5. Neuropathology | 2.89 | 0.85 | 0.88% | 2.63% | 27.19% | 41.23% | 24.56% |

Survey respondents could also write in KSA statements that they believed should be included in the listing of important knowledge, skills, and abilities. See Appendix G for the content coverage write-in comments. The Test Specifications Committee reviewed the comments to determine whether there were important statements not covered on the survey that should be included in the test specifications.

### *Test Content Recommendations*

In survey Section 3: *Domain Weighting*, participants were asked to assign a percentage weight to each domain. The sum of percentage weights was required to equal 100. This information guided the Test Specifications Committee in making decisions about how much emphasis the domains should receive on the Neurology test content outline. The mean weights across all survey respondents are in Table 4.

**Table 4.** *Survey Respondents' Test Content Recommendations by Mean Percentages & Standard Deviations*

| Domain | Mean | SD | Range | |
|---|---|---|---|---|
| | | | Min | Max |
| 1. General Knowledge | 20.44 | 7.98 | 5 | 50 |
| 2. Medical Neurology | 28.78 | 7.33 | 17 | 50 |
| 3. Surgical Neurology | 21.02 | 6.98 | 5 | 40 |
| 4. Neuroradiology | 20.67 | 5.22 | 0 | 30 |
| 5. Neuropathology | 9.10 | 4.50 | 0 | 25 |

### *Write-In Comments*

Many survey respondents provided responses to the open-ended questions in Section 4: *Comments*. See Appendix H for write-in comments about expected changes to job roles over the next few years, professional development/continuing education needs, and other comments regarding the Neurology survey and test specifications.

# DEVELOPMENT OF TEST SPECIFICATIONS FOR THE NEUROLOGY EXAMINATION

The Test Specifications meeting for the Neurology exam was conducted on May 20 & 21, 2023, in Greenwood Village, CO. The steps involved in the development of the test specifications included the following:

- presentation of the job analysis project and results to the Test Specifications Committee;
- identification of the KSA statements to be included in the Neurology test specifications; and,
- development of the test content weights for the exam.

### *Presentation of the Job Analysis Project & Results to the Test Specifications Committee*

The first activity involved in the test specification development was to provide the Test Specifications Committee an overview of the job analysis activities that were conducted and to present the results of the study.

### *Identification of the KSA Statements to be Included on the Neurology Exam*

The Test Specifications Committee reviewed the KSA results to make final recommendations about the areas that should be included on the exam.

The survey results served as the primary source of information used by the Committee members to make test content decisions. Recommendations were based on the following criteria:

- the mean KSA ratings for all respondents;
- the frequency distribution of ratings for all respondents; and,
- the appropriateness of the content for the examination.

### *KSA Statements Recommended for Inclusion*

- 95 of the 100 KSA statements that achieved mean ratings at or above 2.50 (pass category) were approved for exam inclusion by the Test Specifications Committee; 14 of those statements were modified
- 3 KSA statements achieved mean ratings between 2.40 and 2.49 (borderline category) and were approved for exam inclusion by the Committee
- 1 of the 35 KSA statements that achieved mean ratings less than 2.40 (fail category) was approved for exam inclusion by the Committee
- 1 additional General Knowledge KSA statement was added by the Committee

Table 5 contains the additional, modified, and removed statements.

