National Certification Examination (NCE) Professional Practice Analysis (PPA)
Executive Summary

Overview

In 2022, the NBCRNA conducted a national **professional practice analysis** (PPA) of the knowledge, skills, and abilities required for entry-level practice as a nurse anesthetist.

The purpose of the practice analysis was to maintain a logical, practice-related, and research-based content framework for the NCE. NBCRNA conducted this practice analysis to validate a framework for content development of the NCE, to establish a linkage between the NCE test specifications and actual role requirements of the entry-level nurse anesthetist, and to allow practicing nurse anesthetists to provide input into the content scope of the NCE.

NBCRNA appointed a PPA Panel that provided leadership and oversight for the project. The panel consisted of 14 subject-matter experts in nurse anesthesia, who were representative of the profession with respect to geography (from across the United States) and practice setting, among other demographic variables, and primarily reflective of those nurse anesthetists who are entering the profession. The group was charged with analyzing the practice of nurse anesthesia at entry level and updating the content outline.

The practice analysis study consisted of the following five major phases (Figure 1).

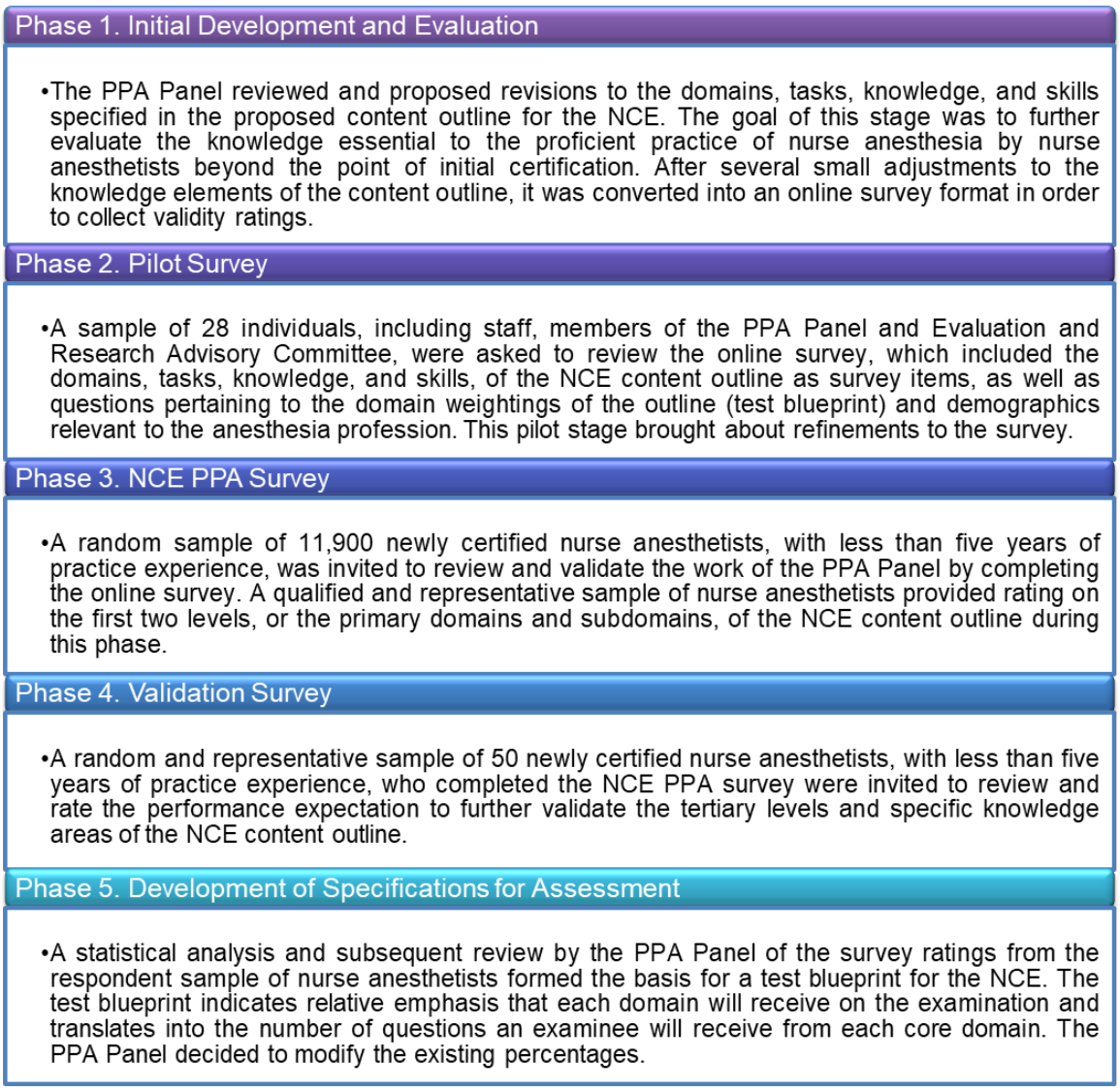

Figure 1. The NCE PPA Study Five Phase Development Process

Initial Development

The panel began their work with a qualitative review of the current NCE outline, identifying areas for revision. The following is a summary of the initial changes made to the content outline:

- **Domain I. Basic Sciences** – *Anatomy and Physiology* was separated from *Pathophysiology* to permit better subcategorization of *Nonpathologic Anatomy and Physiology*; subcategories of *Pharmacology* were reorganized and updated. The subdomain of *Applied Chemistry, Biochemistry, and Physics* was changed to *Applied Chemistry, Biochemistry, Physics, and Mathematics*, with a subcategory specifically for *Anesthesia-related Mathematics*.
- **Domain II. Equipment, Instrumentation, and Technology** – *Airway Equipment* category was updated,

with the addition of bronchial blockers and the removal of some equipment considered obsolete, such as the *Combitube* and *lighted stylet*. *Transesophageal Echocardiography* was added as a subtopic of *Cardiovascular monitoring equipment*, and *Patient Warming Equipment* was broken off as its own subdomain. *Infusion devices* was added as a new subdomain.

- **Domain III. General Principles of Anesthesia** – *Ethical Considerations, Legal Issues, and Safety and Wellness* categories were expanded and subdivided. Under *Fluid Volume Assessment and Management*, subtopics were added for *Goal-Directed Fluid Management*, *Massive Transfusion Protocol*, and *Thromboelastography*. The subtopic for *Intraoperative Monitoring* was removed as already covered under domain 2. Under *Airway Management*, *retrograde intubation* was removed and a topic for *Emergency Front-of-Neck Access* added. Subdomains for *Total Intravenous Anesthesia*, *Infection Control*, and *Intraoperative Fire Safety* were added.
