

# The Use of High-Fidelity Simulation in the Admissions Process: One Nurse Anesthesia Program's Experience

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*Nurse anesthesia programs across the country are frequently in search of better selection criteria and more efficient evaluation systems. The goal is to select qualified applicants who will successfully complete the program and represent the profession of nurse anesthesia. The primary method of assessing the quality of candidates' noncognitive attributes at the Oakland University Beaumont Program of Nurse Anesthesia (Royal Oak, Michigan) was by face-to-face interviews. The admissions committee believed that high-fidelity simulation may be a valuable tool to improve the overall admission process. For the 2008 application interview process, high-fidelity simulation was used as a method of simultaneously evaluating candidates' cognitive and noncognitive attributes, in addition to the traditional face-to-face interview.*

*On completion of the admission interview process, a retrospective research design was used to identify a possible correlation between high-fidelity simulation performance scores and other candidate characteristics. The findings of this pilot study revealed a positive correlation between simulation and face-to-face interview scores, suggesting that candidates who exhibited desirable noncognitive attributes in the face-to-face interview also performed well in the simulation environment. The use of high-fidelity simulation as an interview tool may provide an innovative adjunct for admission committees in assessment of candidates.*

**Keywords:** Admission, interview, graduate nurse education, nurse anesthesia, simulation.

Admission into nurse anesthesia programs is known to be a competitive process among a diverse pool of candidates. The admissions committee at the Oakland University Beaumont Program of Nurse Anesthesia, Royal Oak, Michigan, recognizes the need to develop assessment methods that are useful in identifying not only scientific and technical competency but also essential personal characteristics necessary to be successful in a rigorous academic curriculum. The goal of the admissions committee is to select candidates who will be successful in the program and as future clinicians.<sup>1</sup> The literature reveals a consensus that the assessment of cognitive and noncognitive attributes should be incorporated into the admissions process.<sup>2,3</sup> Specifically, various researchers have examined desirable cognitive and noncognitive candidate qualities for nurse anesthesia programs.<sup>4,5</sup> Cognitive factors include undergraduate grade point average (UGPA), Graduate Record Exam (GRE) scores, and critical thinking examinations.<sup>4</sup> Noncognitive attributes

are exhibited through examination of leadership qualities, sharing of thoughts and ideas through communication, interpersonal interactions, expression of formulated thought in written essay, and articulation during the interview process.

This program used face-to-face interviews as a primary method of assessing noncognitive attributes of candidates. With the availability of high-fidelity simulation (HFS) in the program, the admissions committee believed this tool would be able to assess cognitive and noncognitive attributes of candidates. For the 2008 application and interview year, the use of HFS was implemented for the first time as part of the admission process.

High-fidelity simulation replicates real-life clinical scenarios of normal and pathologic human conditions using manikins equipped with computer-adaptive software.<sup>6</sup> Simulation scenarios require the participant to display cognitive and noncognitive attributes to effectively manage the problem presented in the scenario.<sup>7</sup> Simulation has been successfully used in healthcare for

Overall interview score
UGPA score
Simulation test score
Writing scores
Goal statement
Interview essay
ICU years experience score
Professional involvement score
Total RN years experience
GRE scores
Initial nursing degree type (ADN/BSN)

**Table 1. Summary of Applicant Profile Data**

Abbreviations: ADN, associate degree in nursing; BSN, bachelor of science degree in nursing; GRE, Graduate Record Examination; ICU, intensive care unit; UGPA, undergraduate grade point average.

skills attainment and mastery, promotion of safety in the workplace, teamwork, and collaboration.<sup>6-10</sup> Use of HFS as an interview tool in graduate nurse anesthesia programs has not been studied to date. This pilot study evaluated the HFS performance scores of candidates to determine if a correlation existed with performance in other candidate data profile categories (Table 1 and Table 2) and to determine the usefulness of HFS in the interview process to identify high-quality candidates for the program.

Ziv et al<sup>3</sup> examined the use of simulation scenarios for the medical school admissions process, specifically identifying ways to evaluate noncognitive attributes of the candidates. The study was performed in Israel and used the Hebrew acronym MOR that represents “selection of medicine.” The 5 noncognitive traits of responsibility, self-awareness, communication skills, maturity, and management of stressful situations were evaluated through the simulation interview methods. By simulating true-to-life scenarios and observing a candidate’s actions, Ziv et al<sup>3</sup> hypothesized that the candidate’s innate noncognitive traits could be observed.

