

Predicting Success in Nurse Anesthesia Programs: An Evidence-Based Review of Admission Criteria

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Nurse anesthesia programs strive to minimize attrition due to academic reasons and maximize student success. The authors examined the evidence for evaluating applicants to nurse anesthesia programs that may help predict success in the program and on the National Certification Examination for Nurse Anesthetists.

A search strategy guided gathering of evidence from peer-reviewed journals. Evidence from non-anesthesia graduate nursing programs was included because of the suspected lack of evidence specifically examining nurse anesthesia programs. Eight sources involved solely graduate nurse anesthesia programs, 9 involved graduate nursing programs without student registered nurse anesthetists, and 2 pertained to graduate nursing programs with student registered

nurse anesthetists. Most of the evidence sources were descriptive studies.

The evidence overall supports current commonly used admissions criteria such as undergraduate grade point averages. The requirement for applicants to take the Graduate Record Examination should be examined closely. Programs should also consider the length of time the applicant has been out of a formal educational setting.

Based on these findings, programs may cautiously explore revising the admission policy. Further investigations are proposed to explore the predictive value of various admission criteria.

Keywords: Admission selection criteria, education, academic success, nurse anesthetist, review article.

Nurse anesthesia is a demanding field of advanced practice nursing. Several years of preparation are necessary to become a Certified Registered Nurse Anesthetist (CRNA). An applicant must possess a bachelor of science in nursing (BSN) or a bachelor's degree in a related field and have at least 1 year of acute care experience¹ as well as meeting other specific admission criteria, including past academic performance and scores on standardized tests.

Although there are minimum standards for admission to nurse anesthesia educational programs (NAEPs), imposed by both the Council on Accreditation of Nurse Anesthesia Educational Programs (COA)² and individual programs, applicants vary in how well they perform once enrolled. An applicant may meet or exceed the minimum criteria but struggle, fail the program, or fail the National Certification Examination for Nurse Anesthetists (NCE). Failing the NCE, albeit rare,³ may be considered analogous to being unsuccessful in the NAEP because NCE success is required to practice as a CRNA. A review of the evidence supporting admission criteria will help NAEPs formulate an evidence-based selection process.

History and Review of the Literature

There are currently 112 graduate-level NAEPs in the United States. Programs provide a science foundation along with clinical anesthesia experience to prepare students to become competent nurse anesthetists. Students spend 24 to 36 months learning the art and science of nurse anesthesia.⁴ The total tuition depends on whether the student is paying in-state or out-of-state tuition and ranges from less than \$10,000 to more than \$70,000, with approximately half of the programs costing approximately \$21,000 to \$60,000.³ Recent graduates were in the clinical setting for a mean of about 2,000 hours and administered an average of approximately 800 anesthetics.⁵ The number of hours and cases vary depending on the facility caseload, location, time of year, and specialty rotations.

The COA calls for programs to monitor student attrition. The Selection and Evaluation Committee of the COA reviews these data. Excessive student attrition or NCE failures may result in a change of the program's accreditation status.⁶ Students leave programs or fail the NCE for other than academic reasons, but it is imperative that programs choose applicants likely to succeed in the rigorous course of study.

Materials and Methods

• **The PICO Question.** The patient or population, intervention, comparison, and outcome (PICO) format is extensively used in evidence-based practice to guide the search for the current best evidence to address a problem.⁷ The question guiding this evidence-based review in the PICO format was as follows: For nurse anesthesia program students (population), what components of admission evaluation (intervention) best predict program completion and NCE success (outcome)? For this question, there is no comparison element of PICO format because evidence supporting the factors that best predict success were sought.

• **Search Strategy.** A literature review was conducted using PubMed, Cumulative Index to Nursing & Allied Health Literature (CINAHL), Trip, ProQuest, SumSearch, and Google Scholar for the years 1980 to 2011. Search terms, used alone and in combination, included “success in nurse anesthesia programs”, “attrition in nurse anesthesia”, “student registered nurse anesthetist success”, “student registered nurse anesthetist attrition”, “nurse anesthesia education”, “success”, and “national certification exam”.

