A Report on the Council on Certification of Nurse Anesthetists 2001 Professional Practice Analysis

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The purpose of this article is to report the results of the 2001 Professional Practice Analysis performed by the Council on Certification of Nurse Anesthetists. This analysis was used to validate the content and test specifications for the National Certification Examination. A total of 2,545 surveys were mailed to 2 groups of Certified Registered Nurse Anesthetists and 1,197 surveys were returned, a response rate of 47%. The first section of the survey gathered relevant demographic, educational, and experiential background. The second section gathered data concerning the frequency in which they encountered, and the level of expertise required to manage, patient conditions and surgical procedures. The results from this survey were consistent with previous surveys. The Rasch rating scale model was used to transform the results from ordinal data into a linear measure of the item frequency and importance. Members of the Council on Certification of Nurse Anesthetists carefully reviewed all the survey results and voted to maintain the current test specifications and percentages.

Key words: Certification examination, Professional Practice Analysis.

The purpose of this article is to present the results of the Council on Certification of Nurse Anesthetists (CCNA) Professional Practice Analysis (PPA) completed by the CCNA in 2002. The CCNA is charged with protecting and serving the public by assuring that individuals credentialed as Certified Registered Nurse Anesthetists (CRNAs) have met predetermined qualifications or standards for providing nurse anesthesia services.[1] To achieve this charge, the CCNA develops, maintains, and administers the entry-level certification examination that determines whether nurse anesthesia practitioners have attained minimum competencies for practice in the United States.

One of the key features of the examination process is to ensure that test content and specifications are formulated on the basis of current clinical practice. According to national testing standards, credentialing agencies should repeat their validation studies every 3 to 5 years.[2] The PPA is used to provide content validation for the National Certification Examination (NCE). For test construction purposes, the PPA orders the content items so they can be placed on a continuum that reflects the relative importance of the item. The results of the PPA are used to evaluate whether any changes are needed in the current NCE outline or test item banks. The CCNA has previously performed content validation studies in 1987, 1992, and 1996.[3]

Professional Practice Analysis development

The survey for the 2001 PPA was developed using the 1996 PPA as a base document. This was to ensure that a degree of comparability between the current survey and the one conducted in 1996 would be established. The 1996 survey instrument was reviewed by members of the CCNA during the summer of 2001 and modified to reflect current practice. The revised survey instrument was then reviewed by members of the Promissor psychometric staff. Promissor (Evanston, Ill), a psychometric services and testing agency specializing in computer-based solutions for testing and survey organizations worldwide, is used by the CCNA for the development, administration, and maintenance of the NCE. The survey included information related to demographics, practice setting, education, experiential background, and the frequency encountered and level of expertise required to manage a patient condition, procedure, process, or piece of equipment.

Professional Practice Analysis administration

The survey was mailed in the fall of 2001 to 2 groups of respondents—a practitioner group and a select group. The practitioner group included CRNAs in clinical practice during the last 2 years and their initial certification period. The select group included individuals who were either members of the American Association of Nurse Anesthetists (AANA) Board of Directors,

Council representatives, AANA committee members, or program directors. The mailing and follow-up actions were conducted by CCNA staff and followed the 4-step procedure of the 1996 survey. This consisted of an alert mailing, the survey mailing, a postcard thank you/reminder mailing, and a final mailing of the survey to all nonresponders. Responses to the survey were collected by the CCNA, and the data was then entered into an electronic file by Suburban Keypunch Service, Inc (Des Plaines, Ill) using a dual entry procedure. The accuracy of the data entry was verified by Promissor using a stratified random sample technique.

Results

Table 1 serves as a guide for data interpretation of the survey items. The complete results of the PPA are presented in Tables 2 through 9. The tables include a mean rating score and, where appropriate, a standard deviation and a Rasch calibration. The means reported in the tables are ordinal level data that are derived from the respondent raw score ratings. The Rasch rating scale calibrations are a log-linear transformation of the ordinal data into a linear, equal interval scale.[4] As such, they give a clearer picture of the importance of the relationship between various categories and subcategories. The Rasch rating scale calibrations also provide the basis for making a meaningful transformation to percentage of items on the test blueprint. A positive Rasch calibration indicates an item of relative high importance, while a negative Rasch calibration indicates the opposite. The results show a high degree of agreement between the practitioner and select groups in most areas surveyed, as indicated by the high correlations obtained in each section. The results of this survey are consistent with the results obtained in both the 1993 and 1996 surveys.

The PPA was mailed to 2,545 individuals. The overall response rate was 47% (1,197/2,545) lower than the response rate of 63.7% in the 1996 PPA. However, for this type and complexity of survey, the 47% response rate was considered good.

Description of respondents

The number of CRNAs in the practitioner and select groups and their respective response rates are provided in Table 2. The response rate, while down from previous years, provides a good foundation to validate the examination blueprint.

Table 3 presents the demographic, educational, and experiential background of the sample. The demographic material has highlighted some interesting similarities and differences between the select and practitioner groups. The differences can be attributed

Table 1. Data interpretation guide

Section 1	**Background information reported with mean percentage responses from the select and practitioner groups.**
Section 2-4	**Patient conditions, procedures, and anesthetic process: mean frequency, level of expertise, and Rasch rating scale calibrations for the select and practitioner groups.**
Frequency scale	**5: Daily**
	4: Weekly
	3: Monthly
	2: Rarely
	1: Never
Level of expertise scale	**5: Very high**
	4: High
	3: Moderate
	2: Low
	1: None
Section 5	**Equipment, instrumentation, and technology: mean frequency, level of expertise, and Rasch rating scale calibrations for the select and practitioner groups.**
Frequency scale	**4: For every case**
	3: For most cases
	2: For some cases
	1: Not available
Section 6	**Fundamental knowledge reported with relative importance and Rasch rating scale calibration.**
Relative importance scale	**5: Very high**
	4: High
	3: Moderate
	2: Low
	1: None

Table 2. Response rate

	Practitioner group	Select group
Surveys mailed	1,878	667
Responses	954	243
Response rate	50.8%	36.4%

Table 3. Demographics and educational and experiential background*

(continues on page 34)

	Practitioner group (%)	Select group (%)
1. Indicate your *primary* anesthesia practice setting:		
Hospital	34.5	32.8
Office/clinic	0.3	0.8
Freestanding clinic	0.9	1.3
University/college	2.7	9.2
Physician group	44.9	28.6
CRNA only group	2.8	3.8
Federal service	4.6	4.2
Independent contractor/ locum tenens	2.9	2.1
Independent contractor/ various arrangements	3.3	8.8
Solo/self-employed	0.1	8.4
2. How many anesthetics do you administer during an average week?		
0 to 5	1.1	11.6
6 to 10	6.5	13.8
11 to 15	18.8	21.8
16 to 20	30.8	23.7
21 to 25	22.5	17.7
26 to 30	2.0	6.4
More than 30	8.3	4.7
3. How many years have you been a Certified Registered Nurse Anesthetist?		
1	19.1	0.0
2	54.1	0.4
3 to 5	26.3	2.1
6 to 10	0.2	25.8
11 to 15	0.1	27.8
16 to 20	0.0	25.8
More than 20	0.2	18.1
4. How many years had you been in nursing before entering a nurse anesthesia program?		
1	4.6	14.3
2	16.9	13.4
3 to 5	32.4	31.1
6 to 10	27.1	26.1
11 to 15	11.4	9.2
More than 15	7.6	5.9
5. In which of the following hospital settings have you had previous nursing experience? Please check all that apply.		
Critical care	64.6	56.5
Medical intensive care unit	49.7	36.4
Surgical intensive care unit	65.0	56.1
Coronary intensive care unit	50.4	36.4
Pediatric intensive care unit	9.8	6.7
Neonatal intensive care unit	9.4	8.4
Recovery room	19.6	22.6
Operating room	11.1	22.6
Emergency room	28.5	28.0
Other	26.0	24.7
6. What is the highest degree you obtained preanesthesia?		
Diploma	0.1	16.5
Associate degree	0.2	4.5
Bachelor's degree	85.4	59.3
Master's degree	4.1	3.7
Doctoral degree	0.3	0.0
Other	9.9	16.0
7. What is the highest degree you obtained in anesthesia?		
Certificate	0.7	44.2
Bachelor's degree	0.0	4.5
Master's degree	98.6	50.8
Doctoral degree	0.1	0.4
Other	0.5	0.0
8. What is the highest degree you have obtained?		
Diploma	0.0	4.1
Associate degree	0.0	1.7
Bachelor's degree	0.6	22.3
Master's degree	98.7	59.9
Doctoral degree	0.5	9.5
Other	0.1	2.5
9. Please indicate your gender.		
Male	45.5	43.9
Female	54.5	56.1
10. Please indicate your race/ethnicity.		
Asian	3.2	0.8
African American	2.7	1.6
White	89.3	94.2
Hispanic	2.6	1.2
American Indian	0.3	0.4
Other	1.8	1.6
11. Which of the following best describes the community in which you primarily practice?		
Rural/small town	20.6	19.3
Suburban	29.6	29.2
Urban	49.6	51.0
12. Indicate what percentage of your work falls within the following responsibilities: (100% total)		
Education	6.4	15.8
Management/supervision	2.3	10.3
Research	0.3	0.4
Consultation	1.9	1.2
Biomedical maintenance/repair	0.4	0.3
Direct clinical patient care	85.2	69.4

Table 3. Demographics and educational and experiential background (continued from page 33)