Subjects from 2 consecutive cohorts were tested with a total of 588 participants.<sup>3</sup> Included in the interview admissions process were the simulation behavioral stations, a “judgment and decision-making questionnaire,” and a “biographical questionnaire.”<sup>3(p994)</sup> The authors referred to these 3 noncognitive components as MOR tools. Individual noncognitive scores were weighted for use in admission decisions. Greater weight was placed on the simulation exercises because they represented a greater proportion of the noncognitive evaluation.<sup>3</sup>

Data analysis concluded that “moderate correlations were found among the 3 noncognitive MOR components, indicating the similarity of the (noncognitive) attributes

Scored categories	Percentage of candidate’s overall score
Interview	40
Simulation	20
Undergraduate grade point average	10
Intensive care unit experience	10
Professional involvement	10
Writing (interview essay/goal statement)	10

**Table 2. Candidate Scoring Tool**

they measure.”<sup>3(p995)</sup> Low correlation between cognitive scores and MOR scores showed that personality characteristics were not assessed effectively through traditional cognitive testing. As a result of the implementation of simulation-based scenarios for medical school candidate selection, there was a 20% amendment in the selection of candidates.<sup>3</sup> Several candidates who previously would have been selected based on high cognitive scores were not chosen because of the low noncognitive scores that they received in the MOR process.<sup>3</sup> This study demonstrated that simulation may be a more effective evaluation of noncognitive skills than a face-to-face interview in the selection of candidates for medical school.

## Method

This pilot study was performed using a retrospective correlational design. The convenience sample was composed of all candidates selected to interview for the Oakland University Beaumont Graduate Program of Nurse Anesthesia during the 2008 interview cycle (N = 70). Application to the program and, as a result, inclusion criteria mandated the following: candidates must be older than 18 years, have a bachelor of science degree in nursing, a minimum UGPA of 3.0, and a minimum of 1 year of intensive care unit (ICU) nursing experience. Applications for institutional review board approval from Beaumont Hospital and Oakland University were submitted; exemption status was granted by both institutions.

The HFS process took place at the Marcia and Eugene Applebaum Surgical Learning Center at Beaumont Hospital, Royal Oak. The 5,000-square-foot state-of-the-art center has an HFS laboratory that contains 2 full-sized mock operating rooms and uses SimMan 3.3 (Laerdal Medical, Wappingers Falls, New York) computer technology with a life-sized adult manikin. Two Certified Registered Nurse Anesthetists (CRNAs), holding positions as trained simulation coordinators for the center, scored the candidates’ performance during the HFS session.

A simulation interview evaluation tool (SIET) (Table 3) was developed by members of the program administration and the 2 CRNA simulation coordinators for use specifically during the admissions process. In develop-

ment of the SIET, noncognitive and cognitive traits that are desirable in nurse anesthesia candidates were identified. These traits were then operationalized into behavioral performance categories. Cognitive performance categories included the following: (1) identifying the patient problem through proper assessment, (2) describing possible physiologic causes, (3) developing and verbalizing a treatment plan, and (4) successfully implementing the treatment plan. Noncognitive performance categories included the following: (1) ability to ask for help or request resources from team members as needed, (2) receptiveness to assertion and ideas from team members, (3) effective use of communication skills, and (4) ability to function as a team leader. Together, the noncognitive and cognitive performance categories formed 8 core objectives. With these 8 core objectives incorporated, the tool evaluated the candidates' ability to perform cognitive and noncognitive functions. The SIET allowed a maximum score of 24. Each core objective was scored on a scale from 1 to 3: 1, the candidate failed to exhibit any behavior that met the objective; 2, the candidate partially met (ie, needs improvement) the objective; and 3, the candidate completely met the objective. Therefore, because there were 8 core objectives, the minimum score a candidate could achieve was 8. The SIET was previously untested for use in research.

As stated, 2 CRNA simulation coordinators participated in the development of the SIET. Each testing session was facilitated and scored by 1 of the 2 simulation coordinators. Before testing, the candidates received a standardized orientation to the HFS laboratory. The coordinator then introduced the clinical scenario to the candidates. The clinical scenarios were performed in a group setting. Each group consisted of 3 candidates. The candidates performed the scenario and were scored using the SIET. The evaluator was concealed from candidates behind a 1-way mirror; therefore, candidates were unable to receive visual cues during scenario testing.

For each candidate, a complete candidate data profile (see Table 1 and Table 2) was created using a scoring system consisting of the SIET score, UGPA, 2 writing samples, face-to-face interview, years of total nursing experience, years of ICU experience, professional involvement, GRE scores, and first nursing degree obtained (associate degree in nursing or bachelor of science degree in nursing). These

Objective	Applicant A		Applicant B		Applicant C	
	No	Needs improvement	Yes	No	Needs improvement	Yes
The applicant was able to identify the problem through proper assessment (ie, hypovolemia due to low CVP, BP, and tachycardia).						
The applicant was able to describe possible causes (postoperative bleeding, inadequate fluid replacement in OR, etc).						
The applicant was able to develop and verbalize a treatment plan.						
The applicant was able to ask for help or request resources from team members as needed.						
The applicant was receptive to assertion and ideas from team members.						
The applicant was able to properly treat the problem (give fluids, ask for lab work, CBC, etc).						
The applicant used effective communication skills:						
Addressed team members by their names;						
Addressed the patient by name;						
Used appropriate tone of voice;						
Made proper eye contact.						
The applicant served as a team leader.						