**Table 5**. *Knowledge, Skill & Ability Statements Added to, Modified on, or Removed from the Test Specifications*

| Domain | KSA | Rationale |
|---|---|---|
| General Knowledge | Identify the gross anatomy and neuroanatomic structures of the cat, ~~and~~ dog, horse, and food/fiber animal brain and spinal cord | Failing equine & food/fiber animal KSAs merged into *General Knowledge* KSA |
| General Knowledge | ~~Identify the gross anatomy and neuroanatomic structures of the horse and food/fiber animal brain and spinal cord~~ | |
| General Knowledge | ~~Differentiate the development of the nervous system from embryonic to mature structures~~ | Failing rating & not used day-to-day |
| General Knowledge | ~~Describe inheritance patterns and types of mutations~~ | Failing rating & not used day-to-day |
| General Knowledge | Recognize the basic principles of anti-seizure drug absorption, metabolism, and clearance (e.g., efficacy, half-lives, MOA, pharmacodynamic, pharmacokinetics, safety, side effects) | Added based on content coverage comments |
| General Knowledge | Differentiate the classes and mechanisms of action of analgesic and anesthetic therapy | Modified so as to replace overlapping KSA from *Surgical Neurology* |
| General Knowledge | Recognize the basic principles of neurologic drug absorption, metabolism, and clearance (e.g., efficacy, half-lives, MOA, pharmacodynamic, pharmacokinetics, safety, side effects) | Additional examples added for clarity |
| ~~Medical Neurology~~ Neuropathology | Clinically interpret CSF analysis (e.g., cell count, CK, glucose, protein) | Domain changed to better match content |
| Medical Neurology | Recognize indications for, and the physiological basis of, electrodiagnostic testing (e.g., sensory, motor, evoked potentials) | Examples added for clarity |
| Medical Neurology | Describe how to set-up for ~~BAER, EEG,~~ EMG, ~~and~~ nerve conduction testing, BAER, and EEG (e.g., sensory, motor, evoked potentials) | Reordered & examples added for clarity |
| Medical Neurology | Interpret testing results from ~~BAER, EEG,~~ EMG, ~~and~~ nerve conduction testing, BAER, and EEG | Reordered for clarity |
| Medical Neurology | ~~Interpret ophthalmologic electrodiagnostic testing (e.g., ERG, VEP)~~ | Failing rating & covered by another specialty |
| ~~Surgical Neurology~~ Medical Neurology | Recognize indications for ~~less common surgical procedures:~~ Myringotomy | Domain changed to more accurately match content & modified to be a stand-alone KSA |
| Medical Neurology | Canine and Feline Disease Pathogenesis, Diagnosis, and Treatment (e.g., analgesia, hyper-osmotic agents/fluid therapy) | Examples added to Sub-Domain title for clarity |
| Medical Neurology | Describe the pathogenesis, diagnostics, and treatment of:<br>…<br>**o.** micturition ~~disorders~~ dysfunction (e.g., UMN/LMN bladder) | Modified & examples added for clarity |
| Medical Neurology | ~~Describe the pathogenesis, diagnostics, and treatment of~~<br>~~a. vascular disease affecting the nervous system (e.g., dummy foal)~~<br>~~b. inflammatory disease of the CNS (e.g., infectious vs non-infectious)~~<br>~~c. inflammatory disease of the PNS, including neuromuscular system~~<br>~~d. traumatic disease of the CNS~~<br>~~e. traumatic disease of the PNS, including neuromuscular system~~<br>~~f. neoplastic diseases affecting the CNS~~<br>~~g. neoplastic diseases affecting the PNS, including neuromuscular system~~<br>~~h. toxic diseases affecting the nervous system~~<br>~~i. anomalous and/or congenital diseases of the nervous system (e.g., wobblers)~~<br>~~j. metabolic diseases affecting the system (e.g., endocrinopathies, liver disease)~~<br>~~k. nutritional diseases affecting the nervous system (e.g., vitamin E deficiency)~~<br>~~l. degenerative diseases affecting the nervous system (e.g., NCL)~~<br>~~m. movement disorders (e.g., shivers, stringhalt)~~<br>~~n. epilepsy (e.g., genetic, structural)~~<br>~~o. sleep disorders~~ | Failing equine & food/fiber animal KSAs removed; certificants will not see large animals often enough to need to have this knowledge memorized & foundational topics will now be covered under modified *General Knowledge* KSA related to the gross anatomy & neuroanatomic structures of the cat, dog, horse… |