Inclusion criteria included English-language sources published in peer-reviewed journals addressing student success in graduate nursing programs, including nurse anesthesia programs, or success on the NCE. Unpublished theses and dissertations were not included because these works do not undergo the level of peer review of a journal article. Evidence from nonanesthesia graduate nursing programs was included because of the suspected lack of evidence specifically examining nurse anesthesia programs. One author (KHO) manually searched the *AANA Journal* index for pertinent sources of evidence from 2000 to present. Reference lists were also reviewed for additional evidence sources. Because of the likelihood of the lack of higher level evidence, inclusion criteria ranged from lower level expert opinion to higher level randomized controlled trials and systematic reviews.

The evidence was evaluated and leveled according to the system proposed by Melnyk and Fineout-Overholt,⁸ in which evidence is graded from level I (systematic reviews) to level VII (expert opinion). For instance, descriptive studies (level VI evidence) were examined for the presence of factors such as representative and well-defined sample of students or graduates, a follow-up period that was sufficiently long and complete, and use of objective and unbiased outcome criteria.

Results

Nineteen lower level evidence sources were located in the literature search.⁹⁻²⁷ The Table offers a summary of the evidence. Eight sources involved solely graduate nurse anesthesia programs,^{9-11,13,15,16,26,27} 9 involved graduate nursing programs without student registered nurse anesthetists (SRNAs) or did not indicate whether

the programs included SRNAs,^{14,17-23,25} and 2 pertained to graduate nursing programs with SRNAs.^{12,24} Most of the evidence was from descriptive studies^{9-12,14-18,20-27} because it is very difficult or ethically impossible to conduct randomized controlled trials.

Overall, the evidence was of low quality and usually contained small sample sizes from retrospective observational studies. There was no evidence from systematic reviews with meta-analysis. The evidence, recognizing the overall low quality, somewhat supported commonly used admissions criteria in predicting successful outcomes in NAEP. These criteria are discussed here.

• **Bachelor of Science vs Other Bachelor's Degree.** Munro and Krauss²¹ found that “intelligent, motivated individuals are able to acquire skills through self-learning and professional experience that are usually provided in baccalaureate nursing programs.” Regardless of the type of baccalaureate degree or experience, motivated students do equally well.²¹ Weaknesses of this study were that no SRNAs were included, it was conducted at only 1 university, and the design of the study was retrospective. However, the sample size was large (435 students).

In a study of solely nurse anesthesia program graduates, the investigator did not find a significant correlation between the type of undergraduate nursing degree (diploma plus baccalaureate, associate plus baccalaureate, or BSN) and score on the NCE.²⁷ The sample size was large, but it is an older study, and the NCE has changed since the study was conducted.²⁷

• **Undergraduate Grade Point Average.** Using stepwise multiple regression, Hansen and Pozehl¹⁴ found that undergraduate grade point average, or GPA (UGPA), and total score (verbal plus analytical scores) on the Graduate Record Examination, or GRE (GRE-total), significantly predicted graduate GPA (GGPA) ($R^2 = 0.34$, $P < .001$). Potential problems with this 1995 investigation include a sample of non-SRNAs, the use of an ex post facto design, and the age of the investigation.¹⁴ In another study of nursing graduate students (including nurse anesthesia students), there was a 99% probability of success when the applicants' UGPA was 3.25 or higher and nursing GPA was 3.0 or higher.²⁴

Findings from an older study²⁷ (1992) examining nurse anesthesia program graduates suggested that GPA from undergraduate science courses (undergraduate science GPA) was indicative of success on the NCE. The findings of this study indicated that undergraduate science GPA accounted for 24% of the variance ($P < .01$) in the overall NCE score.²⁷ Not only is this study dated, it did not include admission data for students who were dismissed from programs before taking the NCE, and the NCE has been changed since this study was conducted.