	Practitioner group (%)	Select group (%)
13. Considering direct patient care, please check all the following practice areas that apply to your practice:		
General surgery	97.4	92.9
Pediatrics	84.8	76.7
Obstetrics	73.4	70.0
Plastic surgery	84.2	80.8
Orthopedic surgery	95.7	90.8
Pain management	26.6	33.8
Neurosurgery	72.6	60.8
Cardiovascular	55.6	47.5
Ophthalmology	84.4	82.5
Geriatric	91.4	89.2
Gynecologic surgery	93.0	89.2
14. Considering the time you devote to *direct patient care*, please estimate the percentage of time you spend in the following activities.		
Preoperative assessment	11.8	10.5
Intraoperative management	76.1	77.6
Postoperative evaluation	9.5	8.1
15. Please estimate the percentage of time you spend with patients in each of the age categories listed below. The percentages should add to 100%.		
Infants	4.5	3.9
Children	7.4	6.7
Adolescents	8.1	8.3
Adults	48.6	49.1
Elderly	28.4	29.0
16. Please indicate the percentage of your patients who fall into the following categories:		
Class I	16.7	19.1
Class II	36.9	43.0
Class III	31.5	32.2
Class IV	11.1	9.8
Class V	1.4	1.8
17. Please estimate your percentage of elective and emergent procedures.		
Elective	81.5	82.8
Emergent	15.6	14.3
18. Please estimate your percentage of inpatients and outpatients.		
Inpatients	38.8	33.9
Outpatients	58.6	63.1

*** CRNA indicates Certified Registered Nurse Anesthetist.**

to variations in the years of nurse anesthesia experience between the 2 groups and that more members of the select group have an academic affiliation. To see more PhDs and educational affiliations in the select group, and more physician group affiliations in the practitioner group is to be expected, and reflects the design of the sampling strategy. The majority of the select and practitioner groups were associated with either a physician group or hospital. More individuals in the select group were associated with a university or were independent contractors/self-employed than in the practitioner group. Again, this reflects the sampling strategy.

In general, practitioners perform more anesthetics per week than members of the select group. Practitioners tend to perform at least 11 or more anesthetics per week, whereas the number of anesthetics performed per week by members of the select group falls in the 0 to 20 range. This may reflect that the select group represents individuals with more varied responsibilities and less time devoted to clinical practice. These results are directly comparable to previous PPA results.

The 2001 PPA differs from the previous PPA surveys in that it asked for the number of years in nursing before entering a nurse anesthesia educational program and the number of years as a CRNA. Since this data was not reported in the past, no comparison can be made at this time. Interestingly, the number of years in nursing before entering a nurse anesthesia program was slightly higher for the practitioner group than for the select group (see Table 3).

The majority of both groups continue to identify previous critical care experience prior to entering a program. Next in frequency was recovery room experience followed by operating room experience. In the general area of critical care, medical intensive care unit, surgical intensive care unit, and coronary care unit were selected more often than pediatric intensive care unit and neonatal intensive care unit. The select group identified more experience in the operating room than the practitioner group did, with the other options being comparable.

The educational preparation of the respondents reflects the relatively recent Council on Accreditation entry-level anesthesia degree requirement of a master's degree.[5] In the practitioner group, 98.6% of the respondents hold a master's degree in anesthesia, whereas 50.8% of the select group hold one. Of interest, 44.2% of the select group respondents hold a certificate as their highest anesthesia degree. Doctoral degrees are held by 9.5% of the respondents in the select group compared to 0.5% in the practitioner group.

As Table 3 illustrates, the vast majority of both groups are white. The percentage of Asians, African Americans, and Hispanics has increased slightly since the 1996 survey for the practitioner group, while it has decreased slightly for the select group. The percentages of male and female respondents in both the practitioner and select groups are similar.

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Table 4. Fundamental knowledge

	Practitioner group			Select group		
	Mean	SD	Rasch	Mean	SD	Rasch
1. Consider the importance of 3 *components of your practice:* (1) the professional issues you encounter in your practice, (2) the responsibilities in your clinical practice, and (3) your knowledge of basic sciences. Please indicate the importance of each component relative to the other components.						
Professional issues	3.78	0.83	–2.51	3.99	0.90	–1.63
Anesthesia practice	4.81	0.43	2.68	4.80	0.45	1.98
Basic sciences	4.33	0.70	0.17	4.34	0.74	–0.34
2. Within the category of *professional issues*, what is the relative importance of knowledge in each of the following?						
Standards of practice	4.50	0.79	0.30	4.63	0.58	0.65
Legal	4.18	0.79	–0.75	4.26	0.76	–0.68
Quality improvement	3.82	0.85	–1.71	4.02	0.81	–1.35
Research	3.24	1.00	–2.97	3.28	1.00	–3.09
Safety	4.67	0.60	1.01	4.76	0.52	1.33
3. Within the category of *anesthesia practice*, what is the relative importance to your practice of knowledge in each of the following?						
Basic principles	4.73	0.49	1.35	4.74	0.48	1.23
Advanced principles	4.54	0.57	0.66	4.61	0.57	0.59
4. Listed below are the general categories of *basic sciences*. Please indicate the relative importance that knowledge of the topics in each category has in your practice.						
Anatomy, physiology, and pathophysiology	4.67	0.52	1.05	4.71	0.51	1.05
Chemistry, biochemistry, physics, and equipment	4.07	0.77	–1.03	4.04	0.81	–1.33
Pharmacology	4.84	0.39	2.07	4.80	0.41	1.60
5. Within the category of *anatomy, physiology, and pathophysiology*, what is the relative importance of the following systems?						
Respiratory	4.88	0.34	2.16	4.83	0.39	1.89
Cardiovascular	4.85	0.38	1.81	4.96	0.37	2.14
Nervous	4.35	0.70	–0.46	4.41	0.68	–0.15
Endocrine	3.93	0.81	–1.65	3.98	0.82	–1.44
Hepatic, renal, gastrointestinal, and genitourinary	4.06	0.78	–1.31	4.00	0.86	–1.35
6. Within the category of *chemistry, biochemistry, physics, and equipment*, what is the relative importance of the following sciences?						
Chemistry	3.91	0.87	–1.97	3.70	0.87	–2.05
Biochemistry	4.00	0.85	–1.49	3.99	0.86	–1.37
Physics	3.68	0.86	–2.27	3.63	0.88	–2.20
Equipment	4.41	0.70	–0.32	4.46	0.71	0.02
7. Within the category of *pharmacology*, what is the relative importance of the following categories?						
General principles	4.71	0.55	0.93	4.66	0.59	0.65
Inhalation anesthetics	4.82	0.42	1.61	4.74	0.53	1.16
Intravenous anesthetics	4.82	0.41	1.68	4.77	0.46	1.32
Local anesthetics	4.50	0.70	0.06	4.52	0.74	0.17
Muscle relaxants	4.74	0.52	1.08	4.66	0.61	0.72
Autonomic and cardiovascular drugs	4.70	0.52	0.92	4.60	0.61	0.47
Other	4.26	0.76	–0.06	3.00*	0.00	—

*** Only 1 individual from the select group rated this other field.**

Table 5. Ratings of patient conditions*

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	Practitioner group				Select group			
	Frequency		Level of experience		Frequency		Level of experience	
	Mean	Rasch	Mean	Rasch	Mean	Rasch	Mean	Rasch
Cardiovascular								
Dysrhythmias	3.75	1.06	3.90	0.42	3.80	1.35	4.01	0.56
Ischemic heart disease/angina	3.78	1.14	4.03	0.61	3.78	1.34	4.19	0.88
Myocardial infarction	3.25	0.47	4.05	0.62	3.09	0.42	4.14	0.73
Hypertension	4.77	3.16	4.12	0.79	4.72	3.34	4.17	0.75
Congestive heart failure	3.41	0.68	4.05	0.63	3.15	0.47	4.11	0.68
Endocarditis	2.13	−1.03	3.45	−0.26	1.97	−1.13	3.59	−0.12
Valvular heart disease	3.16	0.39	3.88	0.39	3.05	0.39	3.96	0.46
Cardiomyopathy	2.92	0.08	3.81	0.27	2.64	−0.12	3.86	0.31
Peripheral vascular disease	3.98	1.44	3.83	0.29	3.95	1.55	3.88	0.34
Congenital heart disease	3.52	−0.87	3.52	−0.15	2.14	−0.84	3.61	−0.04
Pacemaker	3.22	0.46	3.73	0.15	3.15	0.51	3.70	0.09
Electrophysiology	2.58	−0.36	3.55	−0.08	2.40	−0.50	3.54	−0.17
Respiratory								
Bronchitis	3.42	0.69	3.71	0.14	3.36	0.77	3.73	0.11
COPD/emphysema	4.09	1.64	4.02	0.64	3.98	1.62	3.99	0.53
Asthma	4.12	1.67	4.08	0.74	3.94	1.56	4.07	0.67
Pneumonia	2.90	0.06	3.61	−0.01	2.59	−0.18	3.63	0.00
Tuberculosis	1.95	−1.31	3.22	−0.48	1.93	−1.16	3.21	−0.48
Pulmonary embolism	1.97	−1.26	3.84	0.35	1.93	−1.16	3.83	0.22
Cor pulmonale	1.95	−1.31	3.58	−0.05	1.82	−1.34	3.62	−0.05
Pulmonary hypertension	2.40	−0.61	3.78	0.25	2.21	−0.75	3.82	0.22
Upper respiratory tract infection	3.37	0.64	3.66	0.07	3.47	0.89	3.72	0.09
Sarcoidosis	2.03	−1.18	3.18	−0.52	1.98	−1.09	3.26	−0.42
Adult respiratory distress syndrome	2.18	−0.93	3.73	0.16	2.05	−0.97	3.86	0.27
Sleep apnea	3.56	0.89	3.96	0.52	3.32	0.69	3.95	0.39
Epiglottits	1.63	−1.83	3.75	0.19	1.72	−1.52	4.03	0.49
Central nervous system								
Seizures	2.77	−0.11	3.62	0.02	2.70	−0.04	3.65	0.01
Cerebrovascular accident	3.22	0.46	3.73	0.17	3.04	0.39	3.72	0.14
Hydrocephalus	2.05	−1.14	3.35	−0.34	1.95	−1.10	3.44	−0.25
Parkinson disease	2.60	−0.33	3.36	−0.31	2.65	−0.10	3.41	−0.26
Multiple sclerosis	2.24	−0.85	3.42	−0.25	2.19	−0.76	3.44	−0.23
Myasthenia gravis	2.01	−1.21	3.44	−0.22	1.96	−1.11	3.61	−0.03
Alzheimer disease/dementia	2.98	0.16	3.33	−0.34	3.00	0.33	3.34	−0.33
Huntington chorea	1.48	2.09	2.88	−0.82	1.50	−1.87	3.03	−0.68
Demyelinating disease	1.87	−1.44	3.22	−0.46	1.93	−1.18	3.33	−0.40
Intracranial hypertension	2.25	−0.82	3.76	0.23	2.22	−0.70	3.85	0.25
Intracranial tumor	2.44	−0.55	3.79	0.28	2.34	−0.54	3.83	0.25
Intracranial aneurysm	2.23	−0.86	3.88	0.40	2.14	−0.83	4.01	0.52