- **Domain IV. Anesthesia for Surgical Procedures and Special Populations** – a subcategory for *Cardiac Anesthesia* including *coronary artery bypass*, *minimally invasive procedures*, and *management of cardiac devices* was added under *Surgical and Diagnostic Anesthesia*. This replaced a subcategory for *Diagnostic/Therapeutic* that comprised mostly cardiologic topics. The remainder of those diagnostic/therapeutic topics were reclassified as *Non-OR Anesthesia*. Some rare *neuroskeletal* subtopics were also removed from under *Surgical and Diagnostic* and replaced with an Other subtopic, and a category for *Robotic/Laparoscopic Surgery* was added; topics were added for *Intauterine Surgeries*, *Postpartum Hemorrhage*, *Substance Use Disorder Population*, and *Immune-Compromised Patients*.

Survey Methodology and Results

After preliminary revisions to the outline, the resulting outline was subjected to validation by survey ratings. The survey phase proceeded by the following sampling plan:

First, primary domains and subdomains (the first two levels of the outline) were validated by a large-sample survey, sent to all nurse anesthetists within five years of initial certification. Survey participants were asked to evaluate each primary domain and secondary subdomain in the content outline, rating them using 5-point scales for Criticality and Frequency. ***Criticality*** was defined as the degree that inability to perform duties related to each knowledge element could be seen as causing harm to stakeholders. ***Frequency*** was defined as how often the nurse anesthetist performs duties that require proficiency in each of the knowledge elements.

A sample (N = 11,900) of nurse anesthetists within their first five years of initial certification was invited to participate in this primary survey component of the project. From the sample, 1,008 respondents (~9% response rate) completed the primary survey.

Second, the more specific topics (tertiary level of the outline) were validated by a small-scale survey. A smaller sample (N = 50) of nurse anesthetists was randomly selected out of the 348 primary survey respondents who indicated willingness to complete the validation survey for the more specific topics. Participants in this survey rated the more specific elements on a Performance Expectation scale. ***Performance expectation*** indicates the point in the career at which the newly certified nurse anesthetist is first expected to perform duties that require proficiency in the knowledge element. Thirty-one respondents (62% response rate) completed the validation

survey of the tertiary elements.