A recently published study⁹ examined the relationship between UGPA, undergraduate science GPA, GRE-total, and years of critical care experience and academic status for students admitted to nurse anes-

thetia programs. Undergraduate GPA, undergraduate science GPA, and GRE-total were significantly ($P < .001$) positively correlated with academic status, with UGPA having the strongest correlation ($R = 0.313, 0.279, 0.153$, respectively). The investigator found that for every 1-unit increase in UGPA, current GPA increased by 0.264 units. Also, for every 1-unit increase in undergraduate science GPA, current GPA increased by 0.118 units. Strengths of this study included a large sample size (914 students), and it used data exclusively from nurse anesthesia programs.⁹ Despite the large sample size, the data were from less than one-fourth of the nurse anesthesia programs in the United States. "Academic status," not success, was used as a dependent variable. "Academic status" may have been defined differently across the programs. These findings seem to confirm the opinions of surveyed NAEP clinical faculty¹¹ and NAEP directors.¹⁵

• **Graduate Record Examination Scores.** Several studies^{14,17,20,22,24} suggested that GRE scores may help predict student success in graduate nursing programs, but none of these included SRNAs. Hansen and Pozehl¹⁴ found that for nonanesthesia graduate nursing students and using stepwise regression, undergraduate nonnursing GPA and GRE-verbal scores significantly predicted GGPA ($R^2 = 0.32, P < .001$). In contrast, another study involving non-SRNA graduate students found that GRE-verbal scores contributed to 5% of the variance in nursing theory GPA and an insignificant correlation in total GPA in graduate nursing programs.²⁰

Other investigators found GRE scores were weakly correlated with GGPA for all students in various non-anesthesia graduate nursing programs.¹⁷ After combining graduate and doctoral program data, GRE scores were found to account for only 5% to 8% of the variance in GGPA. It was inferred that the barrier it presented to applicants outweighed the predictive value of the GRE. This study had a large sample size of 217 students, took place over 10 years, and fairly recently (2009) addressed admission criteria. However, this study included students from only 1 university and did not include SRNAs.¹⁷

In a study of 120 graduate nursing students (non-SRNAs) at Oakland University in Rochester, Michigan, investigators found that UGPA successfully predicted GRE verbal and quantitative scores ($P < .05$) when UGPAs were greater than 3.28.²³ The authors of this study suggested that both UGPA and GRE scores were not necessary for admission to graduate nursing programs when applicants possessed an UGPA of greater than 3.28.

A large recent study of master of science in nursing students (including SRNAs) found that if applicants had an UGPA of 3.25 or higher and a nursing GPA of 3.0 or higher, the GRE score added little predictive value.²⁴ If a combination of any 2 entry criteria were met (UGPA ≥ 3.25 , nursing GPA ≥ 3.0 , GRE-verbal ≥ 500 , GRE-quantitative ≥ 500), there was a 99% probability the applicant would be successful. The authors suggested that ap-

plicants who did not meet the GPA criteria take the GRE.²⁴

Results of a 2011 study⁹ suggested that the SRNA's GRE score was significantly positively correlated with student academic status. However, this correlation was not as strong compared with UGPA and student academic success and with undergraduate science GPA and student academic success. The researcher suggested that the GRE score offered little predictive value for student success.⁹ The findings of this study only somewhat agreed with a survey of nurse anesthesia program clinical faculty, who considered GRE score important but not essential.¹¹

• **Applicant Essay.** The applicant essay was found to contribute to 8% of the variance in predicting overall GGPA in 1 study.²⁰ In another study, which outlined the development of a new selection process for graduate nursing students, scoring the applicant essay using standard criteria was reportedly a helpful addition.²⁵ These 2 studies did not examine SRNAs.^{20,25}

• **Critical Care Experience and Applicant Age.** A narrative review indicated that "research studies have not yet identified a uniform set of skills and knowledge inherent in the traditional 1 year of critical care experience" (required for admission to NAEPs). The authors of this review did not address all admission criteria, but focused on describing clinical experience (a frequent admission criterion).¹³

A 1995 survey described the opinions of nurse anesthesia program directors about which admission criteria were most influential in the admissions process.¹⁵ Overall years of critical nursing care experience as well as GPA, interview performance, science GPA and years of critical care nursing experience were chosen as most important. Interview performance was chosen most often as the key factor in NAEP admissions. The authors did not evaluate the results with inferential statistics.