Table 5. Ratings of patient conditions*

	Practitioner group				Select group			
	Frequency		Level of experience		Frequency		Level of experience	
	Mean	Rasch	Mean	Rasch	Mean	Rasch	Mean	Rasch
Autonomic hyperreflexia	1.88	−1.41	3.59	−0.02	1.98	−1.07	3.69	0.06
Neuropathy/myophathy	2.69	−0.22	3.39	−0.28	2.62	−0.17	3.45	−0.22
Coma	1.80	−1.55	3.24	−0.48	1.93	−1.16	3.37	−0.34
Psychiatric disorders	3.06	0.26	3.25	−0.43	3.09	0.43	3.30	−0.37
Musculoskeletal								
Fractures	4.19	1.78	3.79	0.28	3.81	1.35	3.66	0.03
Rheumatoid arthritis	3.57	0.90	3.64	0.06	3.52	0.97	3.70	0.07
Spinal cord injury	2.34	−0.69	3.70	0.15	2.23	−0.70	3.87	0.27
Lupus erythematosus	2.18	−0.93	3.22	−0.47	2.15	−0.81	3.31	−0.37
Muscular dystrophy	2.01	−1.20	3.29	−0.38	1.99	−1.07	3.43	−0.27
Scoliosis	2.55	−0.40	3.27	−0.40	2.50	−0.33	3.34	−0.35
Endocrine								
Diabetes mellitus	4.51	2.42	4.11	0.77	4.35	2.17	4.08	0.56
Diabetes insipidus	2.20	−0.92	3.54	−0.10	2.05	−1.00	3.46	−0.29
Hypothyroid/hyperthyroid	3.84	1.24	3.64	0.03	3.52	0.93	3.58	−0.12
Cushing disease	2.13	−1.01	3.29	−0.39	2.05	−1.00	3.32	−0.40
Addison disease	2.06	−1.14	3.28	−0.41	1.98	−1.11	3.32	−0.40
Pituitary dysfunction	2.04	−1.17	3.24	−0.45	1.94	−1.17	3.35	−0.38
Parathyroid dysfunction	2.27	−0.84	3.31	−0.44	2.16	−0.85	3.32	−0.42
Pheochromocytoma	1.65	−1.85	3.71	0.07	1.69	−1.59	3.85	0.18
Insulinoma	1.52	−2.00	3.27	−0.47	1.54	−1.88	3.34	−0.49
Acromegaly	1.62	−1.89	3.09	−0.65	1.63	−1.69	3.23	−0.56
Hypoaldosteronism/Hyperaldosteronism	1.69	−1.78	3.14	−0.60	1.69	−1.62	3.22	−0.57
Hepatic								
Hepatitis	3.01	0.20	3.64	0.02	2.90	0.16	3.71	−0.02
Cirrhosis	2.82	−0.05	3.62	−0.01	2.76	−0.04	3.66	−0.09
Hepatic failure	2.25	−0.83	3.65	0.03	2.09	−0.94	3.71	−0.04
Porphyria	1.65	−1.82	3.29	−0.45	1.58	−1.78	3.45	−0.33
Renal								
Kidney stones	3.62	0.95	3.52	−0.11	3.41	0.80	3.48	−0.21
Acute renal failure	3.05	0.23	3.92	0.46	2.71	−0.09	3.88	0.27
Chronic renal failure	3.57	0.88	3.96	0.53	3.43	0.82	3.93	0.37
Uremia	2.56	−0.39	3.37	−0.31	2.37	−0.55	3.50	−0.20
Nephritis	2.41	−0.61	3.27	−0.41	2.29	−0.65	3.38	−0.33
Hematologic								
Anemia	3.80	1.80	3.69	0.10	3.66	1.00	3.57	−0.15
Sickle cell/hemoglobinopathies	2.83	−0.04	3.57	−0.07	2.74	−0.09	3.61	−0.11
Polycythemia	2.22	−0.89	3.29	−0.39	2.28	−0.67	3.39	−0.35
AIDS/HIV	2.36	−0.66	3.48	−0.15	2.42	−0.47	3.68	−0.03

Table 5. Ratings of patient conditions*

	Practitioner group				Select group			
	Frequency		Level of experience		Frequency		Level of experience	
	Mean	Rasch	Mean	Rasch	Mean	Rasch	Mean	Rasch
Platelet disorders	2.67	–0.24	3.62	0.02	2.55	–0.29	3.66	–0.05
Hemophilia	1.95	–1.30	3.43	–0.24	1.93	–1.19	3.55	–0.22
von Willebrand disease	1.90	–1.38	3.44	–0.22	1.97	–1.12	3.52	–0.23
Disseminated intravascular coagulation	2.01	–1.20	3.86	0.35	2.01	–1.07	3.94	0.29
Gastrointestinal								
Ulcer disease	3.50	0.79	3.47	–0.20	3.32	0.66	3.41	–0.35
Ulcerative colitis	2.90	0.04	3.30	–0.40	2.82	0.05	3.30	–0.47
Diaphragmatic hernia	2.20	–0.91	3.49	–0.19	2.14	–0.87	3.62	–0.13
Hiatal hernia/gastric reflux	3.81	1.22	3.74	0.16	3.79	1.23	3.79	0.05
Gastroesophageal reflux disease	4.50	2.41	3.98	0.54	4.27	1.95	3.91	0.25
Gallstones/gallbladder disease	4.09	1.62	3.70	0.08	3.82	1.27	3.49	–0.28
Pancreatitis	2.64	–0.28	3.51	–0.18	2.46	–0.40	3.59	–0.26
Splenic disorders	2.26	–0.82	3.29	–0.45	2.14	–0.87	3.33	–0.52
Morbid obesity	4.18	1.75	4.10	0.75	3.97	1.50	4.23	0.95
Carcinoid syndrome	2.04	–1.18	3.24	–0.43	2.09	–0.96	3.39	–0.39
Pyloric stenosis	1.98	–1.26	3.37	–0.31	1.94	–1.17	3.46	–0.24
Bowel obstruction	3.19	0.42	3.75	0.22	2.96	0.23	3.71	0.05
Gastrointestinal Bleed	2.78	–0.10	3.69	0.12	2.50	–0.36	3.69	0.03
Other conditions								
Laboratory tests:								
Electrolytes	4.81	3.42	4.17	0.92	4.57	2.65	4.05	0.54
Lipids	3.37	0.63	3.45	–0.20	3.32	0.63	3.37	–0.35
Calcium	3.99	1.46	3.86	0.39	3.70	1.12	3.74	0.09
Coagulation profile	4.50	2.40	4.16	0.91	4.09	1.71	4.05	0.56
Blood glucose	4.72	3.07	4.10	0.75	4.46	2.35	3.96	0.36
DIC panel	2.45	–0.53	3.68	0.07	2.53	–0.34	3.71	0.03
INR	4.30	1.98	3.97	0.56	3.78	1.22	3.78	0.07
Urinalysis	3.98	1.44	3.42	–0.25	3.88	1.36	3.38	–0.32
Renal function studies	3.88	1.30	3.79	0.26	3.60	0.97	3.71	0.07
Endocrine function studies	2.98	0.16	3.45	–0.21	2.88	0.12	3.54	–0.15
Arterial blood gases	3.72	1.09	4.25	1.07	3.36	0.72	4.12	0.55
Liver function studies	3.41	0.68	3.70	0.10	3.33	0.69	3.74	0.04
Hemoglobin/hematocrit	4.85	3.61	4.20	0.97	4.69	3.01	4.03	0.41
Cancer	3.69	0.99	3.49	–0.20	3.57	0.98	3.54	–0.19
Glaucoma	3.17	0.37	3.22	–0.53	2.99	0.31	3.27	–0.39
Hypothermia	2.76	–0.15	3.63	–0.07	2.76	0.03	3.72	0.08
Malignant hyperthermia	1.39	–2.26	4.18	0.94	1.56	–1.77	4.39	1.21
Major trauma	2.47	–0.53	4.03	0.56	2.47	–0.35	4.14	0.73
Shock	2.43	–0.58	4.06	0.66	2.46	–0.38	4.17	0.82
Prematurity	1.94	–1.40	3.49	–0.34	2.09	–0.99	3.77	0.03