| Domain | KSA | Rationale |
|---|---|---|
| Medical Neurology | ~~Describe the pathogenesis, diagnostics, and treatment of~~<br>~~a. vascular disease affecting the nervous system~~<br>~~b. infectious diseases of the nervous system~~<br>~~c. traumatic diseases of nervous system~~<br>~~d. neoplastic diseases affecting the nervous system~~<br>~~e. toxic diseases affecting the nervous system (e.g., salt toxicity)~~<br>~~f. anomalous and/or congenital diseases affecting the nervous system~~<br>~~g. metabolic diseases affecting nervous system (e.g., polioencephalomalacia)~~<br>~~h. nutritional diseases affecting the nervous system (e.g., copper deficiency)~~<br>~~i. degenerative diseases affecting the nervous system (e.g., maple syrup urine disease)~~ | …& food/fiber animal brain & spinal cord |
| Surgical Neurology | Identify the Indications, Describe the Procedures and Post-Operative Care, and Recognize the Complications for ~~Routine~~ the Following Surgical Procedures<br>a. Ventral slot<br>b. Cervical hemilaminectomy<br>c. Thoracolumbar hemilaminectomy<br>d. Durotomy<br>e. Corpectomy<br>f. Dorsal laminectomy of cervical and thoracolumbar vertebral column<br>g. Lumbosacral decompression<br>h. Disc fenestration<br>i. Vertebral column stabilization (e.g., cervical, lumbar/LS, thoracic)<br>~~j. Cervical vertebral distraction-fusion (e.g., disc replacement)~~<br>k. Nerve and muscle biopsy<br>l. Ventriculoperitoneal shunt<br>m. Craniectomy (e.g., rostro-tentorial, suboccipital, transfrontal)<br>n. Atlantoaxial (AA) luxation<br>o. Tumor excision (e.g., brain, spinal cord) | Framing statement modified for clarity; Borderline *Corpectomy* KSA is growing in use & importance [moved from procedure list below to this list of procedures; *Cervical vertebral distraction fusion* moved to procedure list below; *Tumor excision* examples added for clarity; |
| Surgical Neurology | Recognize the Indications for ~~Less Common~~ the following Surgical Procedures<br>~~a. Minimally invasive techniques (e.g., dilators, percutaneous implant placement)~~<br>~~b. Lateral cervical approach~~<br>c. Hypophysectomy<br>~~d. Percutaneous laser disc ablation~~<br>e. Foraminotomy<br>~~f. Corpectomy~~<br>g. Brain biopsy (i.e., stereotactic)<br>~~h. Myringotomy~~<br>~~i. 3D-printed guides and models~~<br>j. Cervical vertebral distraction-fusion (e.g., disc replacement) | Framing statement modified for clarity; failing *Minimally invasive techniques* KSA is up & coming but not yet widely used enough to warrant inclusion; failing *Lateral cervical approach* KSA already covered elsewhere; failing *Hypophysectomy* KSA is niche, but kept in as topic is increasing in diagnosis & literature; failing *Percutaneous laser disc ablation* KSA is not yet understood well enough for inclusion; borderline *Brain biopsy* KSA is covered by a number of papers & it is reasonable to know the indications & when to refer; Myringotomy KSA moved to *Medical Neurology* domain; … |

