Test Development
Solutions

INTERNATIONAL BOARD
OF SPECIALTY CERTIFICATION
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ACKNOWLEDGEMENTS

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Randall	Matthew	Mercy Flight Inc.	Director of Medical Operations	Atoka, TN
Leitner	James	AirMed Regional - Greenville	Base Medical Manager	Elgin, SC
Gapinski	Ryan	Orlando Health Air Care Team	Flight Paramedic	Kissimmee, FL
McBrayer	Donnie	Carilion Clinic Life-Guard	Flight Paramedic	Lexington, VA
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Test Specifications Committee

Last	First	Organization	Title	Location
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Randall	Matthew	Mercy Flight Inc.	Director of Medical Operations	Atoka, TN
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The International Board of Specialty Certification (IBSC) requested a Job Analysis Study from Prometric for their Certified Flight Paramedic (FP-C) Exam.

A job analysis study is designed to obtain descriptive information about the tasks performed on a job and the knowledge needed to adequately perform those tasks. The purpose of this job analysis study was to:

➢ Validate the tasks and knowledge important for flight paramedics; and,
➢ Revise the test specifications for the FP-C Exam.

Conduct of the Job Analysis Study
The job analysis study consisted of several activities completed in collaboration with subject- matter experts: the creation and refinement of tasks and knowledge statements; the development of a survey; the dissemination of the survey; the compilation of survey results; and ultimately the development of test specifications. The successful completion of the job analysis study was made possible by the in-depth information provided by industry professionals.

Survey Development
Survey research is an effective way to identify the tasks and knowledge important for flight paramedics. The task and knowledge statements were split into domains based on distinctions in the industry. The task and knowledge statements included on the survey both covered the same ten domains of practice. The development of the survey was based on task statements created during the previous job analysis study conducted in 2015.

Survey Content
The survey, disseminated in April of 2020, consisted of five sections. IBSC distributed the survey to flight paramedics and other related healthcare professionals.

Survey Sections
Section 1: Background and General Information
Section 2: Tasks
Section 3: Knowledge
Section 4: Recommendations for Test Content
Section 5: Comments

Results

Survey Response
A total of 402 flight paramedics and related healthcare professionals submitted surveys sufficiently complete for data analysis. Based on the analysis of survey responses, a representative group completed the survey in appropriate numbers to meet the requirements for statistical analysis of the results. This is evidenced by the review of the responses for each of the background and general information questions, along with validation by a group of subject matter experts.

Survey Ratings
Participants were asked to rate the task and knowledge statements by importance for a flight paramedic using a five-point scale (0 = Of no importance to 4 = Very Important).

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

Test Specifications Development
In May 2020 a Test Specifications Committee was convened to review the results of the job analysis and to revise the test content outline that guides the FP-C Examination.

Summary
This study used a multi-method approach to identify the tasks and knowledge that are important to the competent performance of a flight paramedic. The job analysis process allowed for input from a representative group of industry professionals and was conducted within the guidelines of professionally sound practice. The results of the job analysis can be used by IBSC as a blueprint for the FP- C Examination.

RESULTS AT A GLANCE

WHO COMPLETED THE SURVEY
A total of 402 responses were used for analysis. The majority of respondents work as field providers.

TASK IMPORTANCE RATINGS
A total of 83 out of 83 task statements achieved high importance ratings for the overall group.

KNOWLEDGE IMPORTANCE RATINGS
130 out of 130 knowledge statements achieved high importance ratings for the overall group.

The International Board of Specialty Certification (IBSC) is a not-for-profit organization responsible for the administration and development of specialty certification exams for critical care professionals. The mission of the IBSC is to improve quality of care delivered in all aspects of specialty EMS care across a wide variety of applications by providing a portfolio of certification exams that are an objective, fair, and honest validation of specialty knowledge to paramedics and other allied health providers. Exams are developed that are responsive to the needs of the specialty paramedic community.

This report describes the job analysis study including the:

> ➢ Rationale for conducting the job analysis study;
> ➢ Methods used to define tasks and knowledge;
> ➢ Types of data analyses conducted and their results; and
> ➢ Results and finalization of the test specifications.