Table 5. Ratings of patient conditions*

	Practitioner group				Select group			
	Frequency		Level of experience		Frequency		Level of experience	
	Mean	Rasch	Mean	Rasch	Mean	Rasch	Mean	Rasch
Substance abuse:								
Tobacco	4.52	2.41	3.84	0.27	4.46	2.49	3.72	0.10
Alcohol	3.78	1.14	3.74	0.11	3.86	1.43	3.67	0.04
Other	3.21	–0.09	3.60	0.03	3.39	0.18	3.67	–0.60
Airway difficulties	3.38	0.61	4.52	1.45	3.44	0.86	4.67	1.96
Congenital anomalies	2.13	–1.08	3.41	–0.40	2.12	–0.90	3.63	–0.17
Pregnancy	3.28	0.51	3.80	0.17	3.09	0.36	3.84	0.11
Vaginal birth after cesarean section	2.56	–0.40	3.56	–0.16	2.65	–0.23	3.73	–0.08
High risk pregnancy	2.44	–0.58	3.72	0.03	2.41	–0.54	3.95	0.16
Sepsis	2.68	–0.30	3.86	0.22	2.51	–0.34	3.93	0.35
Chest x-ray	4.00	1.43	3.53	–0.15	3.81	1.38	3.64	0.01
Pulmonary function tests	3.04	0.22	3.61	–0.05	3.07	0.42	3.72	0.10
Echocardiogram	3.57	0.88	3.73	0.13	3.41	0.84	3.69	0.06
Cardiac catheterization	3.14	0.32	3.60	–0.06	2.88	0.19	3.66	–0.08
CAT/MRI scan	3.03	0.20	3.24	–0.45	2.95	0.24	3.26	–0.45
Electrocardiogram	4.53	2.41	4.05	0.61	4.45	2.38	4.03	0.46
Arteriogram/vessel studies	2.92	0.07	3.22	–0.51	2.82	0.11	3.29	–0.41
Thallium scan	2.61	–0.35	3.12	–0.63	2.58	–0.20	3.24	–0.46
Immunosuppression	2.49	–0.50	3.28	–0.44	2.42	–0.43	3.39	–0.29
Latex allergy	2.89	0.04	3.82	0.26	2.84	0.14	3.96	0.49
Herbal medications or neutraceuticals	3.33	0.57	3.30	0.42	3.59	1.05	3.58	0.04

* COPD indicates chronic obstructive pulmonary disease; AIDS, acquired immune deficiency syndrome; HIV, human immunodeficiency virus; DIC, disseminated intravascular coagulation; INR, international normalized ratio; CAT, computed axial tomography; MRI, magnetic resonance imaging.

Table 6. Ratings of procedures*

(page 1 of 3)

	Practitioner group				Select group			
	Frequency		Level of experience		Frequency		Level of experience	
	Mean	Rasch	Mean	Rasch	Mean	Rasch	Mean	Rasch
Intra-abdominal								
Gallbladder	4.15	1.59	3.88	0.42	3.80	1.39	3.67	0.18
Liver	2.52	–0.32	3.72	0.20	2.39	–0.25	3.80	0.31
Pancreas	2.32	–0.52	3.53	–0.01	2.20	–0.45	3.65	0.17
Spleen	2.39	–0.45	3.54	0.00	2.23	–0.41	3.62	0.13
Stomach	3.16	0.36	3.64	0.12	2.85	0.27	3.60	0.10
Renal	3.17	0.37	3.80	0.32	2.98	0.40	3.75	0.29
Diaphragm	2.20	–0.64	3.50	–0.05	2.17	–0.47	3.69	0.18
Intestine	3.87	1.19	3.85	0.37	3.55	1.07	3.76	0.27
Herniorrhaphy	4.09	1.50	3.71	0.19	3.79	1.37	3.57	0.07
Bladder	3.66	0.90	3.68	0.14	3.42	0.92	3.55	0.05
Abdominal/gynecological	4.12	1.53	3.86	0.37	3.80	1.37	3.70	0.20
Prostatectomy	3.27	0.47	3.81	0.30	2.98	0.41	3.69	0.18
Laparoscopy	4.38	1.92	4.00	0.48	4.08	1.79	3.84	0.35
Vertical banded gastroplasty	1.95	–0.95	3.03	–0.58	1.80	–0.97	3.10	0.43
Genital								
Penis/testis	3.07	0.25	3.42	–0.11	3.02	0.46	3.43	–0.09
Transurethral resection	3.42	0.64	3.76	0.28	3.17	0.62	3.67	0.15
Cystoscopy	3.81	1.10	3.67	0.16	3.46	0.96	3.47	–0.04
Dilatation and curettage	3.73	1.00	3.69	0.16	3.52	1.01	3.60	0.06
Hysterectomy	3.80	1.10	3.78	0.29	3.51	1.00	3.69	0.19
Hysteroscopy	3.67	0.91	3.68	0.16	3.37	0.85	3.59	0.06
Extrathoracic								
Breast biopsy	3.90	1.25	3.66	0.16	3.70	1.27	3.55	0.05
Mastectomy	3.45	0.68	3.72	0.23	3.27	0.74	3.69	0.20
Plastic and/or reconstructive	3.40	0.63	3.66	0.16	3.25	0.70	3.64	0.13
Intrathoracic								
Heart	2.25	–0.61	3.79	0.15	1.89	–0.82	3.81	0.13
Thoracoscopy	2.76	–0.09	4.01	0.53	2.42	–0.20	3.94	0.40
Thoracotomy	2.76	–0.10	4.06	0.62	2.48	–0.13	4.07	0.56
Open lung biopsy	2.62	–0.25	3.97	0.42	2.39	–0.23	3.97	0.42
Mediastinoscopy	2.53	–0.33	3.92	0.40	2.30	–0.34	3.86	0.29
Diaphragm	2.08	–0.81	3.62	0.02	1.98	–0.70	3.71	0.05
Esophagus	2.32	–0.55	3.68	0.10	2.13	–0.52	3.77	0.21
Thoracoabdominal	2.29	–0.59	3.77	0.20	2.10	–0.56	3.85	0.26
Thymus	1.75	–1.21	3.27	–0.37	1.61	–1.22	3.45	–0.19
Head								
Cranioplasty	2.14	–0.74	3.37	–0.28	1.84	–0.92	3.33	–0.26
Rhizotomy	1.91	–1.02	3.12	–0.53	1.77	–1.04	3.11	–0.47
Ear	3.09	0.19	3.48	–0.15	2.86	0.24	3.47	–0.09
Eye	3.42	0.54	3.57	–0.07	3.39	0.81	3.61	0.04
Face	3.25	0.37	3.51	–0.12	3.17	0.57	3.54	0.00
Nose	3.37	0.49	3.54	–0.09	3.24	0.65	3.54	0.00

Table 6. Ratings of procedures*

	Practitioner group				Select group			
	Frequency		Level of experience		Frequency		Level of experience	
	Mean	Rasch	Mean	Rasch	Mean	Rasch	Mean	Rasch
Decompression burr holes	2.39	−0.50	3.59	−0.06	2.14	−0.54	3.59	−0.04
Space occupying lesion	2.39	−0.49	3.74	0.11	2.21	−0.45	3.81	0.15
Vascular	2.33	−0.57	3.77	0.11	2.13	−0.58	3.87	0.19
Transsphenoidal hypophysectomy	1.86	−1.08	3.51	−0.15	1.76	−1.04	3.65	−0.06
Transorbital approach	1.64	−1.29	3.29	−0.40	1.46	−1.45	3.42	−0.29
Stereotactic procedures	2.02	−0.89	3.36	0.32	1.82	−0.95	3.43	−0.28
Esophagoscopy/gastroscopy	2.96	0.06	3.52	−0.13	2.84	0.23	3.59	−0.02
Bronchoscopy	2.94	0.05	3.68	0.03	2.68	0.05	3.65	0.00
Fractures	2.94	0.05	3.58	−0.10	2.81	0.16	3.64	−0.02
Reconstructive	2.75	−0.16	3.48	−0.17	2.53	−0.14	3.54	−0.06
Tonsillectomy and adenoidectomy	3.49	0.61	3.80	0.17	3.25	0.66	3.83	0.27
Orthodontic/dental	2.90	0.00	3.47	−0.18	2.85	0.20	3.59	0.01
Pharynx	2.64	−0.26	3.49	−0.15	2.65	0.00	3.66	0.06
Reconstructive/plastic surgery	2.85	0.08	3.49	−0.14	2.81	0.17	3.48	−0.11
Neck								
Rigid laryngoscopy	2.78	−0.11	3.68	0.06	2.64	−0.04	3.71	0.04
Larynx/trachea	2.70	−0.18	3.76	0.18	2.59	0.05	3.93	0.39
Parathyroid/thyroid	2.91	0.04	3.67	0.07	2.64	0.00	3.74	0.17
Radical neck	2.28	−0.59	3.64	0.03	2.11	−0.58	3.79	0.18
Cervical spine (anterior and posterior approach)	2.97	0.10	3.78	0.20	2.61	−0.06	3.83	0.22
Node biopsies	3.09	0.20	3.45	−0.16	2.91	0.29	3.42	−0.14
Neck tumors	2.57	−0.32	3.51	−0.10	2.47	−0.17	3.59	0.02
Plastic procedures	2.72	−0.18	3.41	−0.22	2.72	0.10	3.46	−0.14
Extremities								
Lower	4.16	1.61	3.80	0.23	3.84	1.40	3.69	0.13
Upper	4.07	1.36	3.80	0.23	3.73	1.23	3.68	0.10
Total joint replacements	3.82	1.14	3.86	0.29	3.37	0.80	3.78	0.19
Vein stripping	2.70	−0.16	3.31	−0.32	2.56	−0.09	3.29	−0.28
Hemipelvectomy	1.74	−1.22	3.09	−0.54	1.56	−1.30	3.35	−0.29
Neuroskeletal								
Laminectomy	3.41	0.57	3.76	0.17	3.07	0.45	3.68	0.06
Cervical fusion	3.12	0.26	3.78	0.20	2.75	0.09	3.72	0.10
Fusions (posterior approach)	3.13	0.27	3.72	0.12	2.78	0.13	3.67	0.04
Spinal cord procedures	2.45	−0.42	3.59	−0.02	2.22	−0.47	3.66	0.01
Surgical sympathectomy	1.84	−1.09	3.24	−0.37	1.69	−1.11	3.22	−0.39
Vascular								
Carotid	2.99	0.12	4.07	0.59	2.75	0.10	4.10	0.51
Thoracic	2.49	−0.39	2.49	0.35	2.32	−0.37	3.99	0.37
Abdominal	2.86	−0.01	4.00	0.48	2.67	0.04	3.99	0.37
Upper extremity	3.19	0.31	3.70	0.10	2.71	0.05	3.61	−0.02
Lower extremity	3.17	0.29	3.71	0.11	2.74	0.08	3.66	0.02
Portosystemic shunts	2.34	−0.55	3.43	−0.22	1.82	−0.97	3.56	−0.13