| Domain | KSA | Rationale |
|---|---|---|
| | | …failing *3D printed guides & models* KSA is up & coming but not yet to the point where it warrants inclusion |
| Surgical Neurology | ~~Apply the principles of anesthesia and analgesia for the neurologic patient~~ | Now covered under modified *General Knowledge* KSA |
| Surgical Neurology | ~~Address common anesthetic complications of the neurologic patient~~ | Already covered under *General Knowledge* & *Medical Neurology* |
| Surgical Neurology | ~~Apply principles of fluid therapy for the neurologic patient~~ | Already covered under *Medical Neurology* |
| Neuroradiology | Myelogram (Radiograph & CT) | Sub-Domain title modified for clarity |
| Neuroradiology | ~~Describe indications for performing a myelogram~~<br>~~Describe myelographic technique (e.g., dose, potential complications)~~<br>Describe indications and techniques for performing a myelogram | Two KSA merged into one to match other statements in domain |
| Neuroradiology | ~~Interpret myelograms of the vertebral column~~<br>~~Identify common artifacts of myelograms~~<br>Interpret myelograms of the vertebral column (including artifacts of myelograms) | Two KSA merged into one to match other statements in domain |
| Neuroradiology | ~~Identify common artifacts of CT~~<br>~~Describe how to correct common artifacts of CT~~<br>Identify common artifacts of CT & describe how to correct them | Two KSA merged into one to match other statements in domain |
| Neuroradiology | Identify common MRI sequences and their indications (e.g., ADC, DWI, FLAIR, STIR, T1, T2, T2*) | Modified based on content coverage comments |
| Neuroradiology | ~~Identify common artifacts of MRI~~<br>~~Describe how to correct common artifacts of MRI~~<br>Identify common artifacts of MRI & describe how to correct them | Two KSA merged into one to match other statements in domain |
| Neuroradiology | ~~Recognize indications for special stains~~ | Failing KSAs are typically handled by someone other than Neurology certificants |
| Neuroradiology | ~~Identify common stains on photomicrograph~~ | |
| Neuroradiology | Evaluate a clinical and anatomical pathological report and provide differentials | Modified for clarity |

*Text in green or red indicates an addition to, or omission from, the original wording

### *Development of Test Content Weights*

The Test Specifications Committee participated in an exercise that required each member to assign a percentage weight to each of the domains. Weights were then entered into a spreadsheet and shown to the committee. The committee members were able to compare the test content weights derived from the survey responses to their own estimates. This resulted in a productive discussion among the Committee members regarding the optimal percentages for the exam.

Table 6 shows the test specifications recommendations including the percentage content. The complete test specifications are in Appendix I.

**Table 6.** *Test Content Weights Recommended by the Test Specifications Committee*

| Domains | # of Statements | Weight |
|---|---|---|
| 1. General Knowledge | 16 | 22% |
| 2. Medical Neurology | 38 | 10% |
| 3. Surgical Neurology | 22 | 25% |
| 4. Neuroradiology | 17 | 25% |
| 5. Neuropathology | 7 | 18% |

The Test Specifications Committee also participated in an exercise to determine the distribution of exam content based on animal type. Their individual weight recommendations were entered into a spreadsheet and shown to the Committee, who were able to compare their own estimates to the content recommendations derived from the survey responses. This resulted in the following recommendation for the optimal percentages for the exam, as show in Table 7.

**Table 7.** *Animal Weights Recommended by the Test Specifications Committee*

| Species | Weight |
|---|---|
| 1. Equine | 4% |
| 2. Food/Fiber | 3% |
| 3. Small Animal | 93% |

# SUMMARY & CONCLUSIONS

This job analysis study for the Neurology exam identified the knowledge, skills, and abilities (KSAs) that are important to the work performed by veterinarians specializing in neurology. The results of the study can be used to guide further development work for the Neurology exam.

KSA statements were developed through an iterative process involving the combined efforts of ACVIM, subject matter experts, and Prometric staff. These statements were entered into a survey format and subjected to verification/refutation through the dissemination of a survey to veterinary professionals. The survey participants were asked to rate the importance of task statements.

The results of the study support the following:

- KSA statements that were verified as important through the survey provide the foundation of empirically derived information from which to develop test specifications for the Neurology exam.
- Evidence was provided in this study that the comprehensiveness of the content within the domains was adequately to well covered.
- The process utilized as well as the information that resulted from the analysis supported the development of the Neurology test specifications.

In summary, the study used a multi-method approach to identify the knowledge, skills, and abilities that are important to the work performed by neurology veterinarians. The results of the study were used to develop test specifications for the Neurology exam.