Job Analysis Study and 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 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 the purpose of developing credentialing examinations, a job analysis study should identify tasks, knowledge, skills, or abilities deemed important for flight paramedics.

The use of a job analysis study (also known as 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 the certification. Content validity refers to the extent to which the content covered by an examination is representative of the task and knowledge 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 who reflect the diversity within the profession. Diversity refers to regional or job context factors and to elements such as experience, gender, and race/ethnicity. Demonstration of content validity is accomplished through the judgments of subject-matter experts. 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[1] (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. Consequently, a testing program that adheres to *The Standards* is more likely to be judged as valid and defensible than one that does not.

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…" (p.181-182)

The job analysis study for the FP-C Examination was designed to follow the guidelines presented in *The Standards* and to adhere to accepted professional practice.

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

The job analysis study for the Certified Flight Paramedic (FP-C) Examination involved a multi- method approach that included meetings with subject-matter experts as well as a survey of the industry. This section of the report describes the activities conducted for the job analysis study.

First, experts identified the tasks and knowledge they believed were important to practice as a flight paramedic. Then, a survey was developed and disseminated to individuals within the field of flight paramedicine. The purpose of the survey was to obtain verification (or refutation) that the tasks and knowledge identified by the initial group of experts are important to the work of flight paramedics.

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 is most important is that a certification examination covers the important knowledge 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 2019, IBSC representatives and the Prometric staff responsible for the conduct of the job analysis held a planning meeting. 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 was comprised of a representative group of flight paramedics. In total, the committee consisted of nine subject-matter experts. A list of the Task Force Committee members appears in Appendix A1. The Task Force meeting was conducted on February 18th and 19th, 2020, in Baltimore, Maryland. The purpose of the meeting was to develop the survey content. Prometric staff facilitated the meeting.

Prometric staff provided a pre-meeting document for the Task Force that included the meeting agenda and what to expect during the meeting. This document is included in Appendix A2.

Activities conducted during the meeting included reviewing and, as needed, revising the major domains, tasks, and knowledge necessary for the competent performance as a flight paramedic. The draft list presented to the Task Force was developed using the results of the 2015 Job Analysis. Survey rating scales as well as background and general information questions were presented, discussed, and revised as needed.

Survey Construction

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

1. Safety and Transport
2. Flight Physiology
3. Airway, Anesthesia, and Analgesics
4. Medical Emergencies
5. Neurological
6. Cardiac
7. Trauma/Burn
8. Maternal Fetal and Neonatal
9. Pediatric
10. Professional Considerations

Survey Review by Task Force Committee

Each Task Force member received a copy of the draft survey for review. 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 via web conference on March 23, 2020, with the Task Force members. Refinements recommended by the Task Force were incorporated into the online survey in preparation for survey distribution.

Final Version of the Survey

The final version of the online surveys consisted of five sections: Section 1: Background and General Information; Section 2: Tasks; Section 3: Knowledge; Section 4: Recommendations for Test Content; and, Section 5: Write-in Comments.

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

In Section 2: Tasks, survey participants rated each task using the importance scale shown below.

Tasks
Importance: How important is this task to the role of a Flight Paramedic?
0 = Of no importance
1 = Of little importance
2 = Of moderate importance
3 = Important
4 = Very important

In Section 3: Knowledge, survey participants rated each knowledge statement using the importance scale shown below.

Knowledge
Importance: How important is this knowledge statement to the role of a Flight Paramedic?
0 = Of no importance
1 = Of little importance
2 = Of moderate importance
3 = Important
4 = Very important

Survey participants were asked to provide a rating measuring the representativeness of each knowledge and task domain. Respondents made their judgments using a five-point rating scale (1 = Very Poorly; 2 = Poorly; 3 = Adequately; 4 = Well; 5 = Very Well). Respondents could note any topics that were not covered within a specific domain in an open response field.