Table 6. Ratings of procedures*

	Practitioner group				Select group			
	Frequency		Level of experience		Frequency		Level of experience	
	Mean	Rasch	Mean	Rasch	Mean	Rasch	Mean	Rasch
Renal artery	2.04	–0.88	3.43	–0.21	1.82	–0.98	3.60	–0.10
Aortic stents	1.85	–1.10	3.40	–0.24	1.78	–1.05	3.59	–0.14
Venacaval filter	1.99	–0.93	3.29	–0.35	1.88	–0.89	3.41	–0.25
Obstetrics								
Cesarean section	3.21	0.35	3.86	0.23	3.02	0.34	3.94	0.26
Vaginal delivery	2.63	–0.24	3.39	–0.29	2.60	–0.10	3.55	–0.17
Labor epidurals	2.81	–0.06	3.64	–0.04	2.78	0.09	3.79	0.00
Intrathecals	2.87	–0.01	3.76	–0.02	2.57	–0.15	3.70	–0.09
Postpartum tubal ligation	2.97	0.10	3.55	–0.10	2.81	0.13	3.58	–0.07
Nonobstetric surgery in the paturient	2.30	–0.58	3.76	0.13	2.22	–0.53	3.98	0.26
Diagnostic/therapeutic								
Venous/arterial catheterization	3.16	0.25	3.61	–0.10	3.02	0.35	3.56	–0.20
Cardioversion	2.72	–0.16	3.61	–0.05	2.55	–0.15	3.52	–0.15
CAT scan	2.18	–0.72	3.12	–0.53	2.14	–0.61	3.15	–0.50
MRI	2.22	–0.68	3.17	–0.48	2.13	–0.62	3.20	–0.44
Electroconvulsive therapy	1.95	–0.98	3.08	–0.57	2.08	–0.66	3.09	–0.55
Echocardiography	2.14	–0.78	3.06	–0.60	1.74	–1.13	2.98	–0.71
Electrophysiology	2.20	–0.69	3.24	–0.41	1.92	–0.89	3.23	–0.47
Pain management	2.19	–0.71	3.10	–0.56	2.35	–0.34	3.37	–0.31
Steroid therapy	2.03	–0.89	2.91	–0.69	1.95	–0.82	3.00	–0.67
Radiation therapy	1.61	–1.41	2.61	–0.93	1.49	–1.48	2.64	–0.89
Endoscopy	2.65	–0.25	3.20	–0.44	2.53	–0.17	3.28	–0.37
Other								
Trauma	2.64	–0.25	3.92	0.20	2.55	–0.13	4.09	0.27
Burns	1.70	–1.29	3.45	–0.32	1.77	–1.03	3.65	–0.26
ACLS	2.52	–0.39	4.16	0.70	2.37	–0.37	4.11	0.28
Pacemakers	2.89	–0.02	3.70	–0.06	2.54	–0.16	3.60	–0.21
Lithotripsy	2.55	–0.35	3.29	–0.44	2.26	–0.45	3.27	–0.48
Organ transplants	1.58	–1.47	3.23	–0.42	1.46	–1.54	3.27	–0.53
Positioning:								
Prone	3.83	1.02	4.13	0.65	3.58	1.01	4.02	0.47
Supine	4.89	3.24	3.98	0.46	4.75	3.08	3.84	0.26
Lithotomy	4.41	1.99	4.04	0.54	4.21	1.88	3.92	0.33
Lateral	3.91	1.27	4.05	0.56	3.61	1.04	3.89	0.32
Sitting	2.88	0.00	3.92	0.38	2.57	–0.12	3.90	0.27
Beach chair	3.19	0.30	3.92	0.36	3.12	0.48	3.88	0.29
Trendelenburg	4.34	1.77	3.98	0.44	4.12	1.73	3.86	0.29
Reverse Trendelenburg	4.28	1.66	3.95	0.41	4.03	1.57	3.89	0.30
Organ harvest:								
Living donor	1.62	–1.39	3.11	–0.55	1.59	–1.31	3.13	–0.51
Cadaver	1.56	–1.49	2.88	–0.75	1.58	–1.34	2.97	–0.65
Laser	2.79	–0.17	3.39	–0.36	2.65	–0.14	3.41	–0.35

* CAT indicates computed axial tomography; MRI, magnetic resonance imaging; ACLS, advanced cardiac life support.

Table 7. Ratings of anesthesia processes and techniques*

	Practitioner group				Select group			
	Frequency		Level of experience		Frequency		Level of experience	
	Mean	Rasch	Mean	Rasch	Mean	Rasch	Mean	Rasch
Inhaled anesthetics								
Nitrous oxide	4.54	1.83	4.27	0.73	4.18	1.36	4.13	0.52
Halothane	1.45	−1.44	3.36	−0.45	1.59	−1.04	3.61	−0.19
Isoflurane	3.97	0.99	4.20	0.62	3.65	0.82	4.08	0.44
Desflurane	3.77	0.82	4.12	0.49	3.65	0.82	3.97	0.21
Sevoflurane	4.61	1.99	4.31	0.84	4.28	1.55	4.17	0.58
Intravenous anesthetics								
Thiopental	3.02	0.16	3.98	0.29	2.85	0.17	3.96	0.26
Methohexital	1.91	−0.82	3.42	−0.41	1.97	−0.62	3.58	−0.27
Morphine	4.08	1.14	4.19	0.61	3.65	0.81	4.07	0.41
Fentanyl	4.96	3.66	4.32	0.83	4.85	2.98	4.21	0.68
Alfentanil	1.77	−0.99	3.41	−0.40	2.01	−0.56	3.66	−0.11
Sufentanil	2.55	−0.22	3.82	0.06	2.65	0.01	3.84	0.13
Meperidine	2.72	−0.08	3.83	0.08	2.46	−0.13	3.79	0.05
Remifentanil	1.81	−0.92	3.45	−0.34	1.80	−0.77	3.51	−0.27
Hydromorphone	2.02	−0.70	3.40	−0.40	1.82	−0.74	3.34	−0.44
Nalbuphine	1.97	−0.74	3.38	−0.44	1.98	−0.57	3.50	−0.24
Butorphanol	1.59	−1.30	3.12	−0.69	1.61	−1.03	3.28	−0.51
Diazepam	1.93	−0.79	3.58	−0.23	1.90	−0.66	3.68	−0.14
Midazolam	4.93	3.48	4.27	0.73	4.88	3.32	4.20	0.59
Lorazepam	1.83	−0.91	3.50	−0.33	1.78	−0.80	3.55	−0.22
Propofol	4.95	3.58	4.37	0.94	4.89	3.39	4.29	0.81
Ketamine	2.91	0.08	4.07	0.44	2.76	0.11	4.08	0.44
Etomidate	3.12	0.26	4.10	0.48	2.79	0.13	3.94	0.24
Ketorolac	4.15	1.22	4.11	0.48	3.84	1.01	4.01	0.36
Local anesthetics								
Procaine	1.70	−1.12	3.27	−0.59	1.79	−0.89	3.45	−0.44
Chloroprocaine	2.06	−0.70	3.46	−0.39	2.08	−0.55	3.62	−0.31
Tetracaine	2.54	−0.26	3.66	−0.17	2.69	0.01	3.76	−0.07
Cocaine	1.82	−0.96	3.40	−0.43	1.80	−0.80	3.62	−0.21
Bupivacaine	4.11	1.17	4.18	0.60	3.88	1.05	4.07	0.49
Lidocaine	4.50	1.74	4.21	0.63	4.27	1.50	4.09	0.45
Etidocaine	1.46	−1.45	3.09	−0.72	1.52	−1.18	3.03	−0.72
Mepivacaine	2.03	−0.72	3.28	−0.54	2.20	−0.37	3.40	−0.40
Ropivacaine	2.25	−0.50	3.42	−0.42	2.24	−0.33	3.37	−0.44
Levobupivacaine	1.53	−1.35	2.98	−0.81	1.47	−1.24	2.93	−0.83
Muscle Relaxants								
Succinylcholine	4.45	1.60	4.39	0.93	3.83	1.00	4.28	0.73
Curare	2.30	−0.46	3.66	−0.17	2.06	−0.51	3.68	−0.09
Pancuronium	2.58	−0.22	3.92	0.18	2.24	−0.35	3.83	0.08

