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# Nurse Anesthetists in Southeastern Kentucky: A Survey of Supply Versus Demand

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**University of Kentucky  
Center for Rural Health**

**Nurse Anesthetists in Southeastern  
Kentucky: A Survey of Supply  
Versus Demand**

**August 2005**

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## **INTRODUCTION**

One of the University of Kentucky Center for Rural Health's missions is to ensure an adequate and well-distributed supply of health care professionals throughout rural portions of the state. To accomplish this goal, the Center offers health professions education programs in a rural setting and administers a loan repayment program that targets primary care providers willing to practice in medically underserved areas. The Center also performs periodic rural health workforce analyses.

It was in regard to the latter objective that the Center was contacted on numerous occasions in late 2004 and early 2005. Several southeastern Kentucky hospital officials expressed concern about a shallow applicant pool for certified registered nurse anesthetist vacancies at their facilities.

CRNAs are registered nurses with advanced training in anesthesiology. They are responsible for selecting and administering anesthetic agents, monitoring surgical patients' responses to those anesthetics, and selecting and administering – or ordering the administration of – drugs required during the recovery from anesthesia. Nurse anesthesia education programs range from 24 to 36 months in length, depending on university requirements, and are at the master's degree level or higher. The educational costs of preparing a nurse anesthetist are roughly one-eighth those of an anesthesiologist, according to the American Association of Nurse Anesthetists – one of the reasons CRNAs serve as the sole providers of anesthetics for surgeries and other procedures in more than 70 percent of rural hospitals. The average annual salary for a nurse anesthetist in the Commonwealth is approximately \$145,000, according to a 2005 Kentucky Hospital Association salary survey.

While more than 90 nurse anesthesia educational programs exist in the United States, Kentucky is home to but one – the Trover Foundation/Murray State University Program of Anesthesia, located about seven hours' driving distance west of Hazard, the Center's headquarters and southeastern Kentucky's geographic midpoint. Twenty-three states have multiple CRNA training programs, according to the Council on Accreditation of Nurse Anesthesia Educational Programs.

In response to the hospital officials' inquiries and a subsequent request from the Kentucky Hospital Association, the Center initiated a project to track the status of nurse anesthetist positions and vacancies within all southeastern Kentucky hospitals. Among the project's purposes were to determine whether a geographic imbalance exists in the distribution of CRNAs in Kentucky and to evaluate the need for a nurse anesthesia training program in the state's eastern half.

## **METHODOLOGY**

A survey was conducted during May 2005 to determine southeastern Kentucky hospitals' level of need for nurse anesthetists and their difficulty in filling CRNA vacancies. Telephone interviews were conducted with the human resources director or chief executive officer at each of the 19 hospitals located in the Big Sandy, Cumberland Valley and Kentucky River area development districts, a 21-county region that encompasses all of southeastern Kentucky. (*For a complete list of the questions asked and results by county, see Table 1 on Page 6*).

An online search was conducted on April 15, 2005, to track Kentucky Board of Nursing registrations for nurse anesthetists by county of residence. The nursing board's electronic records also were analyzed to determine the number of bachelor's- and master's-level nurses – those eligible for enrollment in a nurse anesthesia training program – residing in southeastern Kentucky.

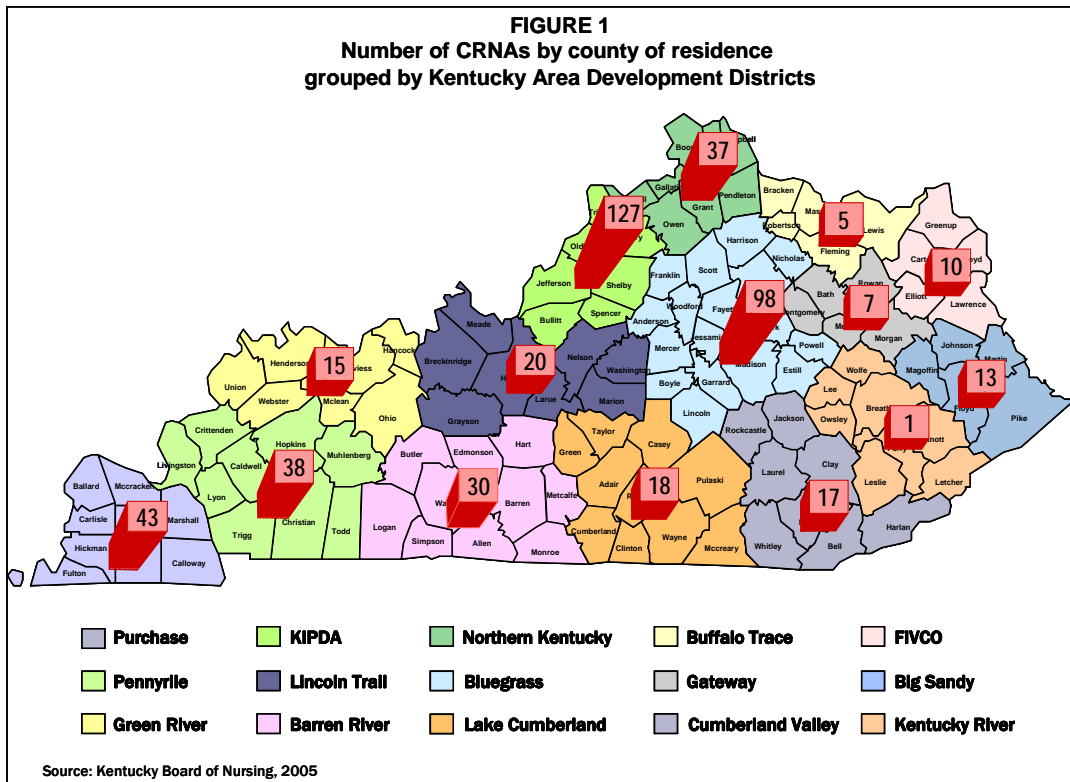
Data were collected during one brief time period and therefore provide a snapshot of vacancies and nurse anesthetist employment trends within the surveyed hospitals. The findings did, however, concur with a January 2001 “CRNA Needs Assessment Survey” conducted by the Center and therefore suggest a persistent health workforce problem for this region. Though a 2004 Kentucky Hospital Association evaluation found a much smaller nurse anesthetist vacancy rate than the Center's more recent survey (16 vacancies statewide to 44.5 within southeastern Kentucky alone), it is believed that the KHA estimate of need was substantially low because of employment arrangements that KHA's survey instrument did not measure, such as contracted nurse anesthetists not being considered hospital employees.

## **FINDINGS**

### **A. GEOGRAPHIC DISCREPANCY**

Kentucky has a significantly lower per-capita ratio of nurse anesthetists as residents than two of its similarly rural border states – West Virginia, with 18.3 CRNAs per 100,000 residents, and Tennessee, with 17.7. With 476 resident nurse anesthetists as of mid-April and a total population in excess of 4.1 million, Kentucky had nearly 11.5 CRNAs per 100,000 residents, still higher than the national rate of 9.3, according to federal Health Resources and Services Administration workforce profiles. Yet, while Kentucky as a whole exceeds the national rate, southeastern Kentucky lags far behind, with fewer than six nurse anesthetists per every 100,000 residents.

On April 15, the state nursing board's online database showed 31 nurse anesthetists registered as living within the Big Sandy, Cumberland Valley and Kentucky River area development districts. Pike County had six resident nurse anesthetists, the most of any southeastern



Kentucky county. By contrast, the entire eight-county Kentucky River district had just one resident nurse anesthetist. Of the state’s 15 area development districts, southeastern Kentucky had the lowest (Kentucky River, with one), fifth-lowest (Big Sandy, with 13) and seventh-lowest (Cumberland Valley, with 17) totals for nurse anesthetist residency. In fact, five individual area development districts – representing nearly every other region of Kentucky – had more resident nurse anesthetists than the three southeastern Kentucky districts combined (*Figure 1*).

For further comparison, consider that southeastern Kentucky’s cumulative total of resident nurse anesthetists was less than one-third that of Jefferson County’s alone (94). Yet, while Jefferson County had over 300 percent more resident nurse anesthetists than southeastern Kentucky, its overall population was just 26 percent greater than the 21 southeastern counties’ combined total, according to the Census Bureau’s July 15, 2005, estimate.

Southeastern Kentucky’s number of resident nurse anesthetists also was considerably less than Fayette County’s total of 42. While southeastern Kentucky had 11 fewer resident nurse anesthetists than Fayette County, it is home to nearly twice as many total residents, according to the Census estimate (520,408 to 266,358).

Finally, southeastern Kentucky’s total of 31 resident nurse anesthetists was just two more than that of McCracken County. Although home to just two hospitals, McCracken’s abundance of

resident CRNAs could be explained by its location – Paducah, the county seat, is less than 90 miles away from Madisonville’s Trover Regional Medical Center, the primary clinical site for Kentucky’s lone nurse anesthesia training program. With 29 nurse anesthetists as residents among a total population of 64,700, McCracken County’s CRNA-to-general population ratio is 1-to-2,231; southeastern Kentucky’s was nearly eight times that, at 1-to-16,787.

Another method of demonstrating the maldistribution of nurse anesthetists in Kentucky is through per-surgical operation ratios. Below are relevant data for southeastern Kentucky, the Bluegrass Area Development District and the Kentuckiana Area Development District, with 2004 surgical operations totals accessed from the state Department for Public Health’s online Data Warehouse:

	Resident CRNAs	Total Population	Surgeries
Southeastern Kentucky	31	520,408	61,246
Bluegrass Area Development District <i>(Fayette and surrounding counties)</i>	98	713,939	94,846
Kentuckiana Area Development District <i>(Jefferson and surrounding counties)</i>	127	895,634	133,307

While it should be noted that the large medical centers in Fayette and Jefferson counties perform a much higher number of intricate surgeries, such as open-heart operations, from a look at just these raw numbers consider that:

- Southeastern Kentucky’s hospitals performed an average of 1,976 surgeries per resident CRNA, more than twice as many as Bluegrass hospitals (968 per) and nearly double Kentuckiana hospitals (1,050 per).
- Kentuckiana has more than 400 percent as many resident nurse anesthetists as southeastern Kentucky, but its hospitals only performed 218 percent more surgeries during 2004. The ratio was nearly identical for hospitals in the Bluegrass region, which has over 300 percent more resident CRNAs than southeastern Kentucky but performed only 155 percent more surgeries.
- While Kentuckiana and Bluegrass hospitals performed substantially more surgeries than their southeastern Kentucky counterparts, the ratio of operations per population was not overly disparate. During 2004, Kentuckiana and Bluegrass hospitals performed an average of one surgery for every 6.7 residents and 7.5 residents, respectively. In southeastern Kentucky, the ratio was one surgery per 8.5 residents.

So, a combined analysis of nurse anesthetist per-population and per-surgical operation data reveals this: Southeastern Kentucky has 12.5 percent of Kentucky’s total population and performs 11.5 percent of the state’s total surgeries – but has only 6.5 percent of the state’s total resident CRNAs.

*Southeastern Kentucky has 12.5 percent of Kentucky’s total population and performs 11.5 percent of the state’s total surgeries – but has only 6.5 percent of the state’s total resident CRNAs.*

**EFFECT**

The above analysis provides strong evidence of the shallowness of the nurse anesthetist applicant pool available to southeastern Kentucky hospitals. Surveyed hospital officials also cited difficulty in recruiting those who live elsewhere to relocate to the region for permanent employment. On a five-point scale, those officials rated nurse anesthetist as the second-most-difficult position to recruit, behind only physicians (*Table 1*).

This set of circumstances has forced most southeastern Kentucky hospitals to contract their anesthesia services to companies that, in many instances, are based outside the state. In those cases, transient nurse anesthetists employed by the contracted companies work for a period of

time at one of the region’s hospitals, then transfer elsewhere and may be replaced by another of the company’s mobile nurse anesthetists. In fact, less than half of the hospitals within the survey region – nine out of 19 – had at least one full-time CRNA on staff as an employee (*Table 1*).

**TABLE 1**  
Comparison of CRNAs employed/contracted in counties with hospitals located in study area\*

1. How many full-time nurse anesthetists are employed by your facility?
2. How many part-time nurse anesthetists are employed by your facility?
3. How many full-time nurse anesthetists are contracted by your facility?
4. How many part-time nurse anesthetists are contracted by your facility?
5. How many nurse anesthetist vacancies does your facility expect within the next year?
6. Rank the level of difficulty your facility has experienced in recruiting nurse anesthetists, in comparison to other health professionals.

County	FTEs employed	Part Time employed	FTEs contracted	Part Time contracted	Vacancy within one year	Recruiting difficulty
Bell	4	0	3	1	4	4
Breathitt	0	0	1	2	1.25	5
Clay	2	0	0	1	1	4
Floyd	1	0.25	5	2	6.25	4
Harlan	2	0	0	1	2	4
Johnson	1	0	0	0	1	4
Knox	0	0	2	0	2	4
Laurel	3	0	0	0	1	3
Leslie	0	0	0	1	1	5
Letcher	0	0	5	1	6	4
Perry	1	0	3	0	4	5
Pike	3	0	9	0	7	5
Rockcastle	1	0	0	1	1	5
Whitley	0	0	4	3	7	3
<b>Totals</b>	<b>18</b>	<b>0.25</b>	<b>32</b>	<b>13</b>	<b>44.5</b>	<b>4</b>

\*Study area contains counties in three southeast Kentucky Area Development Districts: Big Sandy, Cumberland Valley, and Kentucky River.

\* Range for degree of recruiting difficulty is 1-5 with 5 the hardest and 1 the easiest. The total displayed for this column is an average.

Of the 50 full-time nurse anesthetist positions reported at the surveyed hospitals, nurses who were not actual employees of the facility occupied 32 slots. Another 13 part-time nurse anesthetist positions were filled on a contracted basis, meaning that of 63 full- and part-time CRNA positions at southeastern Kentucky hospitals, 45 – or 71.5 percent – were held by non-employees.



Several hospital representatives expressed satisfaction with the use of contract nurse anesthetist companies. In particular, a Baptist Regional Medical Center official said the Corbin-based facility was so pleased with its contract company that it is unclear whether the hospital would hire local nurse anesthetists even if they were available.

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*Hospital officials estimated a potential 44.5 CRNA vacancies within the next year – assuming there would be local applicants for the positions now largely held by contracted workers.*

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For the most part, however, surveyed hospital officials said they would prefer to hire nurse anesthetists as full-time employees of their facility, citing increased local control and other benefits. A higher percentage of on-staff CRNAs within southeastern Kentucky could result in better access to care and less travel time for patients, as well as improved quality of care because of timely surgical intervention for required procedures. Nurse anesthetists who are full-time employees also could be better incorporated into hospitals' surgical teams. As a result, southeastern Kentucky hospital officials estimated a potential 44.5 CRNA vacancies within the next year – assuming there would be local applicants for the positions now largely held by contracted workers (*Table 1*).

#### **B. POTENTIAL APPLICANT POOL FOR CRNA PROGRAM IN SOUTHEASTERN KENTUCKY**

As of April 15, the state nursing board listed 608 bachelor's-level and 248 master's-level nurses as residents of the three southeastern Kentucky area development districts. That means there would be more than 800 potential applicants should a nurse anesthetist program be made available within the region. (Note: Not all of the BSN/MSN nurses would be candidates, as most nurse anesthesia programs require at least one year of critical-care experience as a prerequisite for enrollment. Also, the potential applicants have not been surveyed to gauge their interest in attending a nurse anesthesia training program.). Online records showed there were 1,545 bachelor's- and master's-level nurses within Kentucky's three westernmost area development districts, which are home to Murray State University and its nurse anesthesia clinical site at Madisonville.

Though the western region's applicant pool is nearly twice as large, so is the number of students to be served. Murray State's nurse anesthesia program admits 12 students each year, while a program operating in southeastern Kentucky likely would be designed for no more than six students and perhaps as few as four.

#### **CONCLUSIONS**

From the perspective of the entire state of Kentucky, the current workforce supply of nurse anesthetists falls short of crisis designation. In fact, Kentucky as a whole exceeds the national CRNA-to-population ratio. And where a shortage does exist, hospitals have managed to

continue surgery services – although largely with CRNAs provided by out-of-state contract companies.

Yet, whether examined for per-population or per-surgical operation ratios, the data contained in this workforce survey report definitively confirm what southeastern Kentucky hospital officials already knew to be true: There indeed is a serious maldistribution of nurse anesthetists in the state – a discrepancy that has the potential to impact the availability and quality of surgical care in Eastern Kentucky. Perhaps the most telling numerical evidence is this: 127-to-1. That is the ratio of nurse anesthetists living in the greater Louisville area compared to the entire Kentucky River Area Development District. There seem to be two main reasons for the discrepancy:

- Metropolitan areas such as Jefferson and Fayette counties are home to large medical centers that perform high volumes of surgical procedures, so it stands to reason that is where most nurse anesthetists would settle.

- The state's only nurse anesthesia training program is located in western Kentucky, too far for many southeastern Kentucky-based nurses – particularly those who are in mid-career or have started a family – to travel in search of an advanced degree, even one as financially rewarding as CRNA.

The latter item leads to the consideration that nurses are likely to work near the geographic area in which they were educated, according to workforce profiles. This validates a long-held premise of the Center for Rural Health that health care professionals tend to practice in the area in which they receive their terminal training. For instance, more than 75 percent of graduates from the family medicine residency based at the Center – and nearly 90 percent of its physical therapy graduates – currently practice in rural Kentucky. Other rural medicine training programs, such as the Pikeville College School of Osteopathic Medicine, are based on the same rationale.

Therefore, one potential solution would be to train nurse anesthetists within southeastern Kentucky, whether through the extension of an existing program or, however less likely, the creation of a new one. State nursing board records indicate there is an adequate applicant pool within the region for annual classes of four to six students. After repeated inquiries, the Center for Rural Health has begun exploring the possibility of recruiting a nurse anesthesia education program to Hazard. That would be a significant first step toward easing southeastern Kentucky's nurse anesthetist shortage.

In the interim, southeastern Kentucky's deficiency of resident nurse anesthetists leaves most of the region's hospitals no viable option but to rely on contracted companies for the provision of anesthesia services. This circumstance could subject a hospital to the mercy of an out-of-state

interest. For instance, a gap in the administration of anesthesia services could force a rural hospital to refer a surgical patient to another – likely urban – facility. It also has another negative financial impact: Money spent on contracted services is not reinvested in local economies.

Other factors that should be considered in future research, but which were outside the scope of the Center’s survey, include:

- As was mentioned in the Center’s report, bachelors- and masters-level nurses living within southeastern Kentucky were not polled as to their interest in applying to a nurse anesthesia program. It seems at least a random sampling of this group would be necessary before substantial movement was made toward establishing a CRNA training program in the region.
- The survey process revealed that 31 nurse anesthetists live within southeastern Kentucky, yet the region’s hospitals employ just 18 full-time CRNAs out of 50 such positions, with the remainder filled by outsourced contract workers. The region’s resident CRNAs could be surveyed to discern their work status. This information could be especially useful in projecting retention rates for prospective CRNAs trained within the region.

#### **ENDNOTE**

The authors wish to recognize the contributions of those who helped make this report possible. Lola M. Dixon, the Center’s director of internal affairs, compiled data for the appendix section. Tena R. Smith, a staff support associate with the State Office of Rural Health, designed the report and its graphical elements. Editorial consultants included Elmer T. Whitler, the Center’s director of research; Emery A. Wilson, director of UK’s Office of Health Research and Development; Joseph E. Smith, executive director of the Kentucky Primary Care Association; David Bolt, chief operating officer of the Lewis County Primary Care System and president-elect of the Kentucky Rural Health Association; and Carol Blevins Ormay and Joy Knight, representatives of the Kentucky Hospital Association.

## **APPENDICES**

- A. Education of nurse anesthetists in the United States
- B. Accredited nurse anesthesia programs
- C. The cost of starting a nurse anesthetist educational program
- D. An economic analysis of the investment in nurse anesthesia education

## APPENDIX A

∞ Education of nurse anesthetists in the  
United States

# Education of Nurse Anesthetists in the United States

## Introduction

The nurse anesthesia profession is known for its highly respected educational system and its strong commitment to quality education. Nurse anesthesia education has evolved since the first organized course in anesthesia for graduate nurses in 1909 into a sophisticated educational system in which as of February 1, 2004, eighty-eight (88) programs in the United States and its territories are affiliated with, or operated by, universities and offer a minimum of a master's degree upon completion. Approximately one-half of the programs are within schools of nursing, with the remainder housed within schools of health science and other appropriate graduate schools. These nurse anesthesia graduate programs operate with more than 1000 clinical education sites. The programs range from 24 to 36 months in length, depending upon university requirements, and are at the master's degree level or higher. They provide over 3,500 enrolled students a graduate-level science foundation along with clinical anesthesia experience to prepare them to become competent nurse anesthesia providers.

## Nurse Anesthesia Program Requirements

All nurse anesthesia programs in the United States and its territories are accredited by the Council on Accreditation of Nurse Anesthesia Educational Programs (COA), which is recognized by the U.S. Department of Education and the Council for Higher Education Accreditation as the sole accrediting authority for nurse anesthesia programs. The COA has served as an autonomous accrediting agency following a change in the bylaws of the American Association of Nurse Anesthetists (AANA) in 1975. Prior to 1975 and since 1955, the AANA was listed by the U.S. Commissioner of Education as being the recognized agency to accredit nurse anesthesia schools.

The COA requires that each program undergo a systematic self-study and be reviewed at the program site by COA appointed anesthesia educators. An ongoing monitoring of accredited programs is accomplished through COA annual reports and progress reports. The purpose of this review process is to document that each program is in compliance with the *Standards for Accreditation* of the COA. This stringent process helps to insure the effectiveness of nurse anesthesia clinical and didactic education.

Nurse anesthesia educators have met bi-annually since 1945 at the AANA's Assembly of School Faculty to support existing nurse anesthesia faculty and to develop new faculty. These meetings also serve as an opportunity for the educators to discuss and formulate recommendations concerning the maintenance and improvement of the COA's standards. These recommendations are then forwarded to the COA for consideration.



The administration of a nurse anesthesia program includes program management of faculty and students, fiscal program management, maintenance of COA accreditation and other higher education accreditation requirements of the university, faculty continuing education, and program evaluation. COA standards require that each nurse anesthesia program employ Certified Registered Nurse Anesthetists (CRNAs) with graduate degrees in the roles of program director and assistant program director. Each program must also be able to show organizationally that it provides an extensive, educationally sound curriculum combining both academic theory and clinical practice. Each program must devise policies and procedures using outcome criteria to promote student learning while enhancing the program's quality and integrity.

Each nurse anesthesia program performs ongoing evaluation and assessment to determine its integrity and educational effectiveness. Each program continuously monitors and evaluates its didactic and clinical curriculum, including curriculum content, admissions policies, faculty, and clinical sites used for student educational experiences. These aspects of the program are evaluated periodically to determine their relevance to anesthesia practice.

Admission to a nurse anesthesia program requires graduation from an accredited school of nursing, a baccalaureate degree, current licensure as a registered nurse, and at least 1 year of professional experience in an acute care setting. Most applicants have acquired extensive clinical experience in areas such as coronary, respiratory, post anesthesia, and surgical intensive care units.

## **Nurse Anesthesia Program Curriculum**

The didactic curricula of nurse anesthesia programs are governed by COA standards and provide students the scientific, clinical, and professional foundation upon which to build sound and safe clinical practice. Most nurse anesthesia programs range from 45 to 75 graduate semester credits in courses pertinent to the practice of anesthesia. The science curriculum of graduate nurse anesthesia programs includes a minimum of 31 semester credit hours of courses in anatomy, physiology, pathophysiology, pharmacology, chemistry, biochemistry, physics, professional aspects, equipment, technology, pain management, research, and clinical conferences. Courses in anesthesia practice provide content such as induction, maintenance, and emergence from anesthesia; airway management; anesthesia pharmacology; and anesthesia for special patient populations such as obstetrics, geriatrics, and pediatrics. Students are instructed in the use of anesthesia machines and other related biomedical monitoring equipment and are evaluated didactically using such traditional evaluation methods as examinations, presentations, and papers. Patient anesthesia simulators are an emerging technology used in many programs to develop dexterity and critical thinking skills essential for the practice of nurse anesthesia.

The supervised clinical residency of nurse anesthesia education provides students the opportunity to incorporate didactic anesthesia education into the clinical setting.

Nurse anesthetists are prepared to administer all types of anesthesia, including general, regional, selected local and conscious sedation, to patients of all ages for all types of surgeries. They are taught to use all currently available anesthesia drugs, to manage fluid and blood replacement therapy, and to interpret data from sophisticated monitoring devices. Other clinical responsibilities include the insertion of invasive catheters, the recognition and correction of complications that occur during the course of an anesthetic, the provision of airway and ventilatory support during resuscitation, and pain management. To meet COA standards and be eligible to take the Council on Certification of Nurse Anesthetists (CCNA) Certification Exam, a student must have performed a minimum of 550 anesthetics, which must include specialties such as pediatric, obstetric, cardiothoracic, and neurosurgical anesthesia. This anesthesia experience includes the care of not only healthy but also critically ill patients of all ages for elective and emergency procedures. In most programs, this minimum is surpassed early in their clinical practicum and the average number of anesthetics performed upon graduation is over 800. Based on 2003 certification data nurse anesthesia programs provide an average of 1700 hours of clinical experience for each student.

During their clinical anesthesia experience, students are supervised by CRNAs or anesthesiologists who provide instruction in the safe administration and monitoring of various techniques, including both general and regional anesthesia. The clinical faculty also evaluate the technical and critical thinking skills of students on a regular basis.

## **Scholarly Activities**

With the evolution of nurse anesthesia programs into the graduate education framework, there has been an increase in program requirements for scientific inquiry, statistics, and faculty-guided student research. This scholarly activity may be in the form of a scholarly project. Areas of student scholarly activities include study surveys, animal studies, bench laboratory research, and clinical studies. Research studies may include quantitative research using descriptive and experimental design and qualitative research using valid research methods. Students may do collaborative scholarly work with nurse anesthesia faculty and faculty from other university departments such as pharmacology, physiology, and anesthesiology. Students are encouraged and assisted by faculty to present their scholarly work at professional nurse anesthesia meetings and to publish in the professional literature.

This addition of a scholarly requirement to nurse anesthesia graduate programs has increased the demand for higher education for nurse anesthesia faculty. The number of doctorally prepared CRNAs is increasing to meet the increased demand for university faculty requirements, student mentoring, and other nurse anesthesia scholarly endeavors.

## **Certification and Recertification**

Upon completion of a COA-accredited program, a graduate is eligible to take the national certification examination that is developed and administered by the CCNA. The purpose of this examination is to measure the knowledge and critical thinking skills



required of an entry-level nurse anesthesia provider. Each graduate of an accredited nurse anesthesia program must successfully pass this examination to earn the title of Certified Registered Nurse Anesthetist.

CRNAs are recertified by the Council on Recertification of Nurse Anesthetists, which focuses its efforts on ensuring that CRNAs maintain their skills and keep current with progressive and technological knowledge. The recertification period for CRNAs is two years. This recertification must be maintained for an individual to practice as a CRNA in the United States and to stay in compliance with state nursing regulations.

## Summary

From the commencement of the professional education in nursing, a minimum of 7 calendar years of education and training is involved in the preparation of a CRNA. Graduates of accredited nurse anesthesia programs who pass the rigorous, psychometrically sound Certification Examination are qualified to practice as Certified Registered Nurse Anesthetists. Recertification, which includes a practice and continuing education requirement, must be met every 2 years. In the United States, nurse anesthesia education has flourished for more than a century by continuing to meet increasingly stringent educational standards. Today, the profession and regulatory agencies set the standard of quality for nurse anesthesia education, which has resulted in the safe delivery of anesthesia by CRNAs.

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## APPENDIX B

∞ Accredited nurse anesthesia programs



COUNCIL ON ACCREDITATION®

**Council on Accreditation of  
Nurse Anesthesia Educational Programs**

**List of Recognized Educational Programs**

**222 S. Prospect  
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**List of Recognized Educational Programs by Council on Accreditation of Nurse Anesthesia Educational Programs**

The accreditation program for nurse anesthesia was initiated in 1952 by the American Association of Nurse Anesthetists (AANA). The accreditation function was transferred to the Council on Accreditation of Nurse Anesthesia Educational Programs/ Schools in 1975 in response to a major revision of the U.S. Office of Education criteria. Since 1975, the Council has existed as a fiscally autonomous multidisciplinary body under the corporate structure of the AANA. This multidisciplinary structure gives recognition to the various publics that represent the community of interest within which the nurse anesthesia profession resides. The 12 members of the Council are representative of the following groups: nurse anesthesia educators and practitioners, nurse anesthesia students, health care administrators, university representatives, and the public. All are voting members except the student member.

The Council's scope of accreditation is for institutions and programs of nurse anesthesia at the post-master's certificate, master's or doctoral degree levels in the United States, its territories and protectorates. Both the United States Department of Education and the Council for Higher Education Accreditation recognize the Council as an accrediting agency for nurse anesthesia.

The Council on Accreditation is responsible for establishing the standards and policies for nurse anesthesia educational programs subject to consideration by its communities of interest. The standards address governance, program effectiveness, program of study, resources and accountability. The first set of standards was adopted in 1952 and have been under review and subject to periodic major and minor revisions since that time. Compliance with the standards forms the basis for accreditation decisions made by the Council.

The accreditation process for an established program is based on self-evaluation by the program and a site visit by a team of two or three reviewers. The process is repeated at intervals of up to ten years and may be supplemented by progress reports. A summary report of the review and the program's response to the report are presented to the Council for an accreditation decision.

A new program desiring accreditation must complete a capability study and undergo an on-site evaluation prior to being considered for accreditation. A similar review is required after the first students have graduated.

Accreditation provides quality assurances concerning educational preparation through continuous self-study and review. The ultimate goal of accreditation is to improve the quality of nurse anesthesia education and provide competent practitioners to health care consumers and employers. Graduation from an approved program is one prerequisite of eligibility for national certification and a consideration used by governmental funding and licensing agencies, employers and potential students.

The Council on Accreditation publishes this list of accredited nurse anesthesia programs on an annual basis as information for the public, other agencies and prospective students. A definition of each accreditation action follows:

Accreditation signifies that programs have completed successfully the accreditation process. Accreditation may be awarded for periods of two to ten years.

Probation signifies serious deficiencies that jeopardize the quality of the educational process. Examples are the failure of a program to respond by the specified date to a summary report which identifies serious deficiencies or failure to submit a self-study or a progress report by the due date.

Revocation of accreditation signifies a program does not present sufficient evidence of educational quality nor intent to comply with the standards and criteria.

**Alabama**

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**Birmingham** - Department of Nurse Anesthesia Ida V. Moffett School of Nursing Samford University, 800 Lakeshore Drive, 35229; Michael A. Fiedler, CRNA, PhD; (205) 726-2047; Fax: (205) 726-4179; E-mail: MSNinfo@samford.edu  
L28; SD JUN  
DLR 05/2003 NRD 10/2006  
Master of Science in Nursing

**Birmingham** - Nurse Anesthesia Program University of Alabama at Birmingham, Room 230 RMSB, 1530 - 3rd Avenue South, 35294-1212; Joe R. Williams, CRNA, MS; (205) 934-3209; Fax: (205) 934-3212; E-mail: williams@uab.edu  
L27; SD AUG  
DLR 10/2000 NRD 10/2010  
Masters of Nurse Anesthesia

**Arizona**

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**Glendale** - Midwestern University Nurse Anesthesia Program, 19555 North 59th Avenue, 85308-6813; Sandra L. Lovell, CRNA, MA, MS; Dennis Paulson, PhD; (623) 572-3603; (888) 247-9277; Fax: (623) 572-3449; E-mail: slovel@midwestern.edu  
L27; SD JUN  
DLR 05/2004 NRD 10/2007  
Master of Science in Nurse Anesthesia

**Arkansas**

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**State University** - Arkansas State University College of Nursing and Health Professions Department of Nursing, P.O. Box 910, 72467-0910; Susan Campbell, CRNA, MEd, MS; Phyllis Skorga, PhD, RN, CCM; (870) 972-3390; Fax: (870) 972-2954; E-mail: scampbell@astate.edu  
L28; SD JAN  
DLR 10/2002 NRD 05/2006  
Master of Science in Nursing in Nurse Anesthesia

**California**

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**Los Angeles** - University of Southern California (USC) Program of Nurse Anesthesia Department of Anesthesiology Keck School of Medicine, 1540 Alcazar Street, CHP #223, 90089-9012; Michele E. Gold, CRNA, PhD; Philip Lumb, MD, BS, FCCM; (323) 442-2037; Fax: (323) 442-1701; E-mail: ussnap@usc.edu  
SD AUG  
DLR 05/1999 NRD 05/2009  
MS in Nurse Anesthesia

**Oakland** - Samuel Merritt College Program of Nurse Anesthesia, 435 Hawthorne Ave., 94609; Celeste G. Villanueva, CRNA, MS; (510) 869-8926; Fax: (510) 869-6677; E-mail: cvillanueva@samuelmerritt.edu  
L27; SD SEP  
DLR 05/2004 NRD 05/2014  
Master of Science in Nursing  
(Post-Master's Certificate also available)  
~ MSN Online in Nursing

**Pasadena** - Kaiser Permanente School of Anesthesia/California State University Fullerton Department of Nursing, 100 South Los Robles, Suite 550, 91188-6305; John J. Nagelhout, CRNA, PhD; Michael Ward, MD; (626) 564-3016; Fax: (626) 564-3099; E-mail: john.j.nagelhout@kp.org  
SD SEP  
DLR 05/1998 NRD 05/2006  
MS in Nursing

**Connecticut**

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**Bridgeport** - Southern Connecticut State University and Bridgeport Hospital Nurse Anesthesia Program, 267 Grant Street, 06610-2870; Nancy A. Moriber, CRNA, MS, APRN; Dennis S. Buonafede, MD; (203) 384-3054; Fax: (203) 384-3855; E-mail: info@bhnep.org  
SD MAY  
DLR 05/2001 NRD 05/2011  
MS Biology

**New Britain** - New Britain School of Nurse Anesthesia, 100 Grand Street, 06050-0100; Joan H. Dobbins, CRNA, MS, APRN; John Satterfield, MD; (860) 224-5612; Fax: (860) 826-4992; E-mail: johdobbins@nbgh.org  
L29; SD MAY  
DLR 10/2000 NRD 10/2010  
MS in Biological Sciences: Anesthesia

**New Haven** - Hospital of St. Raphael School of Nurse Anesthesia, 1423 Chapel Street, 06511; Judy Thompson, CRNA, MS, APRN; (203) 789-3351; Fax: (203) 789-3352; E-mail: hrsrna@snet.net  
L29; SD MAY  
DLR 10/2004 NRD 10/2014  
MS Biology/Anesthesia

**District of Columbia**

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**Washington** - Georgetown University School of Nursing Nurse Anesthesia Program, Box 571107, 3700 Reservoir Road, NW, 20057-1107; Donna M. Jasinski, CRNA, DNSc; (202) 687-4612; Fax: (202) 687-5553; E-mail: jasinskd@georgetown.edu  
L27; SD AUG  
DLR 10/1998 NRD 05/2006  
MS  
~ MS in Nursing

**Florida**

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**Miami Shores** - Barry University Master of Science Program in Anesthesiology, 11300 NE 2nd Avenue, 33161-6695; Dolores M. Gibbs, CRNA, PhD; (305) 899-3230; (800) 756-6000; Fax: (305) 899-3366; E-mail: mrodriguez@mail.barry.edu; dgibbs@mail.barry.edu  
L28; SD JAN  
DLR 10/2002 NRD 10/2010  
Master of Science in Anesthesiology

**Naples** - Norman R. Wolford School of Nurse Anesthesia/ Florida Gulf Coast University, 4933 Tamiami Trail North, Suite 201, 34103-3012; Norman R. Wolford, CRNA, MS, EdD; Karen E. Miles, RN, EdD; (239) 649-0238; Fax: (239) 649-0381; E-mail: nwolford@wolford.edu  
L28; SD AUG  
DLR 10/2003 NRD 10/2007  
Voluntary Closure - Awaiting Final Approval by COA  
December 9, 2006  
Master of Science in Nursing

**Naples** - Wolford College Nurse Anesthesia Program, 4933 Tamiami Trail, Suite 201, 34103; Norman R. Wolford, CRNA, MS, EdD; (239) 649-0238; Fax: (239) 649-0381; E-mail: admissions@wolford.edu  
L28; SD FEB  
DLR 10/2004 NRD 05/2008  
Master of Science in Nurse Anesthesia

**North Miami** - Florida International University School of Nursing Anesthesiology Nursing Program, 11200 Southwest 8<sup>th</sup> Street, Suite 485, 33199; Jeffrey A. Groom, CRNA, MS, PhD (C); (305) 348-7747; Fax: (305) 348-7823; E-mail: miguel.sahagun@fiu.edu  
L28; SD AUG  
DLR 10/2004 NRD 10/2010  
Master of Science in Nursing

**Panama City** - Gooding Institute of Nurse Anesthesia Bay Medical Center, 615 N. Bonita Avenue, 32401-3623; David R. Ely, CRNA, EdD; Donna Vincent, JD; (850) 747-6918; (800) 422-2418; Fax: (850) 747-6115; E-mail: gooding@baymedical.org  
L28; SD AUG  
DLR 05/2002 NRD 05/2012  
MS in Nurse Anesthesia

**Georgia**

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**Augusta** - Medical College of Georgia Nursing Anesthesia Program, 1120 15th Street, EB-229, 30912-4210; Shannon Powell-Thomas, CRNA, MN; (706) 721-9558; Fax: (706) 721-8206; E-mail: shpowell@mccg.edu  
L28; SD AUG  
DLR 10/1998 NRD 05/2006  
MN (Master of Nursing)  
(Post-Master's Certificate also available)

**Macon** - Mercer University School of Medicine Program in Nurse Anesthesia, 777 Hemlock Street, HB 185, 31208-2102; Roger D. Masters, CRNA, MS; (478) 633-1609; Fax: (478) 633-7061; E-mail: Kervin.matthew@mccg.org  
L28; SD AUG  
DLR 01/2005 NRD 10/2008  
MSA - Master of Science in Anesthesia

**Illinois**

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**Chicago** - Rush University College of Nursing Nurse Anesthesia Program, 600 S. Paulina St., #1072B, 60612; Margaret Faut-Callahan, CRNA, DNSc, FAAN; (312) 942-7100; Fax: (312) 942-3043; E-mail: Margaret\_E\_Faut-Callahan@rush.edu  
L27; SD JUN  
DLR 05/1997 NRD 05/2005  
Master of Science in Nursing  
(Post-Master's Certificate and ND & DNSc also available)  
~ Master of Science in Nursing

**Decatur** - Decatur Memorial Hospital's Nurse Anesthesia Program/Bradley University, 2300 North Edward Street, 62526-4193; Rhonda M. Gee, CRNA, MSN; Jon M. Jacoby, MD; (217) 876-2578; Fax: (217) 876-2587; E-mail: rhondag@dmhhs.org  
L33; SD AUG  
DLR 10/1999 NRD 10/2009  
Master of Science in Nursing/Nurse Administered Anesthesia Major

**Edwardsville** - Southern Illinois University Edwardsville  
School of Nursing Anesthesia Nursing Specialization,  
Campus Box 1066, 62026-1066; Andrew Griffin, CRNA, MS,  
APN; Jacquelyn Clement, PhD, APRN-BC, FNP; (618) 650-  
3283; Fax: (618) 650-3854; E-mail: agriffi@siue.edu  
L27; SD AUG  
DLR 05/2002 NRD 05/2010  
Master of Science Degree with a major in Nurse Anesthesia  
(Post Master's Certificate in Nurse Anesthesia also  
available)

**Evanston** - Evanston Northwestern Healthcare School of  
Anesthesia/DePaul University, 2650 Ridge Avenue, 60201;  
Bernadette T. Roche, CRNA, EdD; (847) 570-1959; Fax:  
(847) 733-5392; E-mail: anesthesiaschool@enh.org  
L36; SD SEP  
DLR 10/1998 NRD 10/2005  
MS Nursing  
(Post-Master's Certificate also available)

## Iowa

**Iowa City** - The University of Iowa College of Nursing  
Anesthesia Nursing Program, 200 Hawkins Drive, Room  
6441 JCP, UIHC, 52242-1079; Edward S. Thompson,  
CRNA, PhD, ARNP; Deborah J. Dehring, MD; (319) 384-  
7354; (800) 553-4692; Fax: (319) 384-7286; E-mail: e-s-  
thompson@uiowa.edu  
L30; SD AUG  
DLR 10/2000 NRD 10/2010  
MSN (Master of Science in Nursing) Anesthesia Nursing  
Specialization

## Kansas

**Kansas City** - University of Kansas Medical Center Program  
of Nurse Anesthesia Education, MailStop 2020, 3901  
Rainbow Boulevard, 66160; Carol G. Elliott, CRNA, MPA;  
(913) 588-6612; Fax: (913) 588-3334; E-mail:  
nanesthe@kumc.edu  
L30; SD JUN  
DLR 10/1999 NRD 10/2009  
MS in Nurse Anesthesia

**Wichita** - Newman University Nurse Anesthesia Program,  
3100 McCormick Avenue, Suite 210 ECK, 67213-2097;  
Sharon Niemann, CRNA, MHS; Michael Caughlin, MD; (316)  
942-4291 Ext. 272; Fax: (316) 942-4483; E-mail:  
niemanns@newmanu.edu  
SD AUG  
DLR 10/2003 NRD 05/2011  
MS in Nurse Anesthesia

## Kentucky

**Madisonville** - Trover Foundation/Murray State University  
Program of Anesthesia, 435 North Kentucky Ave., Suite A,  
42431-1768; LaDonna Cates, CRNA, MSN; Cayce Cooper,  
DO; (270) 824-3460; Fax: (270) 824-3469; E-mail:  
anesprog@trover.org  
L27; SD MAY  
DLR 09/1997 NRD 10/2005  
Master of Science in Nursing

## Louisiana

**New Orleans** - Louisiana State University Health Sciences  
Center (LSUHSC) School of Nursing Nurse Anesthesia  
Option, 1900 Gravier Street, 70112; Kathleen R. Wren,  
CRNA, PhD; (504) 568-4128; Fax: (504) 568-4136; E-mail:  
kwren@lsuhsc.edu  
L32; SD AUG  
DLR 05/2003 NRD 05/2013  
Master of Nursing with a specialization in Nurse Anesthesia  
Option

## Maine

**Portland** - University of New England School of Nurse  
Anesthesia, 716 Stevens Avenue, 04103; Nina M. Turcato,  
CRNA, MSNA; (207) 797-7261 Ext. 4516; Fax: (207) 797-  
7225; E-mail: nturcato@une.edu  
L27; SD SEP  
DLR 10/2002 NRD 10/2010  
Master of Science Nurse Anesthesia

## Maryland

**Baltimore** - University of Maryland School of Nursing  
Graduate Program Nurse Anesthesia, 655 W. Lombard  
Street, Suite 365C, 21201-1579; Caleb Rogovin, CRNA, MS,  
CCRN, CEN; (410) 706-4038; Fax: (410) 706-0344; E-mail:  
kossick@son.umaryland.edu  
L28; SD AUG  
DLR 05/2004 NRD 10/2007  
Master of Science in Nursing

**@Bethesda** - Navy Nurse Corps Anesthesia Program, Naval  
Medical Education and Training Command, Code OGNC1,  
Bldg1, Rm1631, 8901 Wisconsin Avenue, 20889-5611; CDR  
Lee Olson, CRNA, MS, NC, USN; CDR Ann N. Hasselbeck,  
NC, USN; (301) 295-6091; Fax: (301) 295-0827; E-mail:  
rlolson@nmetc.med.navy.mil  
L30; SD JUN AUG  
DLR 05/1999 NRD 05/2009  
Master of Science (Nursing)

**@Bethesda** - Uniformed Services University of the Health Sciences Graduate School of Nursing Nurse Anesthesia Program, 4301 Jones Bridge Rd., 20814-4799; LTC Bruce Schoneboom, AN, CRNA, PhD; Patricia Hinton-Walker, RN, PhD; (301) 295-1180; Fax: (301) 295-1722; E-mail: bschoneboom@usuhs.mil  
L30; SD JUN  
DLR 10/2003 NRD 10/2013  
Master of Science in Nursing

## Massachusetts

**Boston** - Northeastern University Bouve College of Health Sciences School of Nursing Nurse Anesthesia Program, 207 Robinson Hall, 02115-5000; Connie Calvin, CRNA, MS; (617) 373-3115; Fax: (617) 373-8675; E-mail: c.long@neu.edu  
L28; SD MAY  
DLR 10/2003 NRD 10/2013  
MS in Nursing  
(Certificate of Advanced Graduate Study (CAGS) also available)  
~ MS in Nursing

**Chestnut Hill** - Boston College William F. Connell School of Nursing Nurse Anesthesia Program, 140 Commonwealth Avenue, 02467; Susan A. Emery, CRNA, MS; (617) 552-4928; Fax: (617) 552-0745; E-mail: emerysu@bc.edu  
L27; SD JAN  
DLR 10/2002 NRD 05/2006  
MS in Nursing  
(Post-Master's Certificate also available)

## Michigan

**Detroit** - University of Detroit Mercy Graduate Program of Nurse Anesthesiology, Nurse Anesthesia College of Health Professions, 4001 W. McNichols, PO Box 19900, 48221-3038; Michael P. Dosch, CRNA, MS; (313) 993-2454; Fax: (313) 993-1271; E-mail: doschmi@udmercy.edu  
L27; SD AUG  
DLR 09/1997 NRD 10/2005  
MS in Anesthesia

**Detroit** - Wayne State University, Eugene Applebaum College of Pharmacy and Health Sciences, 259 Mack Avenue, Suite 1600, 48201; Prudentia Worth, CRNA, PhD; Samuel Perov, MD; (313) 577-1716; Fax: (313) 577-5589; E-mail: pworth@dmc.org  
SD SEP  
DLR 10/2003 NRD 05/2014  
Master's of Science in Anesthesia  
(Post Master's Certificate in Pediatric Anesthesia and See above also available)

**Flint** - The University of Michigan-Flint/Hurley Medical Center Master of Science in Anesthesia Program, Hurley Medical Center, One Hurley Plaza, 48503-5993; Lynn L. Lebeck, CRNA, DNSc; Surya R. Thota, MD; (810) 257-9264; Fax: (810) 760-0839; E-mail: dmcfar1@hurleymc.com  
SD SEP  
DLR 05/2004 NRD 05/2014  
MS in Anesthesia  
~ MS in Anesthesia

**Royal Oak** - Oakland University Beaumont Graduate Program of Nurse Anesthesia, 3601 West 13 Mile Rd, 48073; Karen L. Zaglaniczny, CRNA, PhD, FAAN; (248) 898-8075; Fax: (248) 898-8250; E-mail: kzaglaniczny@beaumont-hospitals.com  
L28; SD SEP  
DLR 10/2002 NRD 10/2012  
Master of Science in Nursing  
(Post-Master's Certificate also available)

## Minnesota

**Minneapolis** - University of Minnesota School of Nursing Nurse Anesthesia Area of Study, 5-160 Weaver-Densford Hall, 308 Harvard Street S.E., 55455-0342; Kathleen A. Fagerlund, CRNA, PhD; (612) 467-3392; Fax: (612) 970-5887; E-mail: fager003@umn.edu  
SD JUL  
DLR 10/2000 NRD 10/2008  
MS, Major in Nursing  
(Post-Master's Certificate also available)

**Minneapolis** - Saint Mary's University of Minnesota Graduate Program in Nurse Anesthesia in affiliation with Abbott Northwestern Hospital, 2500 Park Avenue, 55404-4403; Merri L. Moody, CRNA, MS; Thomas G. Healey, CRNA, MA; (612) 874-9877; (866) 437-2788; Fax: (612) 728-5167; E-mail: mmoody@smumn.edu  
L28; SD MAY  
DLR 10/2000 NRD 10/2010  
MS in Nurse Anesthesia

**Rochester** - Mayo Clinic College of Medicine, School of Health Sciences, Master of Nurse Anesthesia Program, 1108 Siebens Building, 200 1st Street SW, 55905-0002; Mary E. Shirk Marienau, CRNA, MS; Beth A. Elliott, MD; (507) 284-8331; Fax: (507) 284-0656; E-mail: marienau.mary@mayo.edu  
L30; SD SEP  
DLR 10/2004 NRD 10/2014  
Master of Nurse Anesthesia  
~ Master of Nurse Anesthesia



**St. Louis Park** - Minneapolis School of Anesthesia, 6715 Minnetonka Boulevard, 55426-3499; Rebecca L. Gombkoto, CRNA, MS; (952) 925-5222; Fax: (952) 925-6004; E-mail: gombkoto.msa@worldnet.att.net  
L27; SD SEP  
DLR 09/1997 NRD 05/2005  
MS in Nurse Anesthesia

### Missouri

**Kansas City** - Truman Medical Center School of Nurse Anesthesia, 2301 Holmes Street, 64108; Mark Lipari, CRNA, MA; (816) 404-1100; Fax: (816) 404-1103; E-mail: tmcanes@tmcmcd.org  
L36; SD JUN  
DLR 05/2001 NRD 05/2005  
MA in Biology

**Springfield** - Southwest Missouri School of Anesthesia, 1235 E. Cherokee, 65804; William O. Kirk, CRNA, MA; Jo Yassa, MD; (417) 820-6890; Fax: (417) 820-6895; E-mail: SMSA@sprg.mercy.net  
L30; SD JAN AUG  
DLR 10/2002 NRD 10/2006  
Master of Science in Nurse Anesthesia  
~ Master of Science in Nurse Anesthesia

**St. Louis** - Barnes-Jewish College of Nursing and Allied Health at Washington University Medical Center Nurse Anesthesia Program, MS: 90-30-625, 306 S. Kingshighway Blvd., 63110-1091; Bernadette Henrichs, CRNA, PhD, CCRN; (314) 454-7055; (800) 832-9009; Fax: (314) 454-5239; E-mail: henrichb@msnotes.wustl.edu  
L28; SD AUG  
DLR 05/2004 NRD 10/2007  
Master of Science in Nursing with Concentration in Nurse Anesthesia

**St. Louis** - Webster University MS in Nurse Anesthesia, 470 E. Lockwood Avenue, 63119-3194; Julie A. Stone, CRNA, EdD; (314) 968-5916; Fax: (314) 968-7194; E-mail: gadmit@webster.edu  
L30; SD SEP  
DLR 05/2001 NRD 05/2011  
MS in Nurse Anesthesia

### Nebraska

**Lincoln** - BryanLGH Medical Center/University of Kansas School of Nurse Anesthesia, 1600 South 48th Street, 68506-1299; James D. Cuddeford, CRNA, MA; (402) 481-3135; (800) 742-7844; Fax: (402) 481-8404; E-mail: james.cuddeford@bryanlgh.org  
L36; SD JUN  
DLR 10/1999 NRD 10/2009  
Master of Science, Nurse Anesthesia

### New Jersey

**Camden** - The University of Medicine & Dentistry of New Jersey - Our Lady of Lourdes Medical Center Nurse Anesthesia Program, 1600 Haddon Avenue, 08103; Catherine Y. Morse, CRNA, MSN; (856) 757-3897; Fax: (856) 968-2568; E-mail: morsec@lourdesnet.org  
L27; SD MAY  
DLR 05/1998 NRD 05/2005  
Probation  
Master of Science in Nursing with the Specialty of Anesthesia  
(Post-Master's Certificate in Anesthesia also available)  
~ Master of Science in Nursing

**Newark** - University of Medicine & Dentistry of New Jersey School of Nursing/University Hospital Nurse Anesthesia Program, Room E-245 University Hospital, 150 Bergen Street, 07101-1709; Clare Golden, CRNA, MSN; Thomas Pallaria, CRNA, MS; (973) 972-2513; Fax: (973) 972-2357; E-mail: goldencf@umdnj.edu  
L28; SD AUG  
DLR 05/2004 NRD 10/2007  
Master of Science in Nursing

### New York

**Albany** - Albany Medical College Nurse Anesthesiology Program, MC-131, 47 New Scotland Avenue, 12208-3479; Kathleen M. O'Donnell, CRNA, PhD; Denise Martin-Sheridan, CRNA, PhD; (518) 262-4303; Fax: (518) 262-5170; E-mail: amcnap@mail.amc.edu  
L26; SD SEP  
DLR 05/2000 NRD 05/2010  
Master of Science

**Brooklyn** - SUNY Downstate Medical Center Nurse