NBCRNA
National Board of Certification & Recertification for Nurse Anesthetists

Various Uses and Predictive Value of the Self-Evaluation Examination (SEE)

Research Brief

June 1, 2023

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Introduction

The year 2023 marks the seventh year since the NBCRNA launched a reconfigured version of the Self-Evaluation Examination (SEE) on September 1, 2016. One of the goals of the SEE reconfiguration was to improve its predictive validity. While the NBCRNA (2017, 2021) and other investigators (Goode et al., 2019) have released interim analyses evaluating the predictive accuracy of the SEE regarding future performance on the NCE, a comprehensive analysis pooling data over multiple years has not yet been undertaken.

Recently, a panel discussion was presented at the annual Assembly of Didactic and Clinical Educators (ADCE) in Austin TX. The objectives of the session were to familiarize the audience with the accumulated validity evidence of the SEE. The purpose of this report is to provide in written form the analytical component of that presentation; namely, the summaries of the survey-related information regarding usage of the SEE at programs, and the statistical analysis of the predictive value of the SEE.

Two data sources formed the basis of the presented analyses: (1) a survey of nurse anesthesia educational program (NAEP) administrators (*n*=107), and (2) examination results (*n*=8,552) since the launch of the reconfigured SEE exam in September 2016. In addition to the summary of survey responses, the formal analyses of predictive value consisted of computation of the Pearson correlation between SEE and NCE scaled scores, graphical inspection of the association between SEE/NCE scores via an X-Y 'scatter' plot, and descriptive statistics comparing SEE scores of those who eventually passed the NCE (1st time) vs. those who eventually failed the NCE.

Summary of Key Findings

Survey results

- 92% of respondents reported having students take the SEE their third year in the program, and 73% of respondents reported having students take the SEE in their second year. Very few (5%) respondents reported having students take the SEE in their first year.
- 88.3% of **faculty** agreed that the SEE is a valuable predictor of NCE performance.
- 72% of respondents said their programs set a minimum benchmark score **for graduation**.
    - The mean "benchmark" score set by programs was computed as 430 (SD=15).
    - 14.7% use the SEE as a requirement for graduation which does NOT include meeting a benchmark score.

Predictive Value

- The Pearson correlation between the two SEE and NCE scores was r = 0.58 (p<.01, deattenuated correlation was *r* = 0.64). This result represents a strong positive correlation between SEE performance and NCE performance. That is, no less than 36% of the variation in NCE scores can be explained solely by performance on the SEE.
- Mean SEE scores for students who pass (M=447.5, SD=32.6) the NCE is higher than for students who fail the NCE (M=409.6, SD=37.5).

- The NBCRNA does not endorse use of minimum benchmark scores on the SEE for determination of graduation or program continuance. If programs wish to use a threshold score for determination of students at risk for failing the NCE, a score of 429 may be an objective basis for doing so.

Conclusions

Based on the analysis conducted here, the SEE continues to provide significant value to Nurse Anesthesia Educational Programs (NAEP) faculty and students. The analysis and evaluation of the SEE examination data showed results consistent with previously published results and confirmed once again that the reconfigured SEE has met its intended goals to a considerable extent. The survey results indicated positive support for the changes the SEE implemented in 2016. The correlational analysis indicated moderate-to-strong, positive correspondence between performance on the SEE and NCE.

The NBCRNA will continue to collect data and to publish evaluation results along the dimensions of performance, testing time, predictive validity, examination reliability, and stakeholder perceptions for the effective use of the SEE program.

Finally, while the SEE continues to demonstrate value to its stakeholders, the NBCRNA is committed to further enhancing the value of this examination. The recently approved Research Agenda for the organization takes up the question, “Is the SEE providing nurse anesthesia educational program faculty useful information or are additional enhancements needed?” The Evaluation and Research Advisory Committee (ERAC) of the NBCRNA will attempt to answer this question in the coming years via a mixed-method -method approach consisting of qualitative and quantitative methodologies and data triangulation.