Table 7. Ratings of anesthesia processes and techniques*

Vecuronium	3.24	0.33	4.03	0.33	3.05	0.31	3.94	0.23
Atracurium	2.24	−0.50	3.70	−0.10	2.15	−0.41	3.77	−0.01
Mivacurium	2.52	−0.26	3.83	0.01	2.44	−0.18	3.83	0.02
Pipecuronium	1.13	−2.15	2.91	−0.89	1.25	−1.67	3.02	−0.75
Doxacurium	1.13	−2.18	2.89	−0.91	1.28	−1.62	3.02	−0.75
Rocuronium	2.80	1.51	4.28	0.70	3.92	1.02	4.03	0.30
Cisatracurium	2.80	−0.05	3.89	0.10	2.38	−0.24	3.63	−0.19
Antagonists								
Edrophonium	1.95	−0.80	3.55	−0.30	2.10	−0.48	3.71	−0.11
Neostigmine	4.79	2.40	4.30	0.75	4.41	1.60	4.16	0.54
Pyridostigmine	1.71	−1.10	3.35	−0.50	1.91	−0.69	3.46	−0.40
Naloxone	2.39	−0.36	3.99	0.27	2.31	−0.29	3.98	0.22
Flumazenil	1.99	−0.76	3.78	−0.01	1.93	−0.66	3.68	−0.09
Physostigmine	1.64	−1.19	3.40	−0.44	1.70	−0.92	3.44	−0.40
Other								
Nonparticulate antacids	3.41	0.45	3.87	0.13	3.21	0.44	3.75	−0.01
Histamine blockers	3.99	0.98	3.97	0.27	3.74	0.89	3.90	0.21
Antibiotics	4.85	2.68	4.04	0.36	4.61	2.07	3.95	0.26
Antiemetics	4.84	2.65	4.19	0.60	4.59	2.03	4.15	0.52
Cardioactive agents	4.10	1.08	4.27	0.70	3.73	0.87	4.19	0.55
Anticholinergics	4.64	2.02	4.25	0.67	4.27	1.47	4.15	0.47
Antihypertensive drugs	4.37	1.45	4.33	0.81	4.09	1.24	4.24	0.60
Calcium channel inhibitors	3.17	0.26	4.05	0.35	3.06	0.28	4.06	0.36
Beta blockers	4.08	1.09	4.25	0.67	3.70	0.84	4.19	0.55
Bronchodilators	3.81	0.81	4.16	0.53	3.49	0.66	4.16	0.52
Diuretics	3.21	0.29	4.00	0.30	2.95	0.24	3.94	0.24
Insulin	3.15	0.26	4.05	0.38	3.00	0.27	4.09	0.44
Protamine/heparin	3.41	0.45	4.12	0.47	2.97	0.25	3.97	0.29
Dantrolene	1.27	−1.81	3.96	0.18	1.41	−1.36	4.15	0.45
Monoamine oxide inhibitors	1.82	−0.94	3.47	−0.34	1.63	−1.01	3.58	−0.18
Antidepressant drugs	2.34	−0.41	3.47	−0.34	2.35	−0.25	3.57	−0.19
Corticosteroid drugs	3.28	0.36	3.81	0.08	3.21	0.43	3.84	0.13
Anticonvulsive drugs	2.63	−0.17	3.65	−0.15	2.58	−0.06	3.74	0.02
Tocolytic drugs	2.38	−0.39	3.51	−0.29	2.19	−0.42	3.60	−0.24
Neuroleptic drugs	2.33	−0.43	3.49	−0.31	2.49	−0.12	3.65	−0.08
Blood Products	3.56	0.58	4.21	0.59	3.20	0.42	4.17	0.54
Volume expanders	3.58	0.61	4.09	0.43	3.22	0.45	4.04	0.31
ACE inhibitors	2.72	−0.10	3.70	−0.10	2.60	−0.06	3.67	−0.09
Angiotensin receptor blockers	2.49	−0.30	3.54	−0.27	2.39	−0.23	3.53	−0.23
COX-2 inhibitors	2.46	−0.32	3.42	−0.43	2.39	−0.23	3.42	−0.41
Anesthesia techniques								
Mask maintenance	3.61	0.59	4.38	0.93	3.32	0.50	4.41	0.83
LMA maintenance	4.24	1.26	4.38	0.92	3.99	1.09	4.23	0.57
Nasal	2.90	0.02	4.25	0.56	2.87	0.13	4.32	0.62

Table 7. Ratings of anesthesia processes and techniques*

	Practitioner group				Select group			
	Frequency		Level of experience		Frequency		Level of experience	
	Mean	Rasch	Mean	Rasch	Mean	Rasch	Mean	Rasch
Oral	4.89	2.63	4.48	0.95	4.70	2.08	4.38	0.74
Tracheostomy	2.69	−0.15	4.07	0.28	2.44	−0.22	3.96	0.17
Endobronchial	2.53	−0.28	4.08	0.27	2.37	−0.27	4.10	0.36
Cricothyrotomy	1.33	−1.75	3.65	−0.25	1.35	−1.52	3.83	−0.09
Fiberoptics	2.47	−0.34	3.95	0.12	2.34	−0.30	4.03	0.26
Fast track LMA	2.31	−0.46	3.88	0.05	2.24	−0.38	4.00	0.15
Infiltration	3.50	0.41	3.78	−0.35	3.47	0.49	3.72	−0.31
Subarachnoid block	3.55	0.53	4.15	0.42	3.46	0.58	4.16	0.42
Epidural block	3.33	0.36	4.14	0.42	3.17	0.37	4.18	0.42
Combined spinal/epidural	2.20	−0.57	3.74	−0.10	2.21	−0.40	3.90	0.02
Caudal block	1.62	−1.24	3.26	−0.58	1.63	−1.06	3.41	−0.44
Brachial plexus block	2.07	−0.72	3.52	−0.34	2.21	−0.40	3.71	−0.11
Airway blocks	1.74	−1.09	3.37	−0.49	1.76	−0.87	3.45	−0.37
Intravenous regional block	2.83	−0.04	3.85	0.04	2.86	0.15	3.84	0.05
Retrobulbar/peribulbar block	1.78	−1.04	3.24	−0.61	1.62	−1.07	3.24	−0.56
Ankle block	2.03	−0.74	3.37	−0.48	1.99	−0.62	3.40	−0.44
Digital block	1.72	−1.10	3.13	−0.70	1.74	−0.92	3.19	−0.68
Wrist block	1.53	−1.39	3.00	−0.82	1.54	−1.20	3.05	−0.79
Sciatic block	1.39	−1.62	2.97	−0.85	1.44	−1.38	3.03	−0.82
Femoral block	1.60	−1.26	3.11	−0.73	1.56	−1.17	3.17	−0.68
Topical block	2.37	−0.43	3.25	−0.62	2.46	−0.25	3.31	−0.56
Monitored anesthesia care	4.57	1.89	4.40	0.91	4.43	1.62	4.20	0.48
Total intravenous anesthesia	2.96	0.07	4.06	0.29	2.97	0.21	4.07	0.31
Epidural analgesia	2.95	0.05	3.84	−0.05	2.73	0.03	3.84	−0.03
Infiltration nerve blocks	2.06	−0.75	3.30	−0.63	1.93	−0.70	3.23	−0.60
Intrathecal analgesia	2.52	−0.32	3.60	−0.33	2.24	−0.38	3.50	−0.35
PCA management	2.17	−0.61	3.26	−0.63	2.07	−0.54	3.29	−0.52
Epidural steroids	1.61	−1.27	2.97	−0.89	1.70	−0.95	3.18	−0.65
Laser	2.79	−0.17	3.39	−0.36	2.65	−0.14	3.41	−0.35
Hypotensive	2.85	−0.01	3.86	0.04	2.25	−0.37	3.73	−0.14
Hypothermia	2.25	−0.53	3.47	−0.38	1.80	−0.83	3.38	−0.50
Hyperthermia	1.65	−1.21	3.05	−0.81	1.39	−1.45	3.01	−0.84
Hypnosis	1.24	−1.96	2.33	−1.40	1.23	−1.79	2.55	−1.15

* ACE indicates angiotensin converting enzyme inhibitors; COX-2, cyclooxygenase-2; LMA, laryngeal mask airway; PCA, patient-controlled analgesia.

Table 8. Ratings for equipment, instrumentation, and technology (page 1 of 2)

	Practitioner group				Select group			
	Frequency		Level of experience		Frequency		Level of experience	
	Mean	Rasch	Mean	Rasch	Mean	Rasch	Mean	Rasch
Anesthesia delivery systems								
High/low pressure gas sources	4.46	1.20	4.11	0.30	4.39	0.89	4.06	0.21
Regulators/ manifold	4.46	1.20	4.06	0.27	4.37	0.87	4.02	0.20
Flow meters, valves, floats	4.74	1.95	4.15	0.41	4.70	1.75	4.13	0.40
Vaporizers	4.53	1.35	4.23	0.42	4.47	1.28	4.19	0.50
Proportioning systems	4.27	0.71	4.01	0.14	3.85	-0.04	3.84	−0.26
Pressure failure safety devices	4.55	1.38	4.13	0.36	4.55	1.35	4.06	0.30
“Fail safe” devices	4.55	1.38	4.15	0.27	4.62	1.49	4.09	0.32
Ventilator	4.45	1.18	4.30	0.49	4.30	0.98	4.23	0.48
Carbon dioxide absorbent	4.51	1.28	4.17	0.29	4.44	1.18	4.09	0.28
Rebreathing, circle system	3.92	0.31	4.05	0.24	4.09	0.61	4.09	0.27
Nonrebreathing	2.82	−0.86	3.66	−0.24	2.59	−0.90	3.80	−0.07
Modified nonrebreathing	2.52	−1.16	3.51	−0.40	2.33	−1.15	3.60	−0.28
Pneumatic and electronic alarm	4.51	1.28	4.10	0.29	4.56	1.41	4.13	0.39
Flow-over systems	3.32	−0.50	3.61	−0.24	2.63	−0.98	3.33	−0.60
Airway devices								
Face masks	4.36	0.98	4.28	0.45	4.29	1.10	4.26	0.48
Laryngoscope:								
Rigid	4.05	0.47	4.27	0.46	4.05	0.65	4.31	0.59
Flexible/fiberoptic	2.83	−0.83	3.95	0.06	2.81	−0.65	4.05	0.26
Other	2.29	−1.32	3.40	−0.42	2.32	−3.13	3.36	−1.83
Endotracheal tube	4.33	0.89	4.39	0.64	4.16	0.81	4.38	0.71
Endobronchial tube	2.72	−0.95	4.02	0.10	2.64	−0.80	4.07	0.30
Airways:								
Oral	3.96	0.37	4.11	0.29	3.86	0.44	4.01	0.27
Nasal	3.29	−0.40	4.06	0.22	3.16	−0.30	3.98	0.22
Tracheostomy tubes	2.77	−0.90	3.79	−0.10	2.63	−0.82	3.75	−0.03
Laryngeal mask airway	3.66	0.03	4.25	0.48	3.56	0.11	4.18	0.49
Intubating laryngeal mask airway	2.63	−1.03	3.86	−0.03	2.49	−0.94	3.79	−0.01
Jet ventilation	1.95	−1.65	3.55	−0.31	2.10	−1.30	3.79	−0.01
Lighted stylet	1.93	−1.67	3.30	−0.53	1.95	−1.45	3.36	−0.41
Combitube	1.65	−1.96	3.12	−0.68	1.66	−1.77	3.10	−0.62
Tube exchangers	2.31	−1.30	3.56	−0.29	2.30	−1.10	3.62	−0.13
Monitoring devices								
Electroencephalogram	1.95	−1.64	3.04	−0.76	1.72	−1.71	2.95	−0.75
Evoked potentials	2.20	−1.41	3.21	−0.62	2.05	−1.35	3.15	−0.60
Intracranial pressure	2.22	−1.39	3.42	−0.44	2.01	−1.38	3.29	−0.48
Modified electroencephalograph monitor	2.38	−1.24	3.31	−0.55	2.33	−1.07	3.27	−0.51
Electrocardiogram	4.88	2.49	4.36	0.67	4.90	2.93	4.30	0.58
Arterial pressure monitoring	3.31	−0.34	4.21	0.44	3.06	−0.38	4.02	0.26