**Table 3. Simulation Interview Evaluation Tool (SIET)**

Abbreviations: BP, blood pressure; CBC, complete blood cell count; CVP, central venous pressure; OR, operating room.

UGPA range	Scaled score
3.90 - 4.00	10
3.80 - 3.89	9
3.70 - 3.79	8
3.60 - 3.69	7
3.50 - 3.59	6
3.40 - 3.49	5
3.30 - 3.39	4
3.20 - 3.29	3
3.10 - 3.19	2
3.00 - 3.09	1

**Table 4.** Weighted Scoring of Undergraduate Grade Point Average (UGPA)

data were compiled and yielded a total overall candidate profile for the purpose of this research study (see Table 1 and Table 2). Of note, the admissions committee at this nurse anesthesia program also assigns each candidate an overall quantitative score based on the aforementioned categories. As total admission slots allow, admission is offered to the first number of candidates having the highest overall scores.

The raw values of UGPA and total years of ICU nursing experience were assigned a numeric value based on a set scoring system (Table 4 and Table 5). For example, a UGPA of 3.9 to 4.0 was reflected by a score of 10 (see Table 2) and candidates with 4 or more years of ICU nursing experience received a score of 4. Professional involvement was numerically categorized. Candidates could receive from 1 to 4 points based on their level of involvement. In addition, candidates could receive 1 to 4 points for their 2 submitted writing samples. The first writing sample, a goal statement, was submitted as part of the admissions screening process. The second writing sample was an essay written on the day of the interview on an assigned topic (Table 6). Three separate panels interviewed each candidate. A total interview score of 1 through 12 was given to each candidate.

Candidate data profiles were then submitted for statistical analysis. Statistical analysis was performed by using the SAS system for Windows, version 9.1.3, Service Pack 4 (SAS Institute, Cary, North Carolina). The purpose of the statistical analysis was to determine whether a relationship existed between a candidate's SIET score and other scored admission data (see Table 1).

## Results

To maintain research ethics, we were not given descriptive data such as age, race, or gender of the sample population. Because of the limited sample size, such descriptive data would have resulted in the possible identification of specific candidates.

ICU experience	Scaled score
> 4 y	4
3 y to 3 y 11 mo	3
2 y to 2 y 11 mo	2
1 y to 1 y 11 mo	1

**Table 5.** Weighted Scoring of Intensive Care Unit (ICU) Experience

Scoring criteria	Score
Excellent content/no errors	4
Excellent content/few errors	3
Good content/few errors	2
Poorly written	1

**Table 6.** Goal Statement and Interview Essay Scoring

The Spearman correlation test ( $P < .05$  indicated a statistically significant correlation) was used to examine face-to-face interview scores and SIET scores. A positive linear relationship was found between the 2 variables ( $P = .418$ ;  $P = .003$ ). When examining the performance of candidates receiving an associate degree in nursing before completion of a bachelor of science degree in nursing, the analysis showed that there was no statistical difference in SIET scoring between the 2 degree paths ( $P = .87$ ). The relationship between SIET scoring and years of ICU nursing experience was analyzed by using the Kruskal-Wallis test ( $P < .05$  indicated a statistically significant correlation). When comparing the 4 categories of years of ICU nursing experience with SIET scoring, there was no significance between the median values of the 4 categories ( $P = .51$ ; Table 7). By using the Spearman correlation test, no pattern between SIET score and total years of nursing experience was established ( $P = -.009$ ;  $P = .94$ ). The Kruskal-Wallis test was used to examine a possible relationship between scores received for each of the 2 writing samples and SIET performance scores; no relationship was found. The relationship between SIET scores and UGPA scores was plotted; no linear relationship was found ( $P = .02$ ;  $P = .88$ ). Candidates with a UGPA of 3.5 or more were not required by admissions guidelines to submit a GRE score. Therefore, the sample size for this category of candidates was 21. No relationship between the 2 variables was established ( $P = -.022$ ;  $P = .34$ ). Finally, the category of scored professional involvement (Table 8) was found to have no statistical relationship with SIET scores ( $P = .79$ ).