In Section 4: Recommendation for Test Content, survey participants indicated the content weights that the knowledge areas below should receive on the exam:

1. Safety and Transport
2. Flight Physiology
3. Airway, Anesthesia, and Analgesics
4. Medical Emergencies
5. Neurological
6. Cardiac
7. Trauma/Burn
8. Maternal Fetal and Neonatal
9. Pediatric
10. Professional Considerations

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

In Section 5: Write-In Comments, survey respondents were given the opportunity to answer the following open-ended questions: "What additional professional development and/or continuing education could you use to improve your performance in your current work role?" and "How do you expect your work role to change over the next 5 years? What tasks will be performed and what knowledge will be needed to meet changing practice demands?"

3. Dissemination of the Survey

Prometric provided a survey link to IBSC on March 27, 2020 for dissemination to paramedicine professionals.

4. Analysis of the Survey Data

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

Based on information obtained from the survey, data analyses by respondent subgroups (e.g., level of education) 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 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 task and content coverage ratings

➢ Means, standard deviations, and frequency (percentage) distributions for knowledge 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 and knowledge 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.

This criterion is consistent with the intent of content validity. Therefore, for this job analysis, Prometric recommended the value

Definition of Pass, Borderline and Fail Categories for Task and Knowledge Importance Mean Ratings	
	Means
Pass:	**At or above 2.50**
Borderline:	**2.40 to 2.49**
Fail:	**Less than 2.40**

of this criterion should be set at 2.50. Accordingly, the task and knowledge 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 from 2.40 to 2.49. The Borderline Category is included to provide a point of discussion for the Task Force 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*

Prometric staff facilitated a meeting to develop the test specifications based on the job analysis results on May 12th, 2020, remotely via web conference. The meetings focus:
   ➢ Finalizing the task statements for inclusion based on the survey results;
   ➢ Finalizing the knowledge that is important for inclusion based on the survey results;
   ➢ Establishing the percentage test content weights for each area on the examination; and,
   ➢ Validating the linkage between the task and knowledge.
These percentage test weights guide examination development activities.

Survey Responses

A total of 1,430 surveys were submitted. Of these submissions 1,028 were excluded from analysis due to insufficient response. The remaining 402 submissions were determined to be thorough enough (at least 55% complete) to be used for analysis.
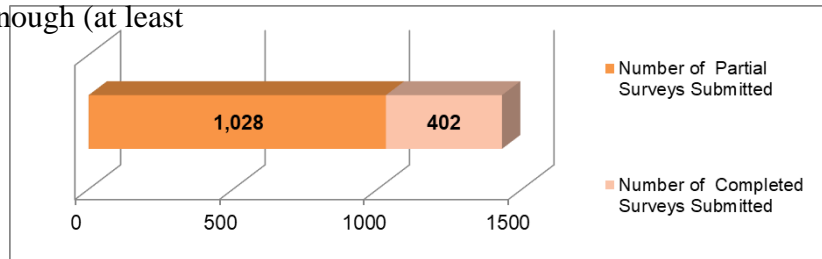
Based on the analysis of survey responses, a representative group of flight paramedics and related professionals completed the survey in sufficient numbers to meet the requirements to conduct statistical analysis. This was evidenced by the distribution of responses for each of the background information 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" options are provided in Appendices C2 through C5. The results in the figures below reflect the sample size used for analysis of 402.