Table 8. Ratings for equipment, instrumentation and technology

	Practitioner group				Select group			
	Frequency		Level of experience		Frequency		Level of experience	
	Mean	Rasch	Mean	Rasch	Mean	Rasch	Mean	Rasch
Noninvasive blood pressure	4.93	2.85	4.17	0.28	4.89	2.72	4.00	0.24
Transesophageal echocardiography	2.24	–1.36	3.36	–0.46	2.00	–1.39	3.34	–0.41
Central venous pressure monitoring catheters	3.01	–0.64	4.06	0.26	2.76	–0.66	3.86	0.12
Pulmonary artery pressure monitoring	2.84	–0.81	4.10	0.32	2.62	–0.79	3.96	0.23
Cardiac output	2.74	–0.90	4.05	0.24	2.54	–0.86	3.90	0.15
Precordial/esophageal stethoscope	4.08	0.58	4.01	0.10	4.35	1.12	3.80	0.07
Apnea monitor	4.25	0.77	4.07	0.19	3.79	0.36	3.83	0.05
Capnography	4.64	1.64	4.29	0.47	4.50	1.41	4.19	0.55
Airway gas analysis	4.64	1.18	4.23	0.43	4.25	0.97	4.10	0.41
Pulse oximetry	4.97	3.61	4.22	0.42	4.93	3.29	4.12	0.46
Airway pressure	4.46	1.20	4.21	0.44	4.33	1.09	4.09	0.42
Respirometer	4.09	0.48	4.01	0.11	4.01	0.58	3.97	0.20
Blood gas analysis	3.23	–0.41	4.20	0.43	2.99	–0.46	4.13	0.37
Peripheral nerve stimulator	4.15	0.69	4.19	0.31	4.02	0.65	4.07	0.34
Urinary output monitoring	3.73	0.13	3.87	–0.04	3.54	0.11	3.70	–0.14
Temperature monitoring	4.56	1.42	3.97	0.06	4.41	1.23	3.77	–0.05
Maternal/fetal monitoring devices	2.61	–1.04	3.36	–0.46	2.62	–0.79	3.45	–0.36
Computer record keeping devices	1.51	–2.10	2.30	–1.28	1.30	–2.26	2.36	–1.24
Computerized patient information retrieval	2.33	–1.26	2.65	–1.02	2.00	–1.40	2.60	–1.07
Computerized preoperative assessment	1.53	–2.07	2.28	–1.31	1.41	–2.10	2.35	–1.25
Infusion pumps	3.49	–0.16	3.88	0.07	3.59	0.14	3.85	0.13
Fluid/blood warmers	3.58	–0.05	3.89	0.08	3.55	0.11	3.79	0.07
Forced air warming blanket	3.96	0.39	3.88	0.08	3.89	0.50	3.75	0.04
Heat and moisture exchanger	3.50	–0.15	3.60	–0.25	3.37	–0.90	3.49	0.23

Table 9. Transformed percentages

	Rasch rating scale calibration	Current % of the test blueprint	Initial transformed (%)	Final transformed (%)
Basic sciences	0.17	30	33	32
Anatomy, physiology, and pathophysiology	1.05	45	33	38
Chemistry, biochemistry, physics, and equipment	–1.03	10	10	11
Pharmacology	2.07	45	45	51
Anesthesia principles	2.68	61	61	59
Basic	1.35	30	40	39
Advanced	0.66	31	20	20
Professional issues	–2.51	4	4	4
Standards of practice	0.30	–	40	32
Legal	–0.75	40	24	20
Quality improvement	–1.71	10	10	8
Research	–2.97	–	–	–
Safety	1.01	50	50	40

(continued from page 34)

Both groups reported that the majority of their work was in direct clinical patient care. Direct patient care accounted for 85.7% of the practitioner group time and 69.4% of the select group time. It is interesting to note that this percentage for the select group has increased from 43.1% in 1996. For the select group, a large percentage of their time also was spent in educational and management/supervisory activities.

The characteristics of the patient populations served by both groups are similar. Both the practitioner and select groups tend to care for adult and elderly, ASA class I, II, or III patients undergoing elective ambulatory surgical procedures. These percentages have not changed from the 1996 survey.

Fundamental knowledge

The fundamental knowledge questions represent the skeleton of the blueprint for the NCE and replicate the major headings on the current examination outline. Respondents were asked to rate each area of fundamental knowledge on a 5-point scale. Respondents were asked to apply this rating to 3 broad areas and then progressively fine-tune each area. See Table 4 for the results of this progression.

The first question dealt with the broadest areas. The respondents indicated that anesthesia practice was most important, followed by basic sciences. Professional issues were rated least important. Both groups offered the same relative rankings of these areas, although the select group did rate professional issues slightly higher than the practitioner group.

The second question dealt with the area of professional issues. Respondents were asked to rate the relative importance of knowledge in the areas of standards of practice, legal, quality improvement, research, and safety. Safety had the highest rating, followed by standards of practice, legal, quality improvement, and research. On this question, both groups had the same relative ranking and were remarkably consistent in their ratings across groups.

The third question asked respondents to distinguish the relative importance of knowledge of basic anesthesia principles and knowledge of advanced anesthesia principles. Knowledge of basic anesthesia principles was rated more important than knowledge of advanced anesthesia principles by both groups, although the practitioner group tended to view the separation as slightly greater than the select group.

The fourth question distinguished the relative importance of topics within the basic sciences. Knowledge of pharmacology was rated as most important. Anatomy, physiology, and pathophysiology were the next most important topics. Chemistry, biochemistry, physics, and equipment were rated least important within the group. These ratings were consistent across both groups and similar to the 1996 survey.

The fifth question rated the relative importance of knowledge related of systems within the area of

anatomy, physiology, and pathophysiology. Cardiovascular and respiratory systems were rated most important, followed by the nervous system. The hepatic, renal, gastrointestinal, genitourinary, and endocrine systems were rated least. Again, the rating across both groups was almost identical and similar to the 1996 survey.

The sixth question rated the relative importance of knowledge in the areas of chemistry, biochemistry, physics, and equipment. Equipment was rated most important. Knowledge of science in the other areas clustered closely together as least important. The practitioner and select groups answered this question similarly.

The last question dealt with the importance of areas within pharmacology. Inhalation and intravenous anesthetics were rated most important, followed by a cluster that included general principles, autonomic and cardiovascular drugs, and muscle relaxants. Local anesthetics were rated least important. Once again, there was remarkable consistency in the ratings across the various groups and with the 1996 survey.

Patient conditions

In this section, respondents were asked to rate patient conditions encountered during practice (see Table 5). Respondents were asked to rate the frequency with which they encountered a preexisting condition and the level of expertise required to manage that condition (see Table 1 for the data interpretation guide). In general the conditions were grouped by body site, although there was an extensive "other" category that contained laboratory tests, diagnostic tests, nonlocalized patient conditions, and conditions such as tobacco and substance abuse. There were areas of overlap and times when certain conditions might be better placed in a different body site category. The CCNA decided to leave most conditions in the same body site category as the previous PPA to facilitate the comparison of the data.

Respondents were able to make greater distinctions between items using the frequency scale than they were using the level of experience scale. The average frequency rating ranged from a low of 1.39 to a high of 4.85, but the average level of experience required rating had a more restricted range of 3.03 to 4.67. Both groups rated this section similarly (frequency, r = .99; level of expertise, r = .93).

The frequency responses for the condition section were distributed according to the prevalence of disease processes. The most frequent cardiovascular conditions encountered were hypertension, peripheral vascular disease, and ischemic heart disease/angina. Asthma and chronic obstructive pulmonary disease/emphysema were the most common respiratory conditions encountered. Interestingly, sleep apnea was the third most common respiratory condition encountered. Sleep apnea was added to the 2001 PPA, so there is no comparison data from previous surveys. The frequency with which central nervous system conditions were encountered was reported as either monthly or rare. This is consistent with the 1996 survey. Fractures were the most common musculoskeletal condition followed by rheumatoid arthritis. Diabetes mellitus and hypothyroid/hyperthyroid were the most common endocrine conditions encountered. The most frequent renal conditions encountered were kidney stones and chronic renal failure. Gastric esophageal reflux disease was the most frequent gastrointestinal condition encountered, followed by morbid obesity.