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Report: Various Uses and Predictive Value of the SEE

Background

The year 2023 marks the seventh year since the NBCRNA launched a reconfigured version of the Self-Evaluation Examination (SEE) on September 1, 2016. Compared with the previous version of the SEE exam, the revised SEE featured the following changes:

- Alignment of SEE content outline with the four primary domains of NCE outline
    - Equal weighting of domains (25% each)
    - The content outline for the SEE underwent an updating in May 2018 to reflect the revisions to the NCE content outline earlier that year.
- Increased test length from 160 to 240 questions to improve reliability and usefulness of domain-level scores
- Increased time limit from three hours to four hours to accommodate the increased test length
- Enhanced predictive capability with respect to future performance on the National Certification Examination (NCE)

One of the goals of the SEE reconfiguration was to improve its predictive validity. In other words, it was desirable that the SEE help educators understand how students would perform on future attempts of the NCE. Ideally, the educators would be assisted in identifying students who were "at risk" for failing the NCE. While the NBCRNA (2017, 2021) and other investigators (Goode et al., 2019) have released interim analyses evaluating the predictive accuracy of the SEE with regard to future performance on the NCE, a comprehensive analysis pooling data over multiple years has not yet been undertaken.

Recently, a panel discussion was presented at the annual Assembly of Didactic and Clinical Educators (ADCE) in Austin, TX. The objectives of the session were to:

- Familiarize the audience with the accumulated validity evidence of the SEE.
- Inform the audience as to the various uses of the SEE results and scores at various NAEPs.
- Enable the audience to defend certain uses of the SEE scores, citing relevant validity evidence.

The purpose of this report is to provide in written form the analytical component of that presentation; namely, the summaries of the survey-related information regarding usage of the SEE at programs, and the statistical analysis of the predictive value of the SEE.

Data Sources and Methods

In the analyses which follow, 2 sources of data were used, (1) a survey of nurse anesthesia educational program (NAEP) administrators, and (2) examination results since the launch of the reconfigured SEE exam in September 2016. For the former, a X-question survey evaluating various uses of the SEE was sent to NAEP directors and assistant directors on December X, 2022. Responses provided by January X, 2023 were included in the descriptive summaries provided here. For the latter analysis, results from all SEE examinations since September 1, 2016 were queried from the NBCRNA database. These results were filtered to include only the final SEE administration before the student's program graduation date. Finally, the latest SEE administration was linked to the result of the student's first attempt of the NCE. The resulting data set included a total of 8,552 unique students final SEE results linked to first-time NCE

results. The analysis consisted of computation of the Pearson correlation between SEE and NCE scaled scores, graphical inspection of the association between SEE/NCE scores via an X-Y 'scatter' plot, and descriptive statistics comparing SEE scores of those who eventually passed the NCE (1st time) vs. those who eventually failed the NCE.

Results

Survey

The summaries presented here are based on 107 (53 program directors, 48 assistant directors, 6 Other) responses to the faculty survey (response rate 36%):

- 92% of respondents reported having students take the SEE their 3rd year in the program, and 73% of respondents reported having students take the SEE in their 2nd. Very few (5%) respondents reported having students take the SEE in their 1st year.
- 88.3% of **faculty** agreed that the SEE is a valuable predictor of NCE
- 72% of respondents said their programs set a minimum benchmark score **for graduation**.
    - The mean "benchmark" score reported by programs was computed as 430 (SD=15)
    - 14.7% use the SEE as a requirement for graduation which does NOT include meeting a benchmark score
- When asked to provide the sources used to determine a benchmark score, respondents indicated that they were guided by:
    - NBCRNA published reports
        - Average score of NCE passing candidates
        - Averages of Year 2 and Year 3 students
        - Percentiles (e.g. setting bench mark score at 80th percentile of national performance, based on SEE Interpretive Guides)
    - Historical internal (program) data
    - Consultation with other programs
- Suggestions for future changes to the SEE included:
    - Performance summaries on the specific areas of the content outline, not just at the domain level (e.g., Anatomy, Chemistry, Pharmacodynamics, Obstetrics, Geriatrics)
    - Timely, consistent, usable reporting by NBCRNA
    - Reporting layers by program characteristics (e.g. front-loaded vs. integrated)

Predictive Value

The Pearson correlation between the two sets of scores was r = 0.58 (p<<0.01). This result represents a strong positive correlation between SEE performance and NCE performance. That is, about 36% of the variation in NCE scores can be explained solely by performance on the SEE. In assessment context, it is common to compute an adjusted correlation, which acknowledges that no scores are perfectly reliable and controls for the presence of measurement error. The equation for deattenuated correlation is given:

$$\frac{\rho_{xy}}{\sqrt{r_{xx} r_{yy}}}$$

where ρ_{xy} is the raw correlation between SEE scores and NCE scores (0.57),

r_{xx} is the reliability of SEE scores (0.93), and

r_{yy} is the reliability of NCE scores (0.83).

