This study describes criteria used by graduate nurse anesthesia educational programs (GNAEPs) in selecting students for admission. The investigators prepared and distributed a 15-item questionnaire to 71 GNAEPs as listed by the Council on Accreditation of Nurse Anesthesia Educational Programs for December 1992. Thirty-eight of 71 (54%) of GNAEPs participated in this study.

Upon examination of standardized test scores, mean Graduate Record Exam scores were: analytical 533, quantitative 512, verbal 510, and cumulative 1,552. The mean Millers Analogy Test score was 47. The mean overall grade point average (GPA) was 3.32 and the mean science GPA was 3.20.

Experience in critical care nursing averaged 5 years, with 54% of students coming from surgical intensive care units and 81% Advanced Cardiac Life Support certified. The most commonly identified prerequisite course was organic/biochemistry.

All programs required references, 97% required interviews, and 68% required essays. Program directors ranked overall GPA, interview, and science GPA among the factors considered most in the selection process. The sample revealed an acceptance rate of 22% for those applying to GNAEPs.

Key words: Anesthesiology education, graduate, nurse anesthetist, nursing education.

Introduction
Nurse anesthesia education programs are modifying curriculums in order to meet a requirement that all offer a master's degree by 1998. Much has been written regarding this requirement's influence on nurse anesthesia education. Yet, to our knowledge, no study has specifically examined the impact of this trend on admission expectations and prerequisites of graduate nurse anesthesia educational programs (GNAEPs) for applicants.

In 1983, there were 143 nurse anesthesia programs graduating 1,100 students. By 1991, there were 89 programs with 700 graduates. This decrease partly resulted from an effort to place schools in a graduate level framework. Many nurse anesthesia clinical spaces were also transferred over to anesthesiology residencies. Since 1967, the number of anesthesiology residents tripled. Approximately 20 years ago, there were two Certified Registered Nurse Anesthetists (CRNAs) to each anesthesiologist, but by 1991, the ratio was 1.2:1. This decline in nurse anesthesia graduates throughout the 1980s concerned the leaders of the American Association of Nurse Anesthetists (AANA). The AANA partly attributed this decline to a decrease in the number of qualified applicants.
Finally, nurse anesthetists have always been a major provider of anesthesia services, though they were not always accorded the same level of professional respect and financial payment as they are today. Nurse anesthesia is also an attractive field to those interested in one-on-one patient care, greater autonomy, and other reasons. This possibly implies great interest in this nursing specialty.

For the previously discussed matters, there is substantial impetus to investigate the factors considered for admission to a GNAEP. Therefore, the purpose of this study was to describe requirements and qualifications GNAEPs used to select students for admission. The following factors were examined:

- Standardized test scores.
- Grade point averages (GPAs).
- Years and areas of critical care experience.
- Nursing certifications.
- Prerequisite courses.
- Criteria considered most in selection.

This study's two primary research questions were:

1. What are the current qualifications of nurses accepted into graduate nurse anesthesia educational programs?
2. What requirements and factors influence the selection process?

Methods and materials

A 15-item questionnaire examining the above factors was prepared. The questionnaire was then reviewed by two graduate CRNA educators. An Institutional Review Board determined the study as exempt under federal research guidelines. Cover letters and questionnaires were distributed to 71 GNAEPs as listed by the Council on Accreditation of Nurse Anesthesia Educational Programs for December 1992.

Program directors provided summary information on their programs and students admitted for the 1992-93 school year. Individual institutional information was kept strictly confidential.

Results

Thirty-eight of 71 GNAEPs (54%) participated in this study. Included were 67% of military GNAEPs and 42% of programs which offered a master's degree on an optional basis only. Each major geographic region of the country was represented.

For each applicable study variable, the survey collected the highest and lowest scores of admitted students, as well as a program mean for each GNAEP. The sample mean for each variable was derived by using the weighted mean method. This method eliminated the possible error introduced by simply averaging the reported means from each GNAEP.

Upon examination of standardized test scores, the following statistics were obtained for the Graduate Record Exam (GRE). Analytical scores ranged from 330 to 800 and analytical program means ranged from 470 to 647. The analytical sample mean was 533. Quantitative scores ranged from 310 to 800 and quantitative program means ranged from 327 to 637. The quantitative sample mean was 512. Verbal scores ranged from 300 to 760, and the range for program means was 426 to 625. The verbal sample mean was 510. These component program means were summed to derive the cumulative GRE program mean. The lowest cumulative GRE program mean was 1,227 and the highest was 1,887. The cumulative GRE sample mean was 1,555 (Table I). There were 11 programs (29%) that indicated they did not use GRE scores.

For the Miller Analogies Test (MAT), the lowest reported score was 29 and the highest was 80. The MAT program means ranged from 39 to 72 and the MAT sample mean was 47 (Table I). There were 18 programs (47%) that did not require or use the MAT.

The overall GPA scores ranged from 2.39 to 4.0 and overall GPA program means ranged from 3.0 to 3.78. The overall GPA sample mean was 3.32. Science GPAs ranged from 1.0 to 4.0. The program means for science GPA ranged from 2.55 to 3.73 and the science GPA sample mean was 3.20 (Table I).

The program means for years of critical care experience ranged from 1.5 to 9 years with a sample mean of 5 years. The range for individual students was from 2 months to 22 years of critical care experience (Table I).

The survey revealed that 54% of students came from surgical intensive care units. This was followed by 18% from medical intensive care units and 9% from postanesthesia care units (Figure 1). A total of 81% of students were Advance Cardiac Life Support certified and 48% were certified Critical Care Registered Nurses.

The most commonly identified prerequisite courses for entry into a GNAEP were organic/biochemistry, pharmacology, pathophysiology, and statistics. Six programs (16%) indicated they did not require any prerequisite courses. Two programs (5%) indicated they only required equivalents to a baccalaureate degree in nursing (Table II).

All 38 programs required references, 37 (97%) required interviews, and 26 (68%) required essays.

Finally, we examined how all of the above fac
Table I
Cumulative data

<table>
<thead>
<tr>
<th>Course</th>
<th>Student low</th>
<th>Student high</th>
<th>Low program mean</th>
<th>High program mean</th>
<th>Sample mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPA</td>
<td>2.39</td>
<td>4.0</td>
<td>3.0</td>
<td>3.78</td>
<td>3.32</td>
</tr>
<tr>
<td>n</td>
<td>455</td>
<td>455</td>
<td>421</td>
<td>421</td>
<td>421</td>
</tr>
<tr>
<td>Science GPA</td>
<td>1.0</td>
<td>4.0</td>
<td>2.55</td>
<td>3.73</td>
<td>3.2</td>
</tr>
<tr>
<td>n</td>
<td>329</td>
<td>329</td>
<td>320</td>
<td>320</td>
<td>320</td>
</tr>
<tr>
<td>Analytical scores</td>
<td>330</td>
<td>800</td>
<td>470</td>
<td>647</td>
<td>533</td>
</tr>
<tr>
<td>n</td>
<td>264</td>
<td>264</td>
<td>264</td>
<td>264</td>
<td>264</td>
</tr>
<tr>
<td>Quantitative scores</td>
<td>310</td>
<td>800</td>
<td>327</td>
<td>637</td>
<td>512</td>
</tr>
<tr>
<td>n</td>
<td>301</td>
<td>301</td>
<td>276</td>
<td>276</td>
<td>276</td>
</tr>
<tr>
<td>Verbal scores</td>
<td>300</td>
<td>760</td>
<td>426</td>
<td>625</td>
<td>510</td>
</tr>
<tr>
<td>n</td>
<td>301</td>
<td>301</td>
<td>276</td>
<td>276</td>
<td>276</td>
</tr>
<tr>
<td>Cumulative scores</td>
<td>N/A</td>
<td>N/A</td>
<td>1,227</td>
<td>1,887</td>
<td>1,555</td>
</tr>
<tr>
<td>n</td>
<td>N/A</td>
<td>N/A</td>
<td>264</td>
<td>264</td>
<td>264</td>
</tr>
<tr>
<td>MAT scores</td>
<td>29</td>
<td>80</td>
<td>39</td>
<td>72</td>
<td>47.4</td>
</tr>
<tr>
<td>n</td>
<td>96</td>
<td>96</td>
<td>71</td>
<td>71</td>
<td>71</td>
</tr>
<tr>
<td>Years of critical care</td>
<td>2 months</td>
<td>22 years</td>
<td>1.5 years</td>
<td>9 years</td>
<td>5.2 years</td>
</tr>
<tr>
<td>n</td>
<td>415</td>
<td>409</td>
<td>402</td>
<td>402</td>
<td>402</td>
</tr>
</tbody>
</table>

In this table, n equals the number of admitted students in the sample for that item. “Low” and “high” are the lowest and highest student scores among n. “Low program mean” and “High program mean” are the lowest and highest reported program means, respectively. “Sample Mean” is the weighted mean for the sample.

Table II
Prerequisite courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Programs</th>
<th>Percent sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic/biochemistry</td>
<td>25</td>
<td>68%</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>15</td>
<td>41%</td>
</tr>
<tr>
<td>Pathophysiology</td>
<td>12</td>
<td>32%</td>
</tr>
<tr>
<td>Statistics</td>
<td>12</td>
<td>32%</td>
</tr>
<tr>
<td>Baccalaureate degree in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nursing/none</td>
<td>8</td>
<td>22%</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>16%</td>
</tr>
<tr>
<td>Physics</td>
<td>4</td>
<td>11%</td>
</tr>
</tbody>
</table>

“Programs” equals the number of programs indicating the course was required. “Percent sample” equals “Programs” requiring respective coursework, divided by the 38 total responding programs. The “Other” category was provided for courses not listed on the survey; for this category, two programs listed research, two listed microbiology, and two listed physical assessment.

Table III
Rank order of eight selection criteria considered during the selection process

<table>
<thead>
<tr>
<th>Item</th>
<th>First</th>
<th>Second</th>
<th>Third</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall GPA</td>
<td>12</td>
<td>8</td>
<td>8</td>
<td>28</td>
</tr>
<tr>
<td>Interview</td>
<td>13</td>
<td>3</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>Science GPA</td>
<td>8</td>
<td>10</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Critical care (years)</td>
<td>1</td>
<td>8</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Standardized test scores</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Critical care (background)</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>References</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

“First,” “Second,” and “Third” refer to the number of times program directors ranked/selected the item as first, second, or third most considered during the selection process, respectively.

tors influence admission into a GNAEP. To accomplish this we asked program directors to rank, in order, the three factors considered most in the selection process. Among these, overall GPA was chosen most often, followed by interview performance, science GPA, and years of critical care experience. However, program directors selected interview performance the greatest number of times as the first most considered factor (Table III).

As an incidental finding, a mean acceptance rate of 22% was calculated by dividing total student admissions (457) by total applicants (2,044) among 37 GNAEPs. This yielded an average of 55 applicants and 12 admissions per program, or a
mean acceptance ratio of 4.5:1. The number of admissions per program ranged from 3 to 36 and individual program acceptance rates ranged from 8% to 89%.

Discussion

Minimum requirements to enter a GNAEP are a baccalaureate degree, 1 year in an acute care environment, and usually a minimum GPA of 3.0. Our survey revealed that an average accepted student into a GNAEP has the following characteristics.

- An overall GPA of 3.3.
- A science GPA of 3.2.
- A cumulative GRE of 1,555 or MAT of 47.
- Five years of critical care nursing experience in a surgical intensive care unit with ACLS certification.
- Organic/biochemistry and pharmacology courses.
- Interviews well.

The above seems to indicate that the average GNAEP student surpasses minimum admission requirements, especially in the area of critical care experience. However, these minimums are not consistently met. For example, the minimum requirement for acute care years of experience is 1 year, but the lowest accepted student had 2 months. This may be explained by an individual having had previous experience as an associate's degree or diploma registered nurse.

Studies have found overall GPA, science GPA, and years of experience as predictive of performance on national nursing licensure examinations. Zaglaniczny found that the science GPA students attained during their nurse anesthesia education accounted for 24% of the variance in the overall score on the national certification examination for CRNAs. This study found that program directors highly considered overall GPA and science GPA. However, they also selected interview performance the greatest number of times as the most considered factor (Table III). To date, no research has been done to establish the predictability of this subjective measure with successful completion of a GNAEP.

Further investigation may be needed on the predictability of standardized test scores to success on the national certification examination. Another area that may warrant investigation is whether differences exist in the admission qualifications among the various degree types of GNAEPs.

Limitation

A limitation of this study is the inability to use the data as a predictor for selection or acceptance into a GNAEP. This is due to the lack of data from applicants who were not accepted for admission.

Summary

All nurse anesthesia educational programs are to offer master's degrees by 1998. A survey was prepared to identify the qualifications of current accepted students and GNAEP admission requirements. Based upon the responses of program directors, a profile of accepted applicants was established for the GRE, MAT, overall and science GPA, as well as other qualifications. Admission requirements of GNAEPs were also identified to include a ranking of factors considered most in the selection process. This survey revealed that minimum requirements for entry into a GNAEP were surpassed by the average admitted student.

REFERENCES


AUTHORS

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The opinions stated in this project are the authors' alone and do not reflect the official opinions of the U.S. Air Force or the Department of Defense.
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From Ding et al. Anesth Analg. 1994;78:450-454

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Neurovascular blockade may have a profound effect in patients with neuromuscular diseases (e.g., myasthenia gravis, Lambert-Eaton syndrome). In patients with a history of prolonged muscle weakness (e.g., myasthenia gravis, Lambert-Eaton syndrome), use of a peripheral nerve stimulator and a dooee not more than 0.010 to 0.000 mg/kg MIVACRON may be used to control the onset of neuromuscular block.

The use of MIVACRON in patients with any history suggestive of a greater sensitivity to the neuromuscular blocking effect of MIVACRON. In three such adult patients, a small dose of MIVACRON (0.03 mg/kg [approximately the ED\textsuperscript{50} in genotypically normal patients]) produced complete neuromuscular block for 26 to 90 minutes. Two of these patients have been reported to have a small dose of MIVACRON (0.015 mg/kg) which was given without prior histamine release, and one patient had a small dose of MIVACRON (0.03 mg/kg) which was given without prior histamine release.

As with succinylcholine, patients homozygous for the atypical plasma cholinesterase gene (1 in 2500 patients) are extremely sensitive to the neuromuscular blocking effect of MIVACRON. In three such adult patients, a small dose of MIVACRON (0.03 mg/kg) produced complete neuromuscular block for 26 to 90 minutes.

Patients with a history of atopy should be observed closely for allergic manifestations. Patients with a history of asthma or chronic bronchitis should be observed closely for bronchospasm.

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The use of MIVACRON before succinylcholine to attenuate some of the side effects of succinylcholine has not been studied.

There are no clinical data on the use of MIVACRON with other nondepolarizing neuromuscular blocking agents.

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There are no clinical data on the use of MIVACRON with other nondepolarizing neuromuscular blocking agents.

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To avoid the risk of overdose and to prevent inadequate neuromuscular block, the dosage should be closely monitored by clinical and electromyographic techniques.

There are no clinical data on the use of MIVACRON with other nondepolarizing neuromuscular blocking agents.

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Develop Your Writing Skills

The program will encompass a broad range of lectures, small-group and one-on-one interactions designed to initiate and promote clinical and scientific writing. Participants will learn to develop themselves as writers and confidently navigate the ins and outs of publishing for books and journals.

All applicants must come to the program with a substantive “work in progress” which might take the form of an unpublished thesis, abstract, a paper requiring revisions, or a project idea which is carefully described in written form.

Featured Speaker

Elizabeth M. Tornquist, MA, is the primary fellowship facilitator. A lecturer in the School of Nursing and the School of Public Health at the University of North Carolina at Chapel Hill, Ms. Tornquist has authored and coauthored numerous articles on writing and nursing research, as well as books on the subjects of nursing research; elder care; and how to think, read, and write effectively. She is a graduate of Duke University, Durham, North Carolina, and she received her master's degree in English from the University of Chicago.

Scientific Editors Participate

AANA Journal scientific editors will provide an AANA Journal focus to the program. At the second workshop on December 3–4, 1994, Chuck Biddle, CRNA, PhD, scientific editor, and John Aker, CRNA, MS, associate scientific editor, presented a variety of material based upon their experience with the Journal. Associate scientific editors, CDR E. Jane McCarthy, CRNA, PhD, USPHS, and John Nagelhout, CRNA, PhD, were also available to provide input and answer questions.

Selection Process

Applications from academic, clinical, administrative, and military CRNAs are invited. In selecting the fellowship participants, the AANA Journal Editorial Advisory Committee will give attention to the following criteria:

1. Motivation for pursuing the Scientific Writing Fellowship Program.
2. Geographic location of applicant—a geographically diverse group of participants is desirable.
3. Member in good standing with the AANA.
4. A desire to publish in the clinical, scientific literature.

Complete Your Application

To be considered, applications must include all of these items:

1. A typed cover letter indicating a desire to be a candidate for the program. The letter should also include:
   A. Motivation for participation in the program.
   B. The current position held by the applicant, as well as a statement regarding the applicant's professional goals.
   C. A current address and daytime telephone number.
2. A one-page double-spaced writing sample that describes your “work in progress.”
3. A curriculum vitae.
4. A copy of the applicant's AANA Membership card.

Don't Miss the Deadline

Applications should be postmarked by September 1, 1995. Applicants will be notified of their acceptance by October 2. Please send your application to:

AANA Journal Fellowship Program,
AANA, 222 South Prospect Avenue, Park Ridge, IL 60068-4001
Attn.: Chuck Biddle, CRNA, PhD, AANA Journal Scientific Editor
If you have any questions concerning this program, contact Sally Aquino at (708) 692-7050, ext. 313.
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