Although applicant age cannot be a discriminating admission factor, Zaglaniczny²⁷ found an inverse relationship between age and overall NCE score. Younger graduates achieved higher NCE scores than did older graduates ($R^2 = 0.263, P < .01$), but graduates with more nursing experience (average age, 31.39 years) scored higher on the NCE than did graduates with less nursing experience (average age, 32.75 years) ($R^2 = 0.267, P < .01$). A recent study found that years of critical care experience were negatively correlated with current graduate GPA ($R = -0.135, P < .001$).⁹

• **Nontraditional Criteria.** Megginson¹⁹ reviewed non-cognitive instruments and determined that there is "a paucity of relevant and psychometrically valid tools available to graduate admission committees." The author recommends further research to develop these instruments to assist in admissions. A limitation of this study is that few noncognitive instruments were available to review, and no mention is made of nurse anesthesia programs. A strength was the author's identification of the need for professional references to be completed on a standardized form.

Source	Design and level of evidence ^a	N	Sample	Outcomes
Burns, ⁹ 2011	Descriptive Level VI	914	SRNAs	UGPA ($R = 0.313$, $P < .01$), undergraduate science GPA ($R = 0.28$, $P < .001$), GRE-total ($R = 0.15$, $P < .001$), critical care nursing experience ($R = -0.14$, $P < .001$) together account for 14.5% of variability in progress in NAEP
Carroll-Perez, ¹⁰ 1996	Descriptive Level VI	63	SRNAs	No statistically significant relationship found ($P > .05$) between success on NCE and program variables examined (number of students per class, program length, program structure, date of graduation, etc)
Clayton et al., ¹¹ 2000	Descriptive Level VI	29	US military clinical NAEP faculty	Faculty rated student factors using Goodrich scale as desirable in students (0 = unimportant, 3 = essential), including integrity (2.97), judgment (2.90), commitment (2.79), hardiness (2.62), and clinical awareness (2.79)
Crosby et al., ¹² 2003	Descriptive VI	48	APN students (including SRNAs)	Most desired applicant characteristics included ethical/trustworthy, clinically competent, interpersonal skills, and experience in a setting with MD-RN interaction
Elnitsky et al., ¹³ 1999	Narrative review Level VII	NA	NAEPs	Discussed SRNAs; no universal set of skills and knowledge identified
Hansen and Pozehl, ¹⁴ 1995	Descriptive Level VI	59	Nursing master's degree program graduates (no SRNAs)	Using stepwise multiple regression: UGPA and GRE-total significantly predicted GGPA ($R^2 = 0.34$, $P < .001$); nonnursing UGPA and GRE-verbal scores significantly predicted GGPA ($R^2 = 0.32$, $P < .001$)
Haritos et al., ¹⁵ 1995	Descriptive Level VI	38	NAEP directors	Most often used in the applicant selection process: UGPA, interview performance, undergraduate science GPA, and years of critical care experience; no inferential statistical treatment of the data
Hulse et al., ¹⁶ 2007	Longitudinal prospective, descriptive Level VI	42	US Army Graduate Program in Anesthesia Nursing students	The only measures that were significant but weakly correlational with likeliness to succeed were external locus of control ($R = 0.24$, $P < .02$) and lower trait anxiety ($R = -0.24$, $P < .02$)
Katz et al., ¹⁷ 2009	Descriptive Level VI	217	Nursing master's degree program students (no SRNAs)	GRE presented a large barrier to application and only predicted 5%-8% of variance in GGPA ($R = 0.16$ - 0.24 , $P < .001$ - $.02$)
McEwan and Goldenberg, ¹⁸ 1999	Descriptive Level VI	41	Nursing master's degree program students (no SRNAs)	High trait anxiety was the only statistically significant predictor of academic success ($r = 0.3493$, $P = .054$)
Meggison, ¹⁹ 2009	Integrative review Level VII	NA	No mention of SRNAs	Lack of available noncognitive instruments; applicant's professional references should be in a standardized format
Munro, ²⁰ 1985	Descriptive Level VII	435	Nursing master's degree program students (no SRNAs)	Overall GGPA regressed on GRE-verbal, GRE-Q, UGPA, references, interview, and essay; these accounted for 10% of the variance ($P = .001$), but only the essay made a significant contribution to the explanation of the variance accounting for 8% of the variance ($P = 0.006$)