Figure 1. *Demographic Question 1. In which of the following countries do you work as a flight paramedic?*
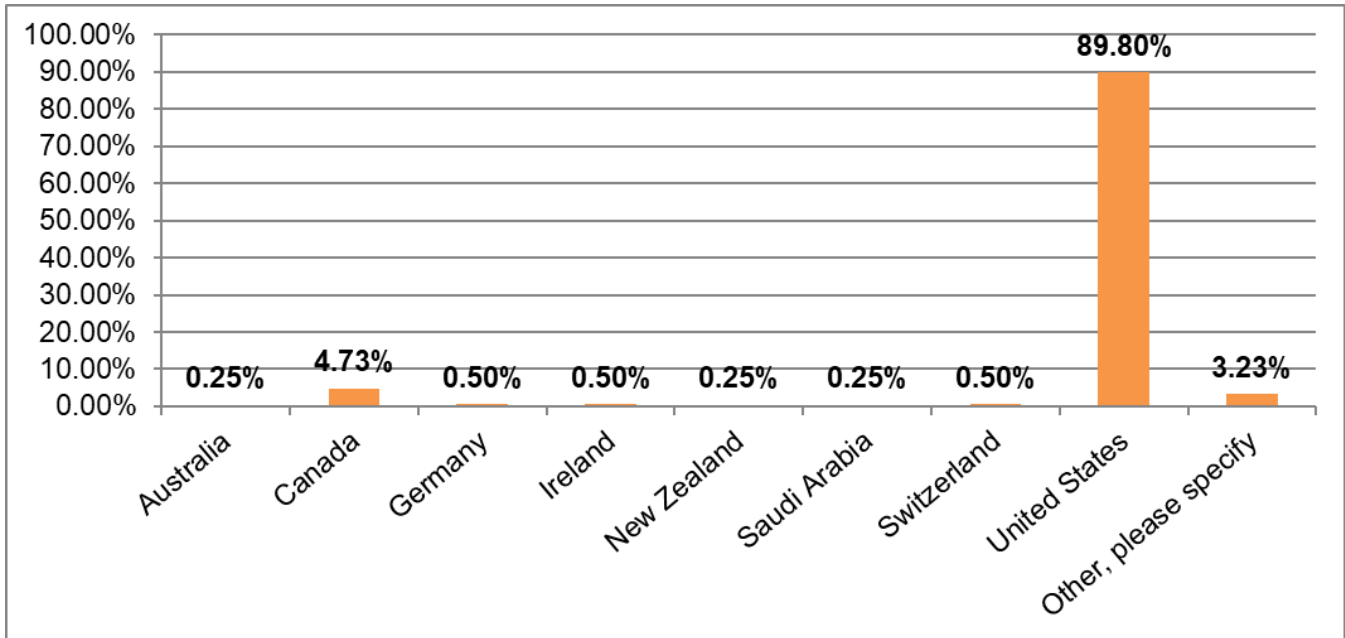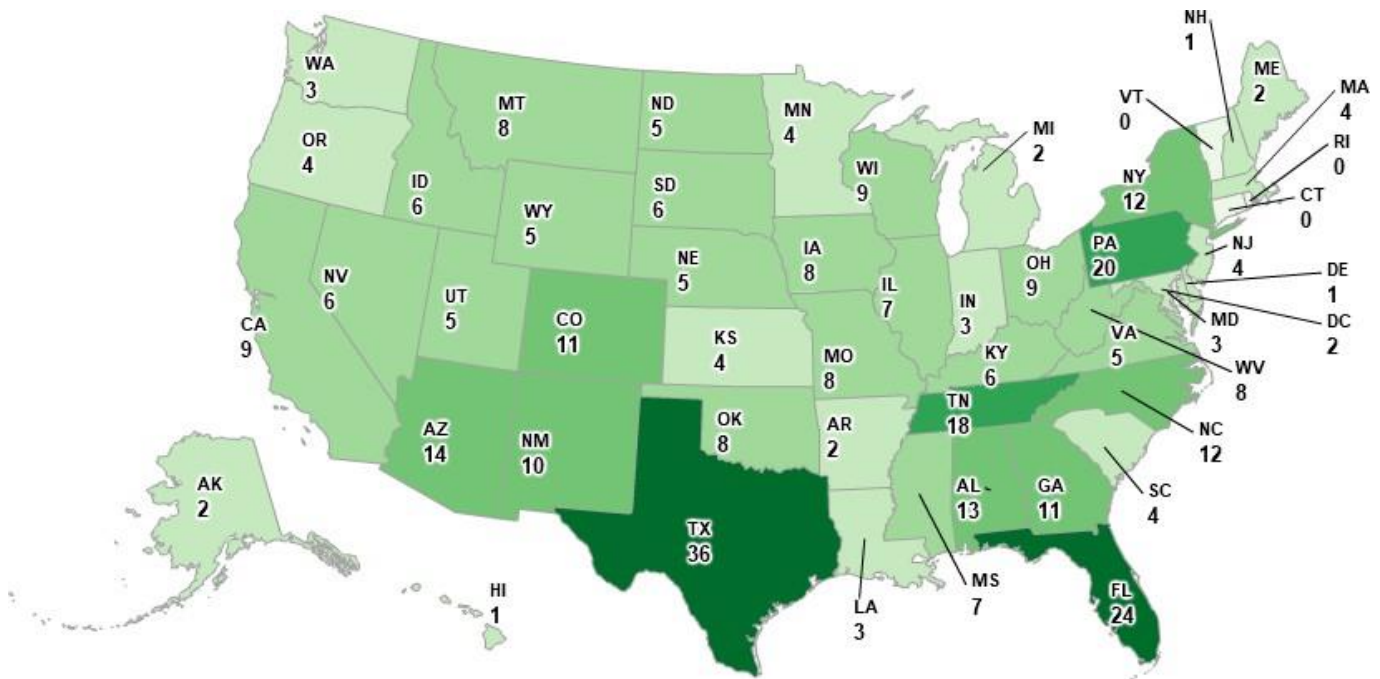