## Discussion

The purpose of this pilot study was to assess whether candidates' HFS performance scores correlate with performance in other candidate data profile categories. The results showed a correlation between face-to-face inter-

SIET score	Years of experience in ICU				P
	1 (n = 12)	2 (n = 36)	3 (n = 11)	4 (n = 11)	
Mean ± SD	19 ± 3	19 ± 4	18 ± 4	20 ± 4	.87
Median (25th, 75th percentile)	19 (17, 21)	21 (16, 24)	17 (15, 21)	21 (16, 24)	
Minimum to maximum	14 to 21	9 to 24	11 to 24	14 to 24	

**Table 7.** SIET Score Versus ICU Experience

Abbreviations: ICU, intensive care unit; SIET, simulation interview evaluation tool.

Scoring criteria	Score
Write, publish, teach	4
Preceptor/charge	3
Journal subscription/committees	2
No professional involvement	1

**Table 8.** Professional Involvement Scoring

view scores and SIET scores. For candidates who exhibited desirable noncognitive attributes in the face-to-face interview, we would have expected a trend of high scores in other noncognitive categories such as writing samples and professional involvement. This trend was not found.

The profession of nurse anesthesia requires a person to have high levels of cognitive and noncognitive functioning. The cognitive skills evaluated by the SIET examined candidates' ability to manage basic critical care scenarios. The researchers are aware that related to performance in HFS settings, nurses with previous exposure to HFS clinical teaching or learning environments may be at an advantage over nurses with no exposure to HFS. Nurses at all levels of experience were able to achieve a high score when being evaluated by the SIET, which was reflected by the median SIET scored performance exhibiting an arbitrary difference across the various levels of ICU experience. The finding of "no difference" suggests that the HFS scenarios and SIET cognitive objectives were appropriately matched to assess the level of basic critical care skills.

This study presented us with various limitations. Because of the retrospective study design, we did not have control over the scoring methods used by the admissions committee to assign quantitative values to certain cognitive and noncognitive categories. These variables included face-to-face interview scoring methods, numeric methods of scoring ICU experience and UGPA, method of evaluation and scoring for writing samples, and SIET development. Because this study relied heavily on candidate SIET scores, development of the SIET was a substantial limitation of the study. The SIET was a pilot tool that had not been previously tested. Therefore, future validation of the SIET may provide other educators with a valuable tool for candidate selection. Because

of a change in employment, neither CRNA evaluator was available for the establishment of interrater reliability at the time of this study.

The study's convenience sample was limited to 70. When looking at subcategories of data, such as GRE scores, the number of observations limited the ability to reliably examine the presence of statistically significant relationships. Ziv and colleagues<sup>3</sup> used different scenarios daily to prevent skewing of data because of candidates having prior knowledge of specific testing scenarios. Implementation of these methods would be advisable for future studies.

Ziv and colleagues<sup>3</sup> were able to conclude that the simulation process is a valid method for evaluating noncognitive traits in medical school applicants. The study's prospective design, extensive tool development and testing, and establishment of interrater reliability contributed to the strength of the study's findings. Because of the limitations previously discussed, it cannot unequivocally be concluded that combining the use of face-to-face interviews and HFS in the admission process is a valid method for evaluating cognitive and noncognitive traits in nurse anesthesia program candidates. Ziv et al<sup>3</sup> also were able to examine how the incorporation of simulation into the interview process changed which candidates were ultimately accepted into their program. Because we could not control the method of the admission interview process, the data were not present to examine this effect in the nurse anesthesia admissions process.

We agree with Ziv and colleagues<sup>3</sup> that future longitudinal studies examining the value of simulation as a predictor of success need to be performed. Ziv et al<sup>3</sup> incorporated ethical dilemmas into the interview process. We recommend for future studies that the addition of ethical dilemmas into HFS scenarios may be of interest.

## Conclusion

Incorporating HFS into the interview process may provide a useful tool to assist admissions committees in identifying "best" candidates for nurse anesthesia programs. The findings of this study revealed a positive correlation between face-to-face interview scores and SIET scores, which shows that candidates who performed well in face-to-face interviews also performed well in

simulation scenarios. The corresponding relationship between these scores suggests that the use of HFS as an interview tool may offer an additional method for admissions committees to pinpoint the attributes of successful candidates. Future studies examining the use of HFS in nurse anesthesia interviews are necessary. Nationally, the incorporation and study of HFS in the nurse anesthesia admissions process may be limited by the lack of availability of HFS laboratories in all nurse anesthesia programs. Studies with larger samples would be necessary to draw conclusions. With improved methods, perhaps additional relationships between candidate data profile variables and HFS performance can be demonstrated. We recognize the limitations of this pilot study, yet we are confident that the use of HFS has a place in the interview process for nurse anesthesia programs. If awareness regarding the value of this interview tool continues to expand, this new paradigm may become an accepted practice for other nurse anesthesia programs.

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