Munro and Krauss, ²¹ 1985	Descriptive Level VI	435	Nursing master's degree program students (no SRNAs)	No significant difference in success reported between students with a BSN or other type of bachelor's degree
Newton and Moore, ²² 2006	Descriptive Level VI	157	Nursing master's degree program students (no SRNAs)	Moderately strong relationship ($r^2 = 0.239$, $P < .01$) between the quality of work of goal statements and nursing theory final course grades
Newton and Moore, ²³ 2007	Descriptive Level VI	120	Nursing master's degree program students (no SRNAs)	UGPA > 3.28 predicts GRE scores (GRE-verbal, $P = .008$; GRE-Q, $P = .046$); concluded GRE not necessary if UGPA ≥ 3.28
Suhayda et al., ²⁴ 2008	Descriptive Level VI	738	Nursing master's degree program students (including SRNAs)	99% probability of success: UGPA ≥ 3.25 and nursing GPA ≥ 3.0 or combination of any 2 entry criteria were met (UGPA ≥ 3.25 , nursing GPA ≥ 3.0 , GRE-verbal ≥ 500 , GRE-Q ≥ 500)
Wilson, ²⁵ 1999	Descriptive, included large literature review Levels VI-VII	NA	Nursing master's degree program faculty (no NAEP faculty)	BSN GPA, California Critical Thinking Skills Test (CCTST), standardized references, and essay detailing career development and nursing experience are now used; school deleted the interview based on findings; no inferential statistical treatment of data
Wong and Li, ²⁶ 2011	Descriptive Level VI	10 ^b 25 ^c	Expert NAEP clinical faculty and NAEP education program faculty	Surveyed faculty identified characteristics beneficial for safe or unsafe nurse anesthesia practice, as determined by at least 80% of survey participants: 17 intrapersonal and 4 interpersonal characteristics identified for safe nurse anesthesia practice; 20 intrapersonal and 3 interpersonal characteristics identified for unsafe nurse anesthesia practice
Zaglaniczny, ²⁷ 1992	Descriptive Level VI	1,690	NAEP graduates	The following predicted performance on NCE ($P < .01$): science ($R^2 = 0.239$) and overall GPA ($R^2 = 0.271$), highest degree attained ($R^2 = 0.248$), gender ($R^2 = 0.256$), number of cases ($R^2 = 0.261$), age ($R^2 = 0.263$), and years of nursing experience ($R^2 = 0.267$)

Table. Summary of Evidence Sources Examining Factors Predicting Success in Nurse Anesthesia and Other Graduate Nursing Programs

Abbreviations: APN, advanced practice nurse; BSN, bachelor of science in nursing; GPA, grade point average; GGPA, graduate GPA; GRE, Graduate Record Examination; GRE-A, GRE-analytical scores; GRE-Q, GRE-quantitative scores; GRE-total, GRE-total scores (GRE-verbal + GRE-A); MID-RN, physician-registered nurse; NA, not available or not specified; NAEP, nurse anesthesia educational program; NCE, National Certification Examination for Nurse Anesthetists; SRNA, student registered nurse anesthetist; UGPA, undergraduate GPA.