Responses to items in the demographic portion of the survey support the conclusion that participants constituted a reasonable sample of certificants across a variety of practice settings. Respondent data provided strong evidence of validity for the four domains of the content outline (Tables 1 and 2), as well as for nearly all knowledge statements included in the content outline.

Table 1. Summary of Primary Domain Criticality Ratings

Domains	Min	Max	Mean	SD	Variance	Count
I. Basic Sciences	1.00	5.00	3.04	1.32	1.75	1024
II. Equipment, Instrumentation and Technology	1.00	5.00	3.39	1.34	1.80	1024
III. General Principles of Anesthesia	1.00	5.00	3.72	1.41	2.00	1024
IV. Anesthesia for Surgical Procedures and Special Populations	1.00	5.00	3.66	1.36	1.86	1024

Table 2. Summary of Primary Domain Frequency Ratings

Domains	Min	Max	Mean	SD	Variance	Count
I. Basic Sciences	1.00	5.00	4.01	1.28	1.65	1024
II. Equipment, Instrumentation and Technology	1.00	5.00	4.28	1.18	1.39	1024
III. General Principles of Anesthesia	1.00	5.00	4.41	1.13	1.29	1024
IV. Anesthesia for Surgical Procedures and Special Populations	1.00	5.00	4.19	1.16	1.34	1024

While space in this executive summary does not permit reporting these indices for every element of the outline, similar summaries of survey ratings were evaluated by the NCE PPA Panel for every knowledge statement on the survey. Based on the survey responses, a total of 17 content areas/topics required further review and validation:

- Eight subdomain areas with a mean rating for criticality and/or frequency scales lower than a 3 (moderate endorsement).
- Nine tertiary levels with fewer than 50% of respondents selecting “within the first six months of certification” for the performance expectation scale.

Subsequent Review and Final Recommendations

On June 17, 2022 the NCE PPA Panel met during a half-day virtual meeting to review the results of the PPA survey and to formulate recommendations for the NCE content outline. The meeting was devoted to reviewing summaries of ratings of the survey respondents, making decisions about what knowledge statements marked for further review and validation should be included/excluded in the NCE content outline, and recommending any

changes to the current domain weights.

Based on the ensuing discussion, and the generally high levels of endorsement on almost all elements of the NCE content outline, minor adjustments to the outline were recommended as a result of the survey analysis and subsequent review:

- In response to survey data indicating that the mathematics element of subdomain I.D., *Applied Chemistry, Biochemistry, Physics and Mathematics*, might merit its own subdomain, the panel split *Mathematics* into a knowledge statement under *General Principles of Pharmacology* titled *Pharmacology-related mathematics* and another titled *Nonpharmacology-related mathematics* under subdomain I.D.
- Responding to data regarding low clinical relevance of the *Chemotherapeutics* knowledge statement under *Pharmacology*, the panel removed this statement and changed a statement under *Anesthesia for Special Populations* to *Immune-compromised* and oncology *patients*.
- In light of input from over 38% of validation survey respondents that *Precordial Doppler* was "not used at all," the panel removed that knowledge statement.
- Since III.H.5., *Emergency front-of-neck access*, is included in the difficult airway algorithm, the panel added the parenthetical "difficult airway algorithm" as clarification to the preceding knowledge statement, *Difficult airway management*, and deleted III.H.5.
- Responding to low criticality ratings on subdomain III.M., *Pain theory*, the panel combined it with III.L., *Pain management*, relabeling that subdomain as *Pain*, with reorganized tertiary topics of *Pain theory* and *Pain management*.
- The panel removed IV.B.1.a.iv., *Intrauterine surgeries*, which over 32% of validation survey respondents said was not used at all, indicating that it was too specialized.

Finally, the panel proposed to change the domain weights after evaluating several different methods to calculate the domain percentages for the NCE content outline, average domain weight allocations indicated by respondents on the survey (Table 3).

Table 3. Domain Weights

Domains	Current Weights	Survey Respondent Weights	Updated Weights (effective 1/2/2024)
I. Basic sciences	25%	18%	**20% (decrease of 5%)**
II. Equipment, instrumentation, and technology	15%	21%	**20% (increase of 5%)**
III. General principles of anesthesia	30%	35%	**35% (increase of 5%)**
IV. Anesthesia for surgical procedures and special populations	**30%**	**26%**	**25% (decrease of 5%)**

The recommendations for revisions to the NCE content outline were subsequently reviewed and approved by the NBCRNA Board of Directors. The updated outline will go into effect January 2, 2024. The updated outline can be found in at https://www.nbcrna.com/exams/nce-resources.