Figure 2. *Demographic Question 1b. In what area do you primarily practice as a flight paramedic?*

Task and Knowledge Overall Ratings

The following provides a summary of survey respondents' ratings of the task and knowledge statements. The survey respondents passed all of the 213 task and knowledge statements.

Tasks

Means and standard deviations for the tasks included on the survey are in Appendix D1. A total of 83 (100%) of the 83 tasks achieved high importance means. Table 1 shows the delineation of tasks in Pass, Borderline, and Fail categories by domain.

Table 1. *Tasks by Pass, Borderline, and Fail categories*

Domains	Number of Task Statements	Pass (Mean 2.50 or Above)	Borderline (Mean 2.40 to 2.49)	Fail (Mean Less than 2.40)
I. Safety and Transport	14	14	0	0
II. Flight Physiology	8	8	0	0
III. Airway, Anesthesia, and Analgesics	5	5	0	0
IV. Medical Emergencies	8	8	0	0
V. Neurological	7	7	0	0
VI. Cardiac	7	7	0	0
VII. Trauma/Burn	10	10	0	0
VIII. Maternal Fetal and Neonatal	14	14	0	0
IX. Pediatric	5	5	0	0
X. Professional Considerations	5	5	0	0
Total	**83**	**83**	**0**	**0**
Percentage		**100.00%**	**0.00%**	**0.00%**

Knowledge

Analysis of the knowledge statements included on the survey are in Appendix E1. A total of 130 (100%) of the 130 knowledge statements achieved high importance means. Table 2 shows the knowledge statements placed in Pass, Borderline, and Fail categories.

Table 2. *Knowledge Importance by Pass, Borderline, and Fail categories*

Domains	Number of Task Statements	Pass (Mean 2.50 or Above)	Borderline (Mean 2.40 to 2.49)	Fail (Mean Less than 2.40)
I. Safety and Transport	18	18	0	0
II. Flight Physiology	6	6	0	0
III. Airway, Anesthesia, and Analgesics	14	14	0	0
IV. Medical Emergencies	15	15	0	0
V. Neurological	12	12	0	0
VI. Cardiac	17	17	0	0
VII. Trauma/Burn	10	10	0	0
VIII. Maternal Fetal and Neonatal	18	18	0	0
IX. Pediatric	12	12	0	0
X. Professional Considerations	8	8	0	0
Total	**130**	**130**	**0**	**0**
Percentage		**100.00%**	**0.00%**	**0.00%**

Subgroup Analysis of Task and Knowledge Ratings

The index of agreement (IOA) is a measure of the extent to which subgroups of respondents agree on which tasks and knowledge are important. Using the mean importance ratings for tasks and knowledge, 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 more tailored to the purpose of a job analysis study 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 knowledge areas shows how to compute the index. If two groups passed the same 96 knowledge areas and failed the same 2 knowledge areas (out of the 100 total knowledge areas 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 additional mean analyses are required.

The index of agreement coefficients were produced on the following background questions:
- In which of the following countries do you work as a flight paramedic?
- In what area do you primarily practice as a flight paramedic?
- What is your primary role within your flight paramedicine program?
- How many years of experience do you have as a paramedic?
- How many years of experience do you have as a FLIGHT Paramedic?
- What is the highest level of formal education you have attained?
- On average, how many patients do you (individually) transport in a month?
- Which type of aircraft do you operate from?
- What is your race/ethnicity?
- What is your sex?
- What is your age?