^a From Melynk and Fineout-Overholt⁸: level I: systematic reviews with or without a meta-analysis; level II: well-designed randomized controlled trials; level III: well-designed controlled trials without randomization; level IV: well-designed case-control and cohort studies; level V: systematic review of descriptive and qualitative studies; level VI: single descriptive or qualitative study; level VII: opinion of authorities and/or reports of expert committees.

^b Expert Certified Registered Nurse Anesthetist clinical faculty.

^c Education program faculty of nurse anesthesia program.

One author detailed the development and implementation of a new graduate student selection method for a nonanesthesia graduate nursing program.²⁵ In this report, the admissions committee reviewed the literature for an alternative method of applicant selection. The findings of the committee's literature search led to the decision to discontinue the face-to-face interview process and to base admissions decisions on the applicants' BSN GPA, score on the California Critical Thinking Skills Test, references using a standardized format, and an essay describing career development and nursing experiences. Using the alternative essay method, the author found that student grades were at least as good in pathophysiology and Foundations of Graduate Nursing courses and significantly better ($P < .01$) in pharmacology courses than those of students who were admitted using the traditional interview process. Using the new admissions selection process, graduate nursing students did at least as well overall, if not better, and the admissions process required two-thirds less time. This may not be generalizable to SRNAs.²⁵

Several of the nontraditional nurse anesthesia admission criteria studied were found to be significant by multiple investigators. One group found that being "ethical and trustworthy" were the highest scoring personal characteristics in importance to program or admissions directors of nurse practitioner or CRNA programs.¹² Using focus groups and a written survey, the researchers also found that critical thinking skills, responsibility, and good judgment were important characteristics. These characteristics were not directly tested.

Another group focused on military NAEPs, which may not be generalizable to nonmilitary programs.¹¹ All of the factors the survey participants found essential related to applicants' character, such as integrity, judgment, and commitment. Factors such as grades and experience were rated as important but not essential. Studies by that group¹¹ and Crosby et al¹² indicated that situational or clinical awareness were essential or important characteristics for applicants to possess.

A recent study surveyed 10 expert CRNA clinical faculty members and 25 NAEP academic faculty members to determine the intrapersonal and interpersonal characteristics that these faculty members considered important for safe and unsafe nurse anesthesia practice.²⁶ It is not unexpected that characteristics considered important for safe practice by at least 80% of these faculty members included being vigilant and ethical. The same percentage of faculty members viewed being lackadaisical and having poor critical thinking skills as characteristics for unsafe practice. There were a limited number of survey participants, and these characteristics were not tested with NAEP applicants or SRNAs. The authors recommended that the study be repeated with a larger sample of nurse anesthesia faculty. These results may contribute to the use of existing tools or to the development of tools to examine these characteristics in NAEP applicants.

A study published in 2007 reported that 2 noncognitive factors were statistically significant when measuring success in the US Army Graduate Program in Anesthesia Nursing.¹⁶ Students with an external locus of control (they believe their success is controlled by external forces) were 2 times more likely to succeed than those with an internal locus of control (they believe that their success is dependent on their own behavior). Students with lower trait anxiety (less prone to anxiety) were more likely to succeed than those students with higher trait anxiety (more prone to anxiety).¹⁶ Weaknesses of this study were the small sample size from 1 nurse anesthesia program and not all participants took all of the tests.

In contrast to the study just described,¹⁶ others¹⁸ found that high trait anxiety was the only valid predictor of academic success in graduate nursing programs. This investigation (which did not include SRNAs), was conducted in Canada and may not be generalizable to the United States.