The patient conditions reported to require the highest level of expertise to manage were airway difficulties, malignant hyperthermia, hypertension, and diabetes mellitus. Several laboratory studies also were included in the group requiring a high level of expertise to manage. They included arterial blood gases, hemoglobin/hematocrit, and electrolytes. The electrocardiogram was the only diagnostic study included in the high level of expertise group.

Procedures

Respondents were asked to indicate the frequency with which they see patients undergoing a particular surgical or diagnostic procedure (see Table 6). They also were asked to indicate the level of expertise related to each procedure that is required in practice (see Table 6). Again, there is a great deal of consistency between the responses of the practitioner and select groups (frequency, r = 0.99; level of expertise, r = 0.95) and between this survey and the 1996 survey.

The most frequently encountered procedures were laparoscopy, lower extremity, gallbladder, abdominal/gynecology, herniorrhaphy, upper extremity, breast biopsy, intestine, and total joint replacement. The procedures rated as requiring the highest level of expertise were carotid, thoracotomy, laparoscopy, open lung biopsy, and mediastinoscopy.

Anesthesia process: Agents and techniques

This section of the survey asked respondents to rate the frequency with which they used a particular anesthesia agent or technique and the level of expertise required to manage that agent or technique (see Table 7). There was a great deal of consistency between the responses of the practitioner and select groups (frequency, r = 0.99; level of expertise, r = 0.97). Again, the results of this survey are similar to those from the 1996 survey.

The most frequently used anesthesia agents were fentanyl, propofol, midazolam, antibiotics, antiemetics, neostigmine, anticholinergics, sevoflurane, nitrous oxide, lidocaine, succinylcholine, and rocuronium. Oral endotracheal intubation and laryngeal mask airway maintenance were rated as the most frequently encountered airway techniques. The most frequent regional techniques were subarachnoid block, epidural, combined spinal/epidural, and intravenous regional. Monitored anesthesia care was rated as high in both frequency and level of expertise. Hypnosis was rated as lowest on both scales.

Equipment, instrumentation and technology

The last section of the survey asked respondents to indicate how many of their cases require the use of a particular device and the level of expertise required to safely use the device (see Table 8). As with the other sections, there was a high degree of consistency between the practitioner and select groups (frequency, r = .99; level of expertise, r = .98). As one would expect, the components of the anesthesia machine and basic monitors were the most frequently used pieces of equipment. Computer record keeping devices and computerized preoperative assessment continue to be the least used pieces of technology.

Implications for the National Certification Examination

The implications of the PPA results for the NCE were assessed by the CCNA through careful review of all the data. The process of transforming job analysis data for use in designing test specifications requires several assumptions. First, the items (eg, patient conditions, procedures, anesthesia agents and techniques, equipment, instrumentation, and technology of anesthesia practice) that are rated as most frequently encountered or most critical by respondents should receive the most weight on the examination.[4] Conversely, those items rated least critical to respondents should receive little or no weight on the examination. Those items with weights that fall in between these extremes should be distributed proportionally. Second, an upper limit on the maximum representation of a particular section must be set.[4] The CCNA has decided to use 4% as the minimum and 35% as the maximum. Once these assumptions have been defined, the Rasch transformed ratings can be used to establish the percentage of questions assigned to various sections of the examination.

The NCE blueprint derived from the 1996 PPA was divided into 5 sections, each with an assigned percentage of questions: basic sciences (30%); equipment, instrumentation, and technology (5%); basic principles of anesthesia (30%); advanced principles of anesthesia (31%); and professional issues (4%).

Table 10. Formulas used to relate Rasch calibrations to current values

Professional issues	1) 0.04 = a + b(–2.51)
Anesthesia principles	2) 0.61 = a + b(2.68)
Solving the first equation for *a* yields	3) a = 0.04 + 2.51b
Entering equation 3 into equation 2 yields	4) 0.61 = 0.04 + 2.5b + 2.68b
Solving equation 4 for *b* yields	5) 0.61 = 0.04 + 5.19b 0.57 = 5.19b 0.1098 = b
Entering the value of *b* into equation 1	6) a = 0.04 + 2.51(0.1098) a = 0.3156

The beginning point for the transformation of the ratings to percentages of questions is the fundamental knowledge section of the survey. Four of the 5 current test specification areas were included in this section. The only current test section not surveyed in this PPA was the equipment, instrumentation, and technology section of the test. For the purpose of this study we will maintain that section at 5% of the test.

Respondents were asked to indicate the relative importance of each of 3 major subsections of the test: professional issues, basic sciences, and anesthesia principles. The correlation between the responses given by the practitioner and the select group was 0.99. Because the 2 sets of responses were virtually identical, the practitioners' ratings will be used for the remainder of the analysis.

The current examination blueprint will serve as the starting point for the transformation. On this blueprint, professional issues was assigned 4%, basic sciences was assigned 30%, and anesthesia principles (both basic and advanced) was assigned 61% of the total test. Using these values as base values, data in Table 9 were obtained.

The recommended transformed percentages are calculated as follows. The lowest rated component, professional issues, was reassigned its current value of 4%. The highest rated component was reassigned its current value of 61%. These values were then placed in the standard linear transformation formula (Y = a + bX, where Y = percent and X = Rasch calibration) to relate the Rasch calibrations to current values. These formulas are shown in Table 10.

The transformation formula to translate the Rasch rating calibrations into percentages is thus Y = 0.3156 + 0.1098X. The initial transformed percentages

exceed the limitation because their totals are greater than 95%. This limitation resulted from reserving 5% of the test for the equipment, instrumentation, and technology section. A scaling factor (0.95/0.98 = 0.97) was thus applied to the initial transformed percentages to ensure their total equaled the required 95% of the remainder of the test. The results of this transformation are presented in Table 9. This procedure takes the importance ratings as reported by the sample of practitioners and transforms them directly into percentages of items on the examination. The only assumption made was that the current percentages of these sections represented a valid starting point in developing the transformation.

The professional issues section was further broken down into 5 subsections. The statistical transformation procedure described above was applied to these subsections. The transformation formula derived was Y = 0.3515 + 0.1471X with a scaling factor of 0.81. This was based on the assumption that safety would make up 50% and quality improvement would make up 10% of the professional issues portion of the NCE –4% of the total examination.

In the anesthesia principles section, respondents were asked to rate the relative importance of basic vs advanced principles of anesthesia. The transformation was based on the initial assumption that the difference in calibrations represented a true perceived difference as reported by the practitioners. The values of 40% and 20% were chosen to indicate this difference. Since there were only 2 subcategories represented, these values became the initial transformed values. Also because there are only 2 subcategories, the development of the transformation formula is not necessary. The initial values were then adjusted by the scaling factor (0.98) so their total represented the 61% of the examination assigned to anesthesia principles. The select group of respondents rated these sections almost identically in importance.

The final 4 questions in the fundamental knowledge section of the survey dealt with refining the basic science section of the examination. The first question asked the practitioners to identify the relative importance of 3 major subsections of the basic science section. The other 3 questions were then used to further refine the breakdown in each of these subsections.

The initial transformation formula was based on the assumption that the current values of 45% for pharmacology and 10% for chemistry biochemistry, physics, and equipment would be used as starting values. The resulting transformation formula was Y = 0.2163 + 0.1129X, and a scaling factor of 1.14 was used to derive the final transformed percentage. These percentages represent a portion of the recommended 30% for the basic science section.

Table 11. Comparison of examination blueprint transformed percentages

	Current blueprint	Practitioner group	Select group
Basic sciences	30	32	32
Equipment, instrumentation and technology	5	5	5
Basic principles of anesthesia	30	39	39
Advanced principles of anesthesia	31	20	20
Professional issues	4	4	4

No data were collected for the equipment, instrumentation, and technology subsection as part of the fundamental knowledge section of this survey. As a result, the recommendation is to maintain the 5% specified in the current test blueprint and to use the information presented above for guidance in selecting questions to be included in this section of the examination. This subsection should be included in future practice analyses.

In general, the results of this survey support the current breakdown of the NCE. A comparison of the current examination blueprint percentages with the recommendations based on the practitioner and select group survey responses are presented in Table 11. The major difference in the results derived from the survey and the current examination blueprint involved the relative importance of basic anesthesia principles as perceived by the practitioners. Based on the data provided by the practitioners, the basic anesthesia principles section would receive twice the weight as the advanced principles section (39% basic vs 20% advanced). The select group did not perceive this separation to be as great as the practitioner group did and weighted these 2 sections closer to equal in importance.

The CCNA reviewed the results from the 2001 PPA as well as results from previous (1993 and 1996) PPAs at its March 2002 meeting. Members of the Promissor psychometric team also were involved in the evaluation of this data. After much discussion and careful consideration, the CCNA members voted to continue using the current test blueprint and percentages.

Summary

This article describes the results and implications of the CCNA's 2001 PPA. One of the purposes of conducting a PPA is to provide content validity for the

NCE by surveying a targeted sample of the CRNA population regarding their current clinical practice. The content of the NCE must reflect and support the knowledge, skills, and abilities of an entry-level nurse anesthetist. The PPA is one of several tools that support a psychometrically sound, legally defensible certification examination. In conducting this practice analysis, the CCNA demonstrated its commitment to keep the examination reflective of current practice. The response rate of 47% (while down from previous years) demonstrates that members of the profession are committed to safe and reliable practice and support the mission of the CCNA. The 2001 results were analyzed both from an ordinal perspective and a Rasch rating scale calibration process. With extremely high interrater reliability, a high level of confidence can be placed in the survey data.

Based on a full review of the data, the CCNA made the decision not to change the current content outline or the percentage of questions in each subsection of the NCE. The CCNA will continue to monitor practice and testing trends and is committed to provide a certification examination that reflects the measurement of entry level knowledge, skill, and ability.

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