The computed agreement coefficients for all tasks equaled 1.00. For the knowledge statements the agreement coefficients ranged from 0.98 to 1.00. Since all questions had an agreement coefficient greater than 0.80, no additional mean analysis was required.

Content Coverage Ratings

The survey participants indicated how well the statements within each of the task and knowledge 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 1=Very Poorly, 2=Poorly, 3=Adequately, 4=Well, and 5=Very Well. The means and standard deviations for the task and knowledge ratings are provided in Appendix G. For the task domains, the means ranged from 4.21 to 4.51 and for the knowledge domains means ranged from 4.27 to 4.56. These means provide evidence that both the tasks and knowledge statements were "well" to "very well" covered on the survey.

Survey respondents could write in tasks or knowledge that they believed should be included in the listing of important task and knowledge. See Appendix H 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 4: Recommendations for Test Content, participants were asked to assign a percentage weight to each knowledge 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 test content outline.

Write-In Comments

Many survey respondents provided responses to the open-ended questions in Section 5: Comments about expected changes in their job role over the next few years. See Appendix I for write-in comments.

DEVELOPMENT OF TEST SPECIFICATIONS FOR THE FP-C EXAMINATION

The test specification meeting for the FP-C Examination occurred May 12th 2020, via web conference. The steps involved in the development of test specifications included the following:

- Presentation of the job analysis project and results to the Test Specifications Committee;
- Identification of the task and knowledge statements to be included on the FP-C test specifications;
- Development of the test content weights for the exam; and,
- Validation of the linkage between task and knowledge statements.

Presentation of the Job Analysis Project and 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. This was followed by a presentation of the results of the study.

Identification of the Task, Knowledge, and Skill Statements to be Included on the FP-C Examination

The Test Specifications Committee reviewed the task and knowledge 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 Test Specification Committee members to make test content decisions. Recommendations were based on the following criteria:
- Mean task and knowledge ratings for all respondents;
- Frequency distribution of ratings for all respondents; and,
- Appropriateness of the content for the examination.

Tasks Recommended for Inclusion

- A total of 83 of the 83 tasks achieved mean ratings at or above 2.50 (Pass category) and all were included on the test specifications. None of the statements required modification from the survey.

Knowledge Recommended for Inclusion

➤ A total of 130 of the 130 knowledge statements achieved mean ratings at or above 2.50 (Pass category) and all statements were included on the test specifications without change.

The final version of the task and knowledge statements can be found in Appendix J.

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 knowledge 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.

Linkage of Task and Knowledge Statements

Task and knowledge linking verifies that each knowledge area included on an examination relates to the competent performance of important tasks. As such, linking supports the content validity of the task included in the test specifications. Linking does not require the production of an exhaustive listing; rather, task-knowledge links are developed to ensure that each knowledge is identified as being related to the performance of at least one, or in most cases several, important tasks.

Linking also provides guidance for item-writing activities. When item writers develop questions for specific knowledge areas, they have a listing of tasks that relate to the knowledge. This provides context for developing examination questions and assists the item writers in question design.

The job analysis study for IBSC identified task and knowledge statements that are important to the work performed by flight paramedics. Further, the data collected will guide the development of the test specifications used for the FP-C Examination.

The task and knowledge statements were developed through an iterative process involving the combined efforts of IBSC, subject-matter experts, and Prometric staff. These statements were made into a survey and disseminated to individuals in the flight paramedicine field for verification/refutation. The survey participants were asked to rate the importance of task and knowledge statements.

The results of the study supports the following:

➢ All of the task and knowledge statements that were verified as important through the survey provide the foundation of empirically derived information from which to develop test specifications for the FP-C Examination.

➢ Evidence was provided in this study that the comprehensiveness of the content within the task and knowledge domains was "well" to "very well" covered.

➢ The process utilized and all of the information that resulted from the analysis to develop the test specifications.

In summary, the study used a multi-method approach to identify the tasks and knowledge that are important to the work performed by flight paramedics. The results of the study were used to develop the test specifications for IBSC's FP-C Examination.