Discussion

There is no consensus on the admission factors predicting success in NAEP. The level of evidence is weak and often dated, and the evidence included students other than those from nurse anesthesia programs. The application of evidence from settings outside nurse anesthesia must be done cautiously. However, there are multiple admission criteria suggested to be of predictive value for success in NAEP. Overall, UGPA^{9,14,17,20,22,24,27} and undergraduate science or nursing GPA^{24,25,27} are best supported by the evidence to predict success in nurse anesthesia and graduate nursing programs. The GRE score is supported by some investigators,^{14,20,25} but the most recent investigation⁹ found it to be less predictive, and that author suggested discontinuing this requirement. Although age is not an admission criterion, overall NCE score and success in NAEPs were reported to have an inverse relationship with age, perhaps due to the length of time since the student had been in a formal education program.^{9,27} The quality of goal statements and essays also may predict success.^{15,20,22}

Of the nontraditional criteria, being ethical and trustworthy and having good judgment¹² were important as well as having "situational" or "clinical" awareness.¹¹ Anxiety and locus of control have been correlated with success in NAEPs.^{16,19} However, work must be done exploring how to validly and reliably measure these nontraditional criteria during consideration of nurse anesthesia applicants.

The results of using an evidence-based approach to examine factors predicting success may assist NAEPs in student selection. Programs may cautiously consider using a method in which an applicant's UGPA, undergraduate science GPA, and length of time they have been out of a formal education setting are weighed more strongly than the GRE score. Programs may consider assessing the nontraditional predictors of success using instruments,

if available, with known psychometric properties. These nontraditional predictors could also be assessed during a face-to-face interview, a tool that program directors indicated was important in the selection process.¹⁵ There is a cost, and interviewers must be properly trained. Applicants who have not been in a formal education setting for some time should be counseled to seek assistance with studying, and programs should consider offering formal assistance to this category of students. These recommendations have been made by others.⁹

It is not surprising that there were no blinded, randomized controlled investigations in this area because of ethical concerns. Any future studies must be performed with an appropriate degree of rigor, preferably including solely SRNAs. Future studies should include more detailed assessment of each criterion required and how it affects the success of the applicant after admission to the NAEP and on the NCE. Ideally, the sample size in future studies should be based on an a priori power analysis. The success of large future studies depends on the participation of a large number of individual NAEPs. Although there is a substantial amount of effort involved in the collection and submission of student admission criteria and success metrics, it may be in the best interest of a NAEP to participate in such a study in order to gain insight useful in optimizing the attrition rate. Data obtained and published from properly designed studies would likely be useful to potential applicants, NAEPs, the COA, and the nurse anesthesia profession.

REFERENCES

1. American Association of Nurse Anesthetists. Become a CRNA. <http://www.aana.com/ceandeducation/becomeacrna/Pages/default.aspx>. Accessed February 22, 2012.
2. Council on Accreditation of Nurse Anesthesia Educational Programs (COA). *Standards for Accreditation of Nurse Anesthesia Educational Programs*. Park Ridge, IL: COA; January 2012.
3. Council on Accreditation of Nurse Anesthesia Educational Programs. Nurse Anesthesia Programs, Summary of 2010 Annual Report Data. <https://coa.us.com/sites/COA/Program/Summary%20of%20Annual%20Report%20Data/Forms/AllItems.aspx>. Accessed February 2012.
4. American Association of Nurse Anesthetists. Qualifications and Capabilities of the Certified Registered Nurse Anesthetist. <http://www.aana.com/ceandeducation/becomeacrna/Pages/Qualifications-and-Capabilities-of-the-Certified-Registered-Nurse-Anesthetist-.aspx>. Accessed February 29, 2012.
5. Muckle TJ, National Board of Certification and Recertification for Nurse Anesthetists (NBCRNA). *NBCRNA Annual Report: Summary of 2011 NCE / SEE Performance and Transcript Data*. February 2012. <http://www.nbcrna.com/certification/Documents/NBCRNA%20Assembly%20Report%20February%202012.pdf>. Accessed February 29, 2012.
6. Council on Accreditation of Nurse Anesthesia Educational Programs. *Accreditation Policies and Procedures*. Park Ridge, IL: COA; January 2012.
7. McKibbin A, Wyer P, Jaeschke R, Hunt H. Finding the evidence. In: Guyatt G, Drummond R, Meade MO, Cook DJ. *Users' Guides to the Medical Literature: A Manual for Evidence-Based Clinical Practice*. 2nd ed. New York, NY: McGraw Hill Professional; 2008:29-58.
8. Melnyk BM, Fineout-Overholt E. Making the case for evidenced-based practice and cultivating a spirit of inquiry. In: Melnyk BM, Fineout-Overholt E. *Evidence-Based Practice in Nursing and Health Care: A Guide to Best Practice*. Philadelphia, PA: Lippincott Williams & Wilkins; 2011:3-24.