Thus, the deattenuated correlation between NCE and SEE scores is 0.64.

Figure 1 displays the X-Y scatter diagram, graphically depicting this association, with each point representing a student's SEE score on the X (horizontal) axis and NCE score on the Y (vertical) axis).

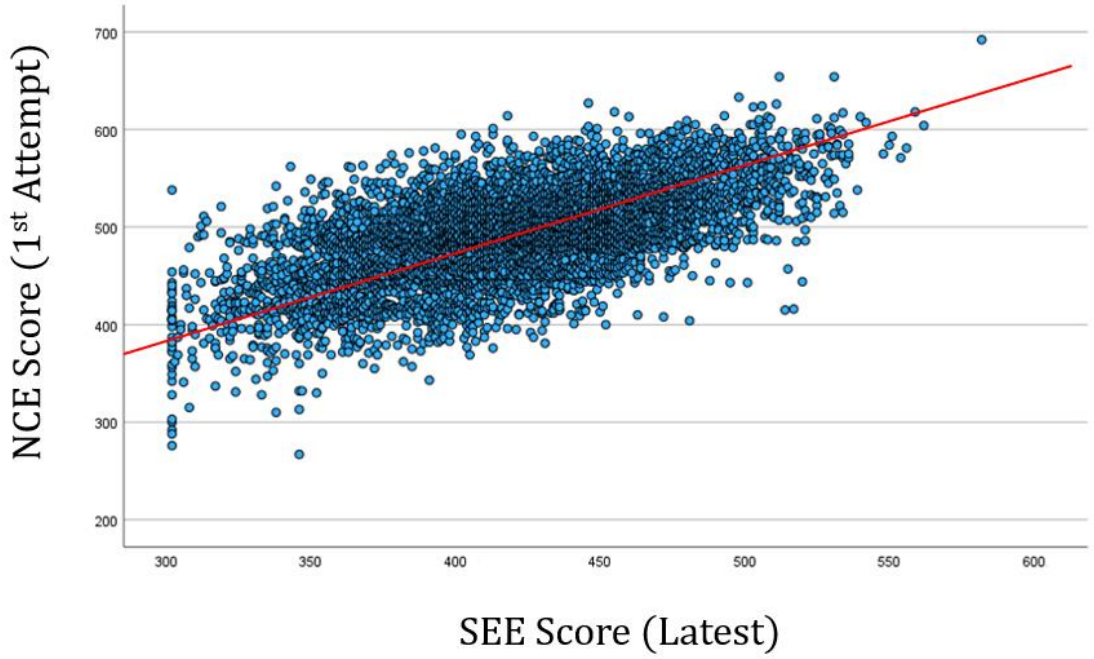

Figure 1. X-Y plot SEE Scores vs. First-time NCE Scores, 2016-2022

Figure 2 presents a comparative view of the SEE scores for the NCE passing and failing groups. Clearly, the relative position of the SEE score distribution for the eventual NCE passers is higher than of the NCE

non-passers. In other words, there is a clear upward shift in SEE scores for students who eventually passed NCE at their first attempt. However, there was a fair degree of overlap between the two score distributions.

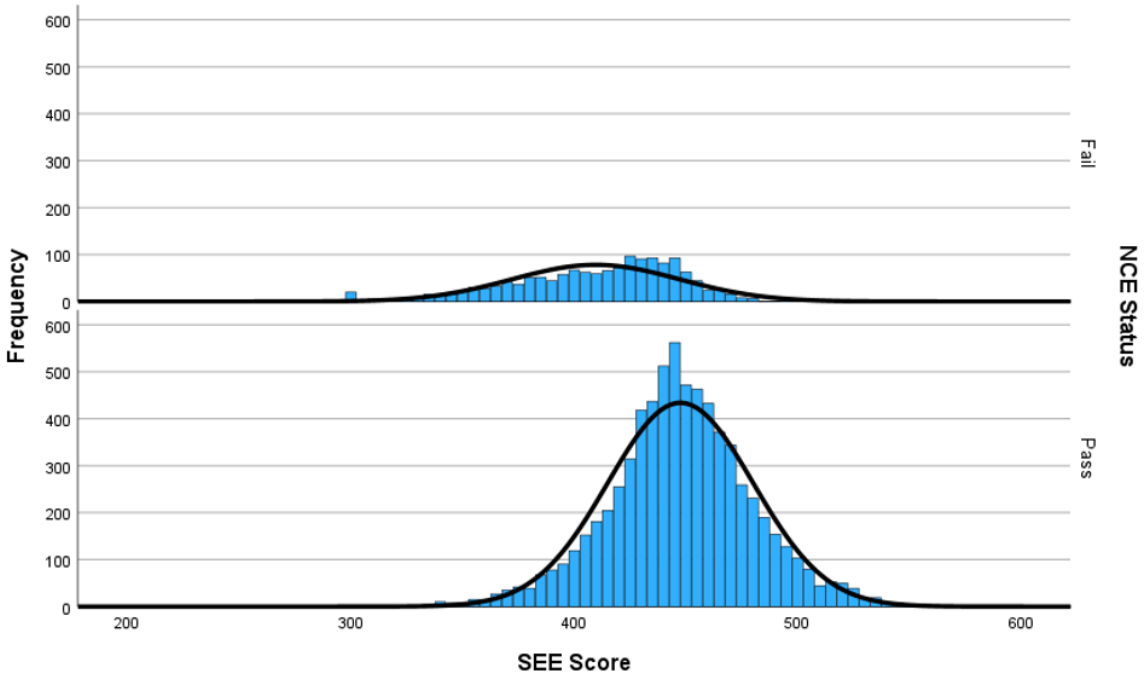

Figure 2. Normal Distributions of SEE Scores for Passing vs. Failing First NCE Attempt

Table 2 represents in tabular format what is depicted visually in Figure 2, summarizing the SEE score for both the eventual passing and failing groups of the NCE. Again, the retrospective mean SEE scores for those who pass the NCE are higher than for those who fail the NCE.

Table 2. Summary of SEE Scores by First-Time NCE Performance, 2016-2022

First-Time NCE Performance	N	SEE Score	
		Average	SD
Fail	1,471	409.6	37.5
Pass	7,081	447.5	32.6

Discussion

The analysis and evaluation of the SEE examination data showed results consistent with previously published results and confirmed once again that the New SEE has met its intended goals to a considerable extent. The NBCRNA will continue to collect data and to publish evaluation results along the dimensions of performance, testing time, predictive validity, examination reliability, and stakeholder perceptions for the effectives use of the SEE program.

Based on the analysis conducted here, the SEE continues to provide significant value to NAEP faculty and students. The survey results indicate positive support for the changes the SEE implemented in 2016. The correlational analysis indicated moderate-to-strong, positive correspondence between performance on the SEE and NCE.

Under significant pressure to achieve a certain 1st time pass rate for accreditation, NAEPs often find it useful / necessary to adopt a threshold SEE score to identify students who may be at risk of failing the NCE. Regarding this use of the SEE, the NBCRNA strongly cautions against imposing a minimum score for graduation or program continuance; this is a misuse of the SEE which goes beyond its purported intent. Remediation should first and foremost rely on domain-level performance to identify areas of strength and weakness. If programs feel compelled to use overall SEE scores to identify students in need of intervention (additional, intentional, preparation, for the NCE), these benchmarks should be established on an objective basis.

One such method to establish an objective threshold is based on the *Contrasting Groups* standard setting method (citation). The contrasting group method involves computing the mid-point between the mean SEE scores for the NCE passing and failing groups. Using the data in Table 2, the mean SEE score for those who went on the pass the NCE is 447.5, while the mean SEE score for those who eventually failed the NCE was 409.6. The mid-point between these two means is given:

$$\frac{409.6 + 447.5}{2} = 428.6$$

Thus, based on the data accumulated thus far, it would be reasonable to say that any student who scores less than 429 on the SEE would more than likely fail their first attempt on the NCE. Please note that this threshold score is only suggested as a guideline. While the new SEE scores suggest higher reliability, and improved predictive validity, there is no perfect predictor of future performance. This threshold could also be subject to change if the NBCRNA changes the NCE passing standard in the future.

Finally, while the SEE continues to demonstrate value to its stakeholders, the NBCRNA is committed to further enhancing the value of this examination. The recently approved Research Agenda for the organization takes up the question, “Is the SEE providing nurse anesthesia educational program faculty useful information or are additional enhancements needed?.” The Evaluation and Research Advisory Committee (ERAC) of the NBCRNA will attempt to answer this question in the coming years via a mixed-method / multi-method approach consisting of qualitative and quantitative methodologies.

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