Job Analysis Report for the Oncology Examination

Conducted on behalf of

July 2023

Prepared by:

PROMETRIC

Nick Baker
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) Oncology 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 Oncology 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 oncology; and
- update the test specifications for the oncology 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 2016.

Survey Content

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

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 119 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 oncology*" using a five-point scale (*0 = Of No Importance* to *4 = Very Important*).

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 June 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 Oncology exam.

RESULTS AT A GLANCE

WHO COMPLETED THE SURVEY

A total of 119 responses were used for analysis. The majority of respondents had been ACVIM certified for 11 or more years, held a Bachelor's degree or higher, worked in a clinical private practice setting, and devoted 76% or more of their time to clinical work.

IMPORTANCE RATINGS

175 out of the 190 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 oncology. 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 Oncology 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 Oncology 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.

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[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 Oncology 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 Oncology 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 oncology. 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 oncology.

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 January of 2023, 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 oncology. 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 February 11 & 12, 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 oncology veterinarian. The draft list presented to the Task Force was developed using the results of the 2016 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. Principles of Cancer Biology
2. Research Principles
3. Tumor Behavior, Diagnostics & Prognostic Indicators
4. Cancer Treatment Modalities
5. Management of Oncology Patients

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 March 2, 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 23, 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 scale shown below.

Knowledge, Skill & Ability (KSA) Ratings
Considering both importance and frequency, how important is each knowledge, skill, or ability (KSA) statement for an individual specializing in veterinary oncology?
0 = Of No Importance
1 = Of Little Importance
2 = Of Moderate Importance
3 = Important
4 = Very Important

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. Principles of Cancer Biology
2. Research Principles
3. Tumor Behavior, Diagnostics & Prognostic Indicators
4. Cancer Treatment Modalities
5. Management of Oncology Patients

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.

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* Oncology *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 April 17, 2023. The invited survey participants received two reminder emails prior to the survey's close on May 19, 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 oncology. 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 statements and content coverage 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 June 12 & 13, 2023, Prometric staff facilitated a meeting to develop test specifications for the Oncology 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 167 participants started the survey. Of those surveys 119 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

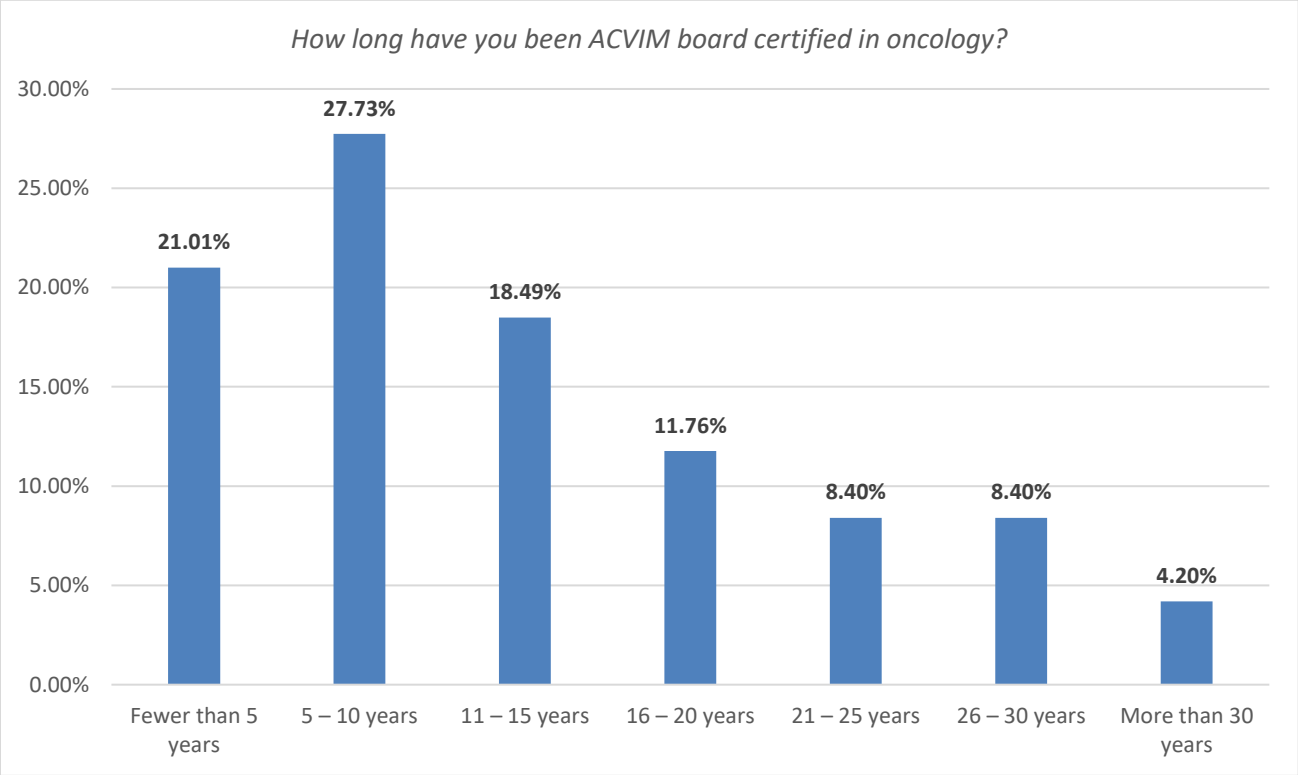


Figure 2. Demographic Question 2

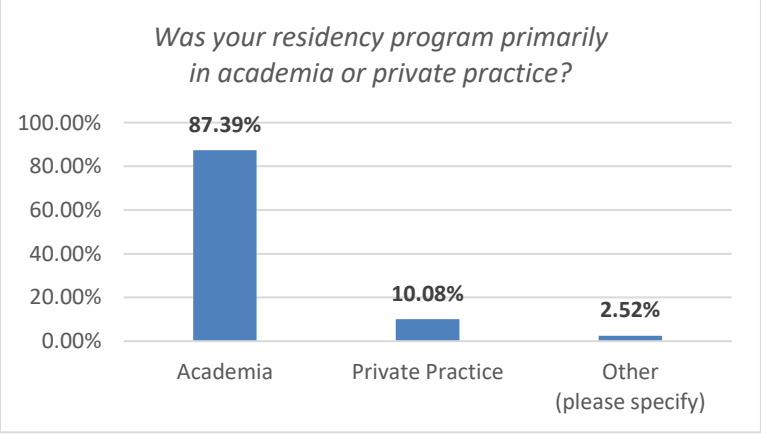


Figure 3. Demographic Question 3

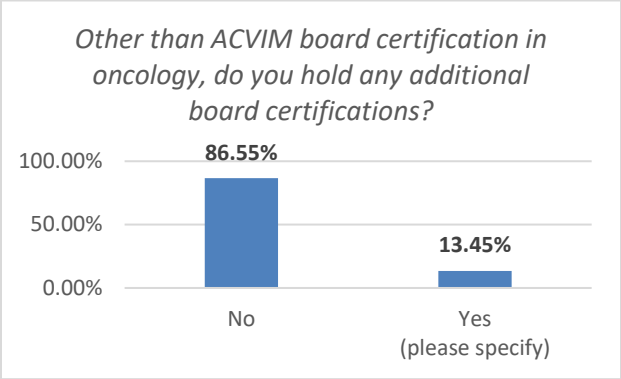


Figure 4. Demographic Question 4

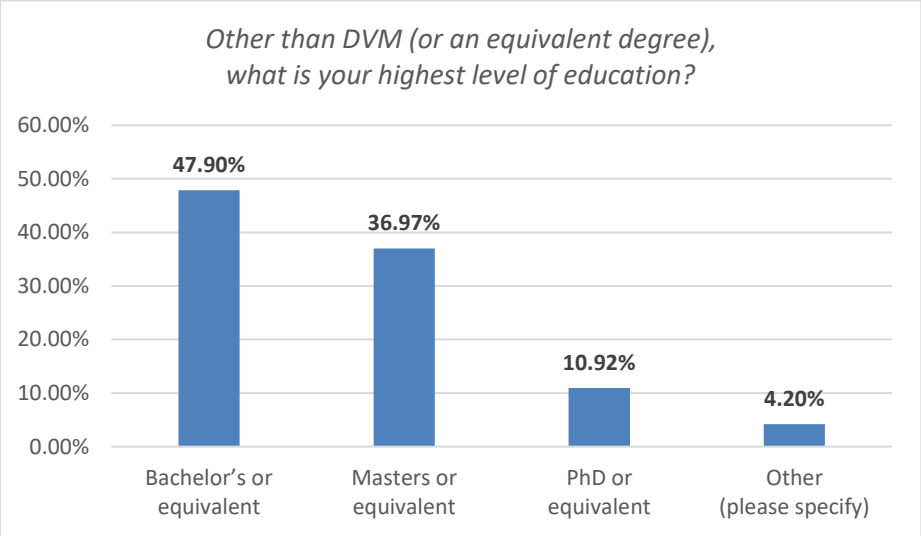


Figure 5. Demographic Question 5

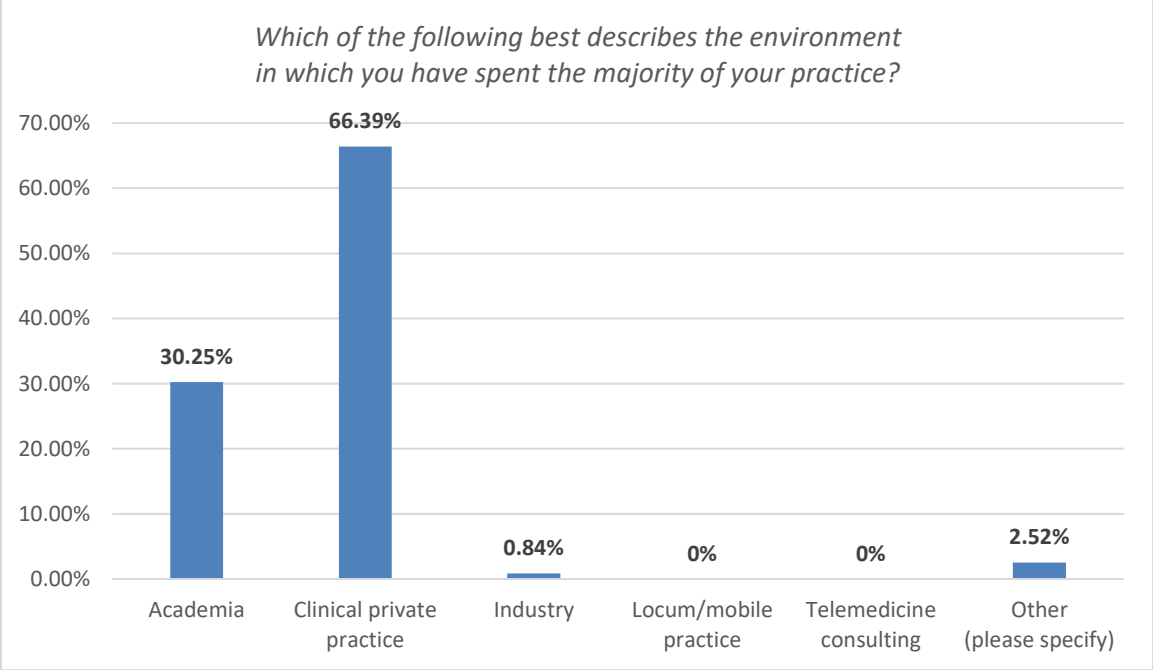


Figure 6. Demographic Question 6

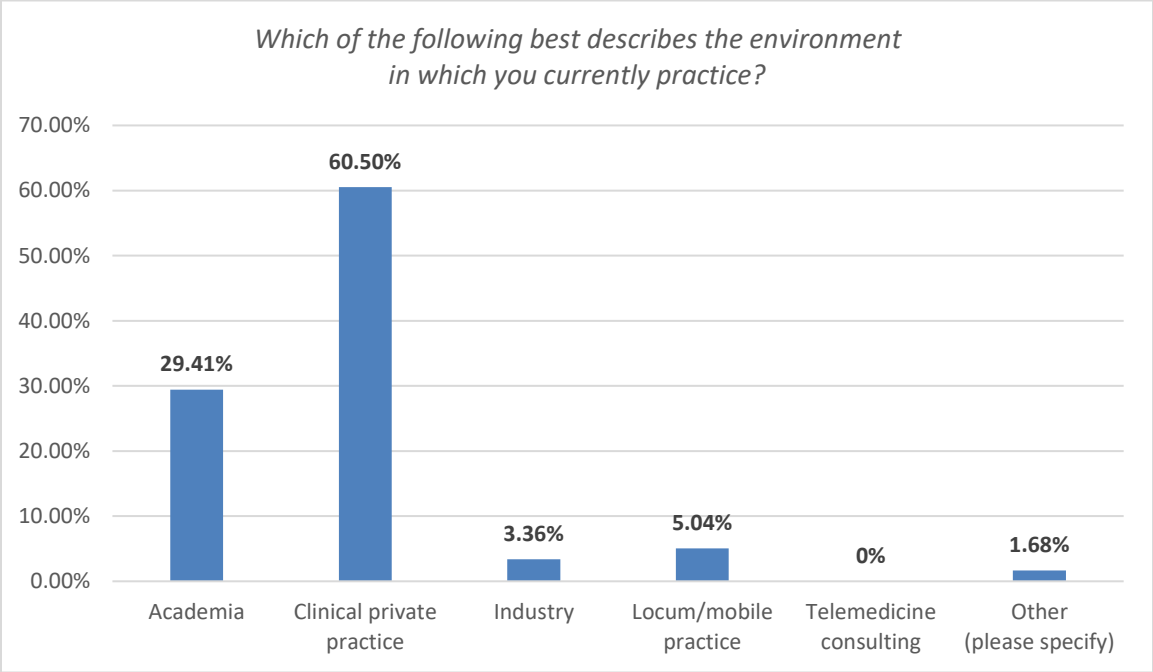


Figure 7. Demographic Question 7

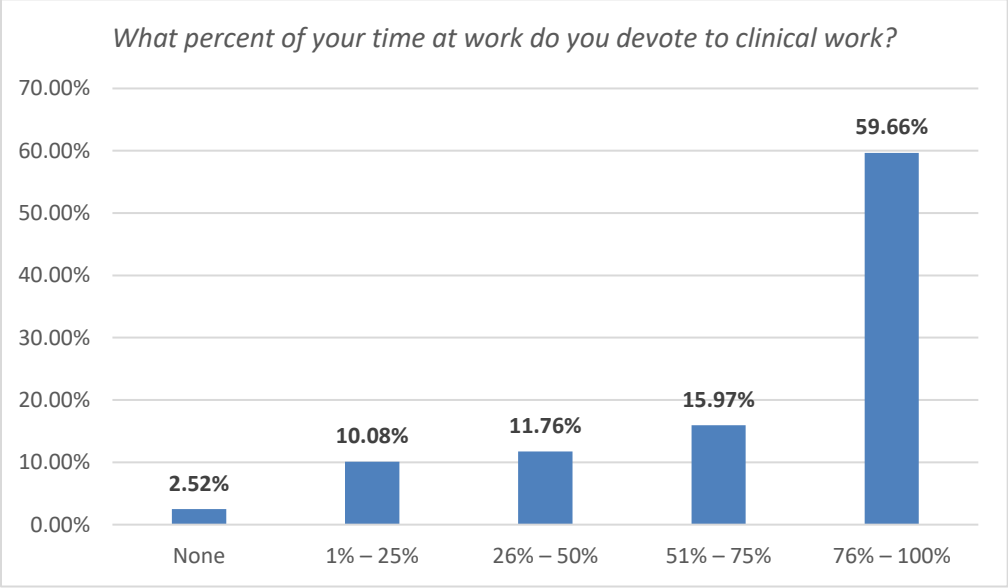


Figure 8. Demographic Question 8

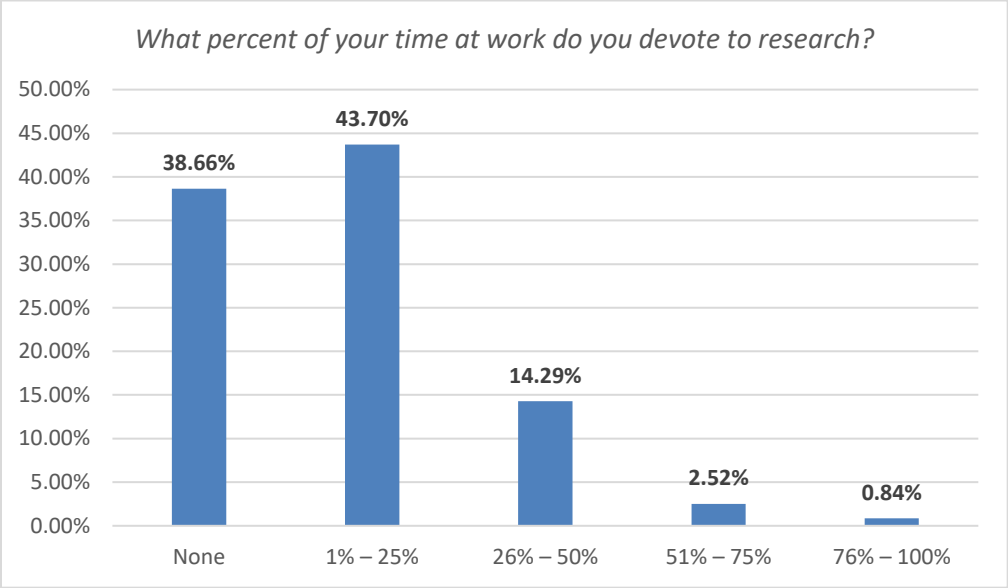


Figure 9. Demographic Question 9

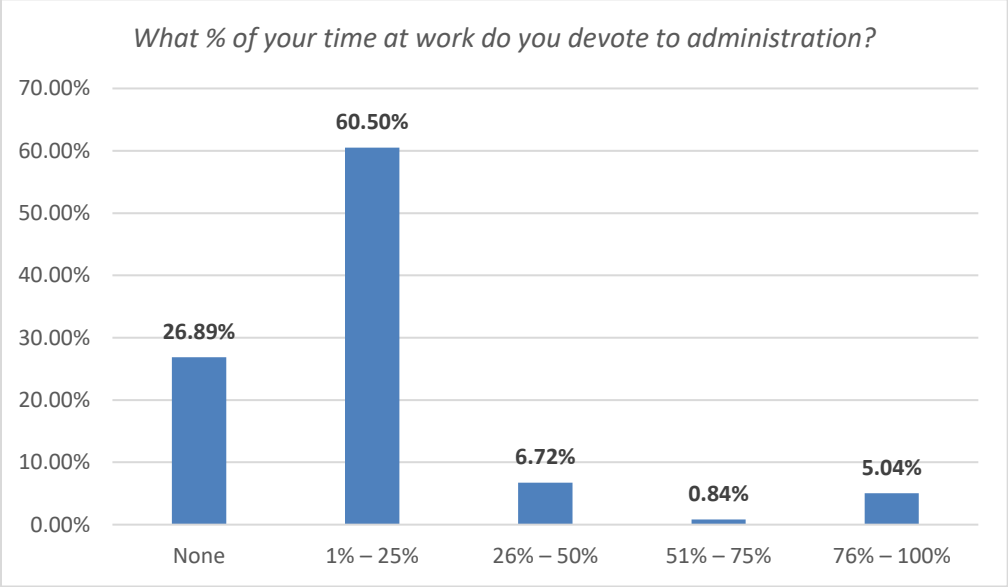


Figure 10. Demographic Question 10

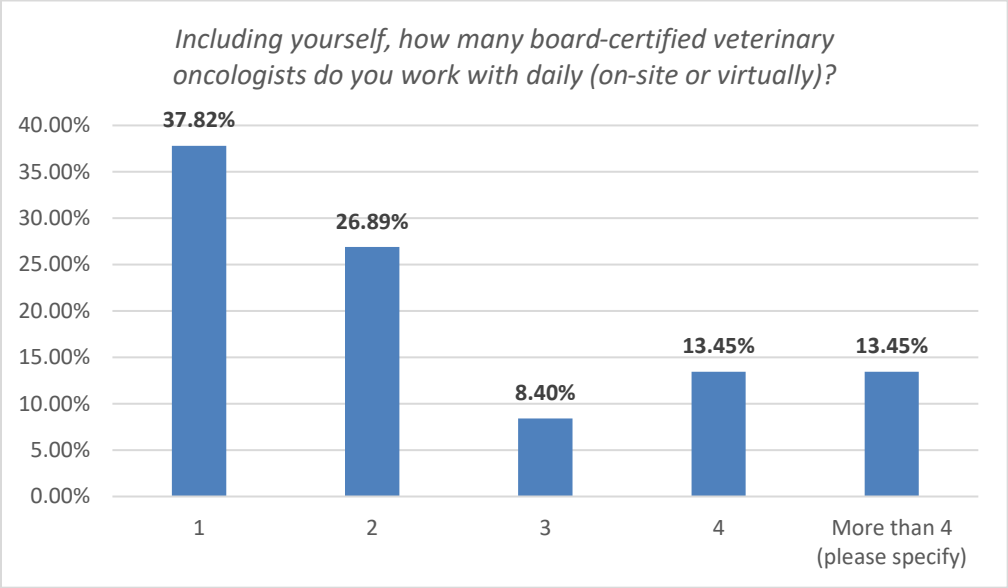


Figure 11. Demographic Question 11

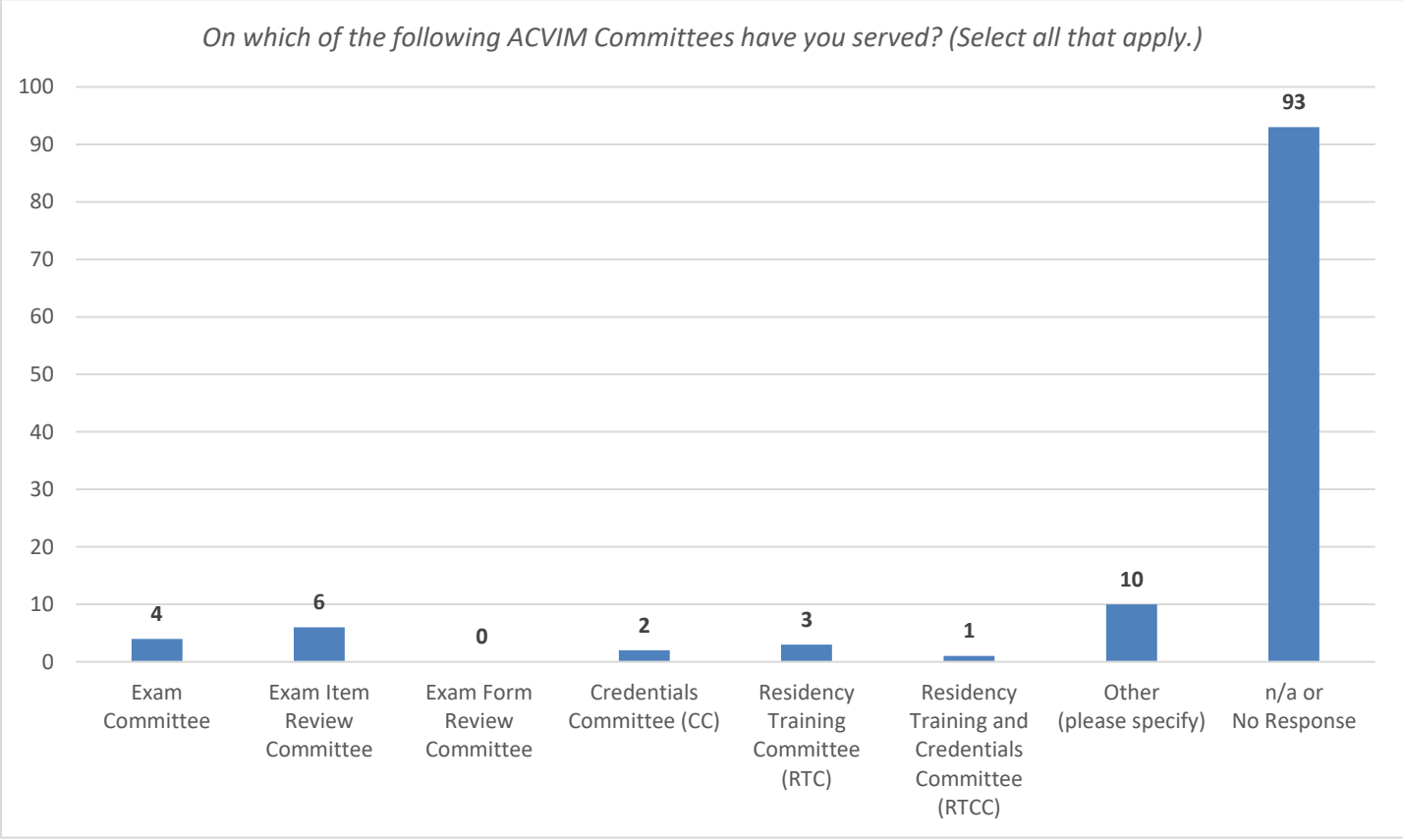


Figure 12. Demographic Question 12

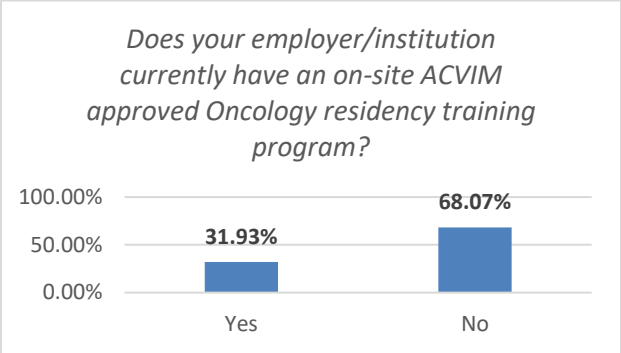


Figure 13. Demographic Question 13

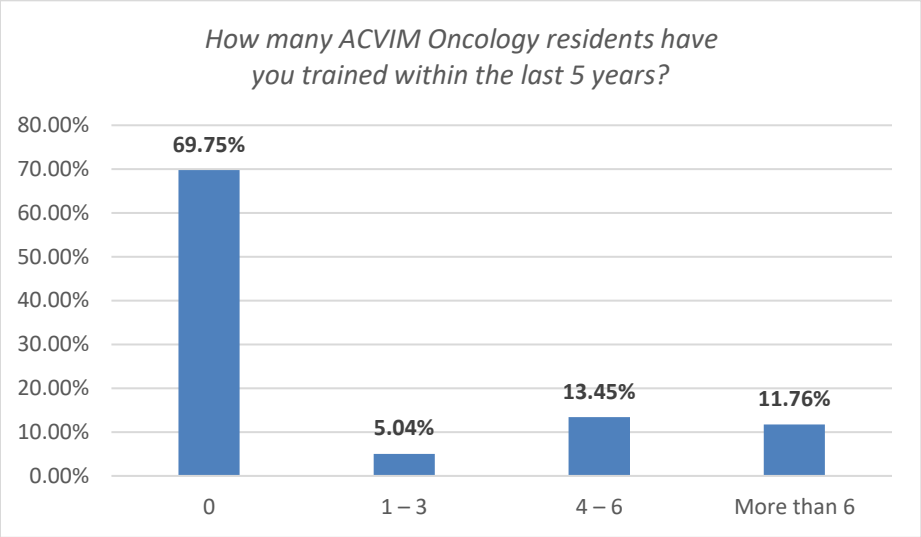


Figure 14. Demographic Question 14

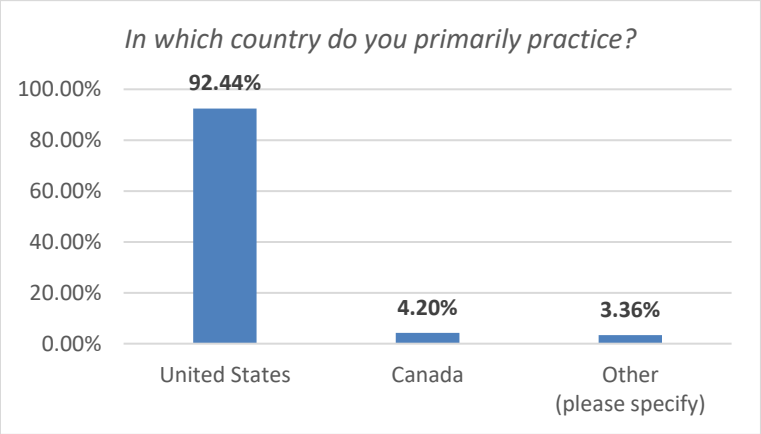


Figure 15. Demographic Question 15A

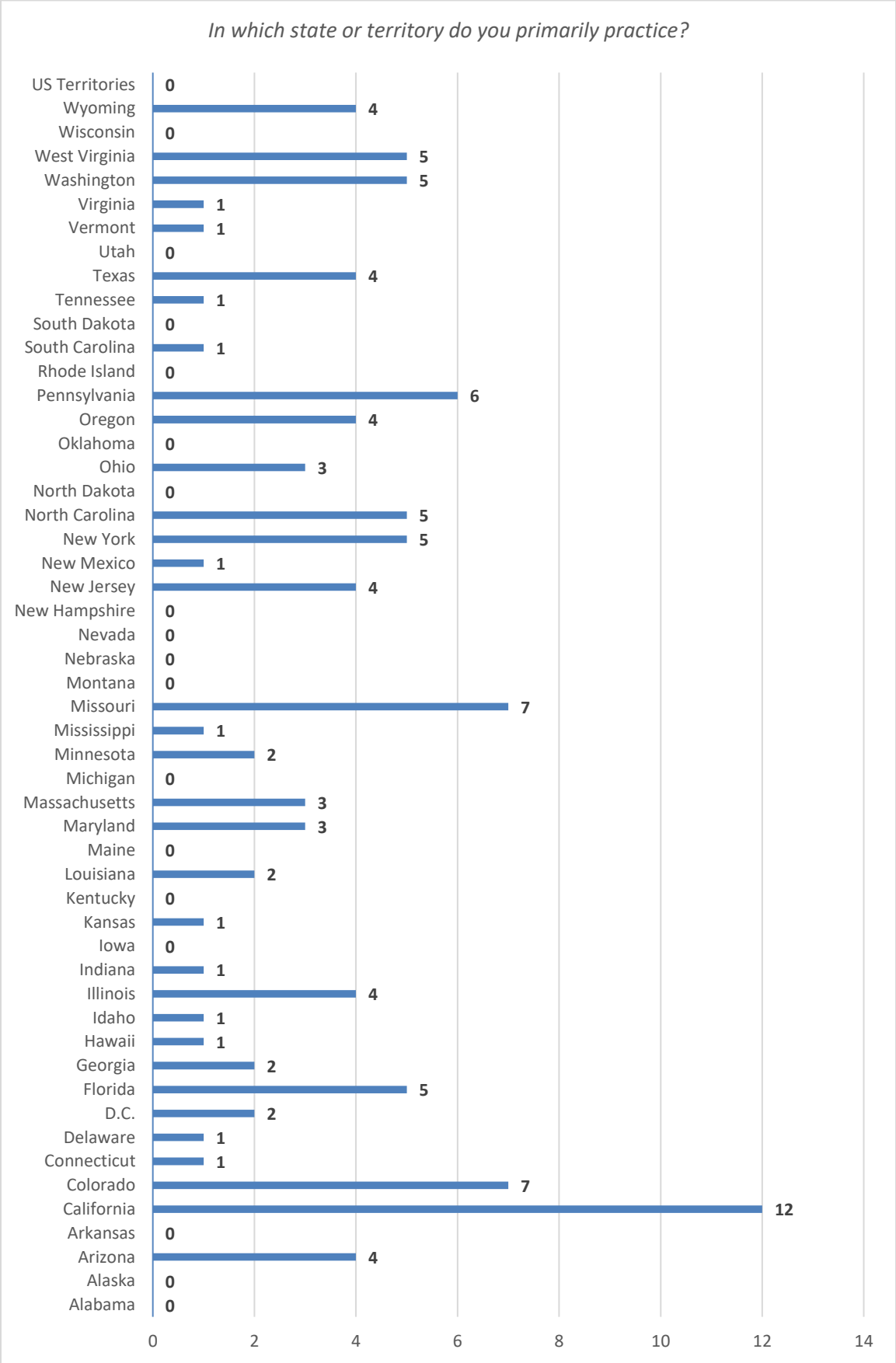


Figure 16. Demographic Question 15B

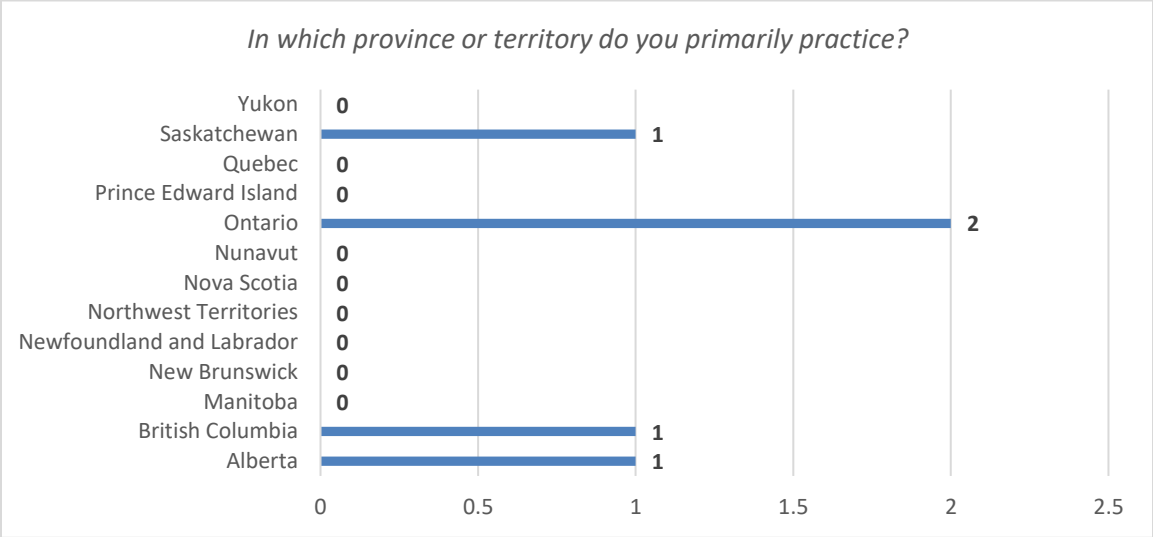


Figure 17. Demographic Question 16

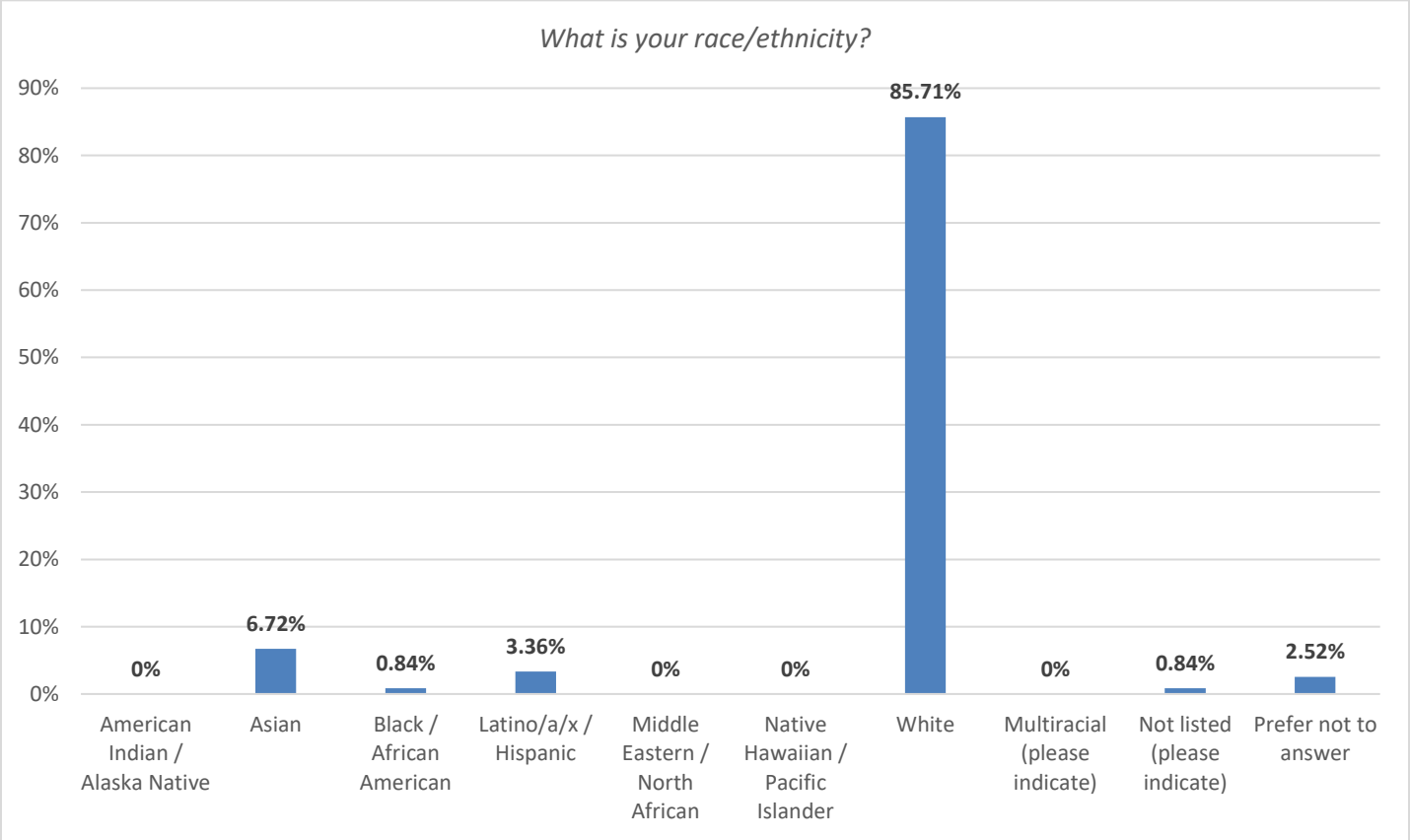


Figure 18. Demographic Question 17

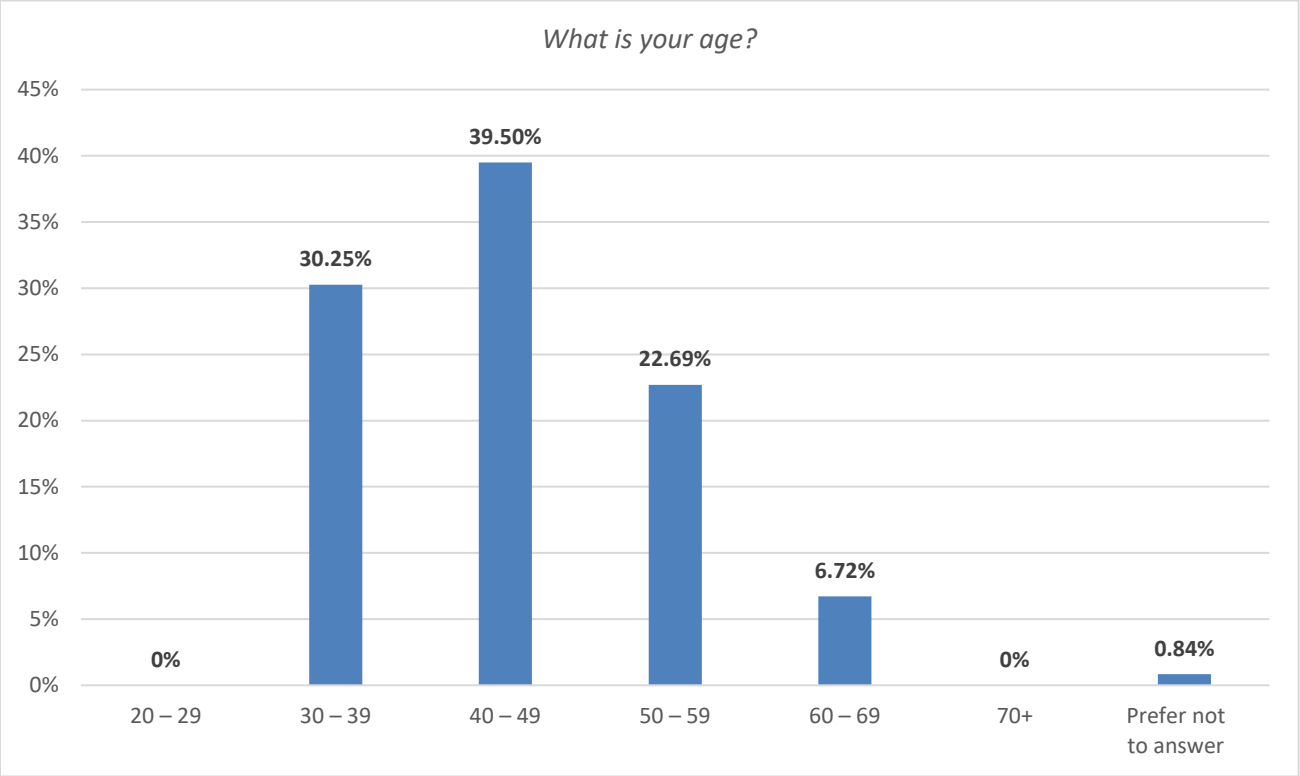
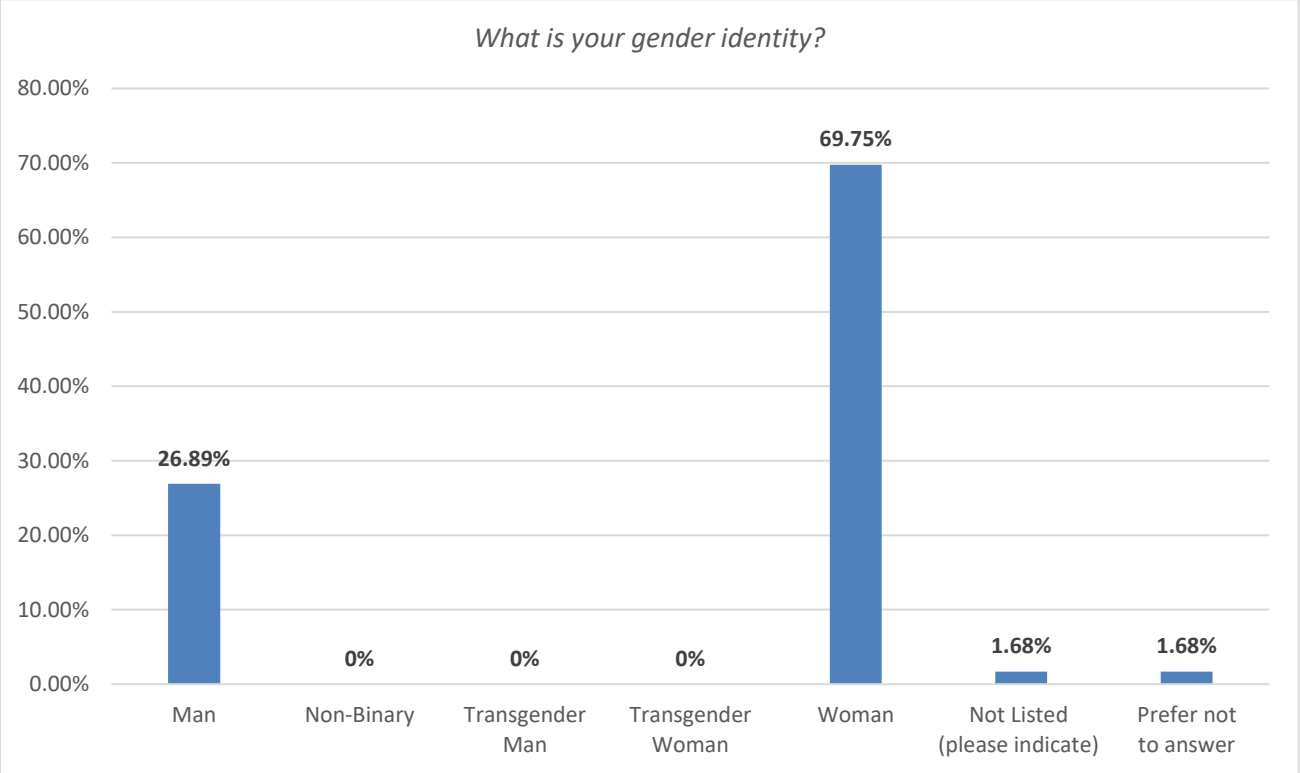


Figure 19. Demographic Question 18



KSA Ratings

Means and standard deviations for the KSA statements included on the survey are in Appendix D. 175 of the 190 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. Principles of Cancer Biology	67	59		8
2. Research Principles	8	8		
3. Tumor Behavior, Diagnostics & Prognostic Indicators	17	17		
4. Cancer Treatment Modalities	71	64	2	5
5. Management of Oncology Patients	27	27		
Total	**190**	**175**	**2**	**13**
Percentage		**92.11%**	**1.05%**	**6.84%**

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:

- Which of the following best describes the environment in which you have spent the majority of your practice?
- Which of the following best describes the environment in which you currently practice?

- What percent of your time at work do you devote to clinical work?
- What percent of your time at work do you devote to research?
- Including yourself, how many board-certified veterinary oncologists do you work with daily (on-site or virtually)?
- Does your employer/institution currently have an on-site ACVIM approved Oncology residency training program?
- How many ACVIM Oncology residents have you trained within the last 5 years?

Agreement coefficients for the task statements ranged from 0.84 to 0.97. 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 2.92 to 3.32. These means provide evidence that domains on the survey were adequately to well covered.

Table 2. *Mean, Standard Deviation & Frequency Distribution Percentage of KSA Content Coverage*

	Content Coverage						
			Frequency Percentage				
Domain	Mean	SD	0 = Very poorly	1 = Poorly	2 = Adequately	3 = Well	4 = Very well
1. Principles of Cancer Biology	3.16	0.79	0%	0%	23.53%	35.29%	38.66%
2. Research Principles	2.92	0.74	0%	0%	31.09%	43.70%	23.53%
3. Tumor Behavior, Diagnostics & Prognostic Indicators	3.32	0.71	0%	0%	14.29%	38.66%	45.38%
4. Cancer Treatment Modalities	3.23	0.69	0%	0%	14.29%	47.06%	36.97%
5. Management of Oncology Patients	3.32	0.70	0%	0%	12.61%	40.34%	43.70%

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 Oncology test content outline. The mean weights across all survey respondents are in Table 3.

Table 3. *Survey Respondents' Test Content Recommendations by Mean Percentages & Standard Deviations*

Domain	Mean	SD	Range	
			Min	Max
1. Principles of Cancer Biology	15.46	6.13	0	30
2. Research Principles	9.63	4.06	0	25
3. Tumor Behavior, Diagnostics & Prognostic Indicators	22.85	6.19	10	50
4. Cancer Treatment Modalities	25.00	4.62	15	40
5. Management of Oncology Patients	27.07	9.53	5	50

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 Oncology survey and test specifications.

DEVELOPMENT OF TEST SPECIFICATIONS FOR THE ONCOLOGY EXAMINATION

The Test Specifications meeting for the Oncology exam was conducted on June 12 & 13, 2023, in Philadelphia, PA. 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 Oncology 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 Oncology 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

- 174 of the 175 KSA statements that achieved mean ratings at or above 2.50 (pass category) were approved for exam inclusion by the Test Specifications Committee; 7 of those statements were modified
- 2 KSA statements achieved mean ratings between 2.40 and 2.49 (borderline category) and were approved for exam inclusion by the Committee; 1 of those statements was modified
- 7 of the 13 KSA statements that achieved mean ratings less than 2.40 (fail category) and were approved for exam inclusion by the Committee
- 1 additional Management of Oncology Patients KSA statement and 1 additional Cancer Treatment Modality KSA statement were added by the Committee

Table 4 contains the additional, modified, and removed statements.

Table 4. *Knowledge, Skill & Ability Statements Added to, Modified on, or Removed from the Test Specifications*

Domain	KSA	Rationale
Principles of Cancer Biology	~~Cite the normal number of chromosomes in dogs, cats, and humans~~	Failing rating, easily searchable & not important enough for inclusion
Principles of Cancer Biology	Define aneuploidy and its significance in cancer	Failing rating & not as frequently utilized, but foundational
Principles of Cancer Biology	~~Recognize karyotype abnormalities~~	Failing rating & infrequently utilized
Principles of Cancer Biology	Define microsatellite instability and its significance in cancer	Failing rating, but impact on the field is increasing & advancing
Principles of Cancer Biology	Explain CpG islands and their significance	Failing rating, more basic & obscure
Principles of Cancer Biology	Recognize extra-chromosomal elements and their impact on DNA and RNA expression (e.g., complimentary DNA, long non-coding RNA, RNA interference, silencing RNAs)	Failing rating & not used day-to-day, but very important & foundational
Principles of Cancer Biology	~~Interpret results of cell death assays~~	Failing rating; moved to example under Research Principles KSA statement below
Principles of Cancer Biology	~~Discuss relationship between mitochondrial function and neoplasia~~	Failing rating, too broad & covered by other KSAs within subdomain
Principles of Cancer Biology	Recognize types of carcinogens and mechanisms of carcinogenesis (including known specific tumor type risk factors)	Modified for clarity
Research Principles	Analyze ~~trial~~ study methods for biases, strengths and weaknesses in power, and statistical conclusions	Modified for clarity
Research Principles	Explain ~~diagnostic~~ test methodologies and analyze results, utility, and limitations (e.g., flow cytometry, PCR/RT-PCR, western blotting, next generation sequencing, cell death assays)	Modified for clarity & failing statement from Principles of Cancer Biology added as example
Tumor Behavior, Diagnostics & Prognostic Indicators	Describe the technology used ~~to create images~~ and interprit images in various modalities (e.g., CT, MRI, PET, radiographs, scintigraphy, ultrasound)	Modified for clarity
Cancer Treatment Modalities	~~Describe emerging intraoperative technologies to assess surgical margins (e.g., near-infrared fluorescence, optical coherence tomography)~~	Failing rating & emerging technology that is not yet well validated or understood how to apply to practice
Cancer Treatment Modalities	Explain mechanism of resistance for radiotherapy	Added based on content coverage comments
Cancer Treatment Modalities	List the ~~four~~ five Rs of radiation and their effect on treatment planning and outcome	Modified and examples added for clarity
Cancer Treatment Modalities	Assess the treatment plan (e.g., dose volume histogram, contouring, dose color wash) and explain implications on normal and tumor tissue, recurrence, and morbidity	Failing rating, but fundamental to everyday practice

Domain	KSA	Rationale
Cancer Treatment Modalities	Discuss the use of radiopharmaceuticals in cancer management (e.g., I-131 and Sm-153)	Borderline rating & limited applications, but fundamental to everyday practice
Cancer Treatment Modalities	Discuss mechanism, indications, ~~outcome,~~ and toxicity of electrochemotherapy for various tumor types	Borderline rating & not yet as widely accepted or used, but becoming increasingly more so
Cancer Treatment Modalities	Discuss mechanism, indications, outcome, and complications of intervention radiology procedures for various tumor types (e.g., embolization, ethanol ablation)	Failing rating, but increasing access & importance
Cancer Treatment Modalities	Discuss the advantages, disadvantages, indications, outcomes, and potential treatment of AEs of the following immunotherapeutic strategies:	Expanded for clarity
Cancer Treatment Modalities	~~Compare dose intensity across protocols~~	Too high-level & already covered under another KSA in the domain
Cancer Treatment Modalities	Discuss indications, risks, limitations, and outcomes for bone marrow transplant protocols	Failing ratings, but sub-domain (Bone Marrow Transplant) is in use & important to know about (despite its shortcomings)
Cancer Treatment Modalities	Describe the types of bone marrow transplant (e.g., allogeneic, autologous)	
Management of Oncology Patients	Discuss the mechanisms of action, indications, and toxicity of: … **f.** blood products	Added based on Committee discussion

*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 5 shows the test specifications recommendations including the percentage content. The complete test specifications are in Appendix I.

Table 5. *Test Content Weights Recommended by the Test Specifications Committee*

Domains	# of Statements	Weight
1. Principles of Cancer Biology	62	22%
2. Research Principles	8	10%
3. Tumor Behavior, Diagnostics & Prognostic Indicators	17	25%
4. Cancer Treatment Modalities	69	25%
5. Management of Oncology Patients	28	18%

SUMMARY & CONCLUSIONS

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