9. Burns SM. Predicting academic progression for student registered nurse anesthetists. *AANA J*. 2011;79(3):193-201.
10. Carroll-Perez I. A study comparing characteristics of nurse anesthesia programs with the success rate on the certification exam. *AANA J*. 1996;64(1):76-80.
11. Clayton BL, Lypek DJ, Connelly LM. Faculty perceptions of characteristics needed for clinical success at military nurse anesthesia programs. *AANA J*. 2000;68(6):515-523.
12. Crosby FE, Dunn JD, Fallacaro MD, Jozwiak-Shields C, MacIsaac AM. Preadmission characteristics of advanced practice nursing students. *J Am Acad Nurse Pract*. 2003;15(9):424-431.
13. Elnitsky C, Cato J, Nichols BS. Essential skills and knowledge of applicants. *AANA J*. 1999;67(3):273-278.
14. Hansen MJ, Pozehl BJ. The effectiveness of admission criteria in predicting achievement in a master's degree program in nursing. *J Nurs Educ*. 1995;34(9):433-437.
15. Haritos G, Shumway SH, Austin PN, Ellis WE. Nurse anesthesia admission qualifications. *AANA J*. 1995;63(3):244-248.
16. Hulse JA, Chenoweth T, Lebedovych L, Dickinson P, Cavanaugh GB, Garrett N. Predictors of student success in the US Army Graduate Program in Anesthesia Nursing. *AANA J*. 2007;75(5):339-346.
17. Katz JR, Chow C, Motzer SA, Woods SL. The Graduate Record Examination: help or hindrance in nursing graduate school admissions? *J Prof Nurs*. 2009;25(6):369-372.
18. McEwan L, Goldenberg D. Achievement motivation, anxiety, and academic success in first year Master of Nursing students. *Nurse Educ Today*. 1999;19(5):419-430.
19. Megginson L. Noncognitive constructs in graduate admissions: an integrative review of available instruments. *Nurse Educ*. 2009;34(6):254-261.
20. Munro BH. Predicting success in graduate clinical specialty programs. *Nurs Res*. 1985;34(1):54-57.
21. Munro BH, Krauss JB. The success of non-BSNs in graduate nursing programs. *J Nurs Educ*. 1985;24(5):192-196.
22. Newton SE, Moore G. The significance of graduate admission written goal statements. *J Prof Nurs*. 2006;22(3):205-209.
23. Newton SE, Moore G. Undergraduate grade point average and Graduate Record Examination scores: the experience of one graduate nursing program. *Nurs Educ Perspect*. 2007;28(6):327-331.
24. Suhayda R, Hicks F, Fogg L. A decision algorithm for admitting students to advanced practice programs in nursing. *J Prof Nurs*. 2008;24(5):281-284.
25. Wilson T. A student selection method and predictors of success in a graduate nursing program. *J Nurs Educ*. 1999;38(4):183-187.
26. Wong E, Li Q. Faculty discernment of student registered nurse anesthetist's personality characteristics that contribute to safe and unsafe nurse anesthesia practice: metrics of excellence. *AANA J*. 2011;79(3):227-235.
27. Zaglaniczny KL. Factors which predict performance on the National Certification Examination for Nurse Anesthetists. *AANA J*. 1992;60(6):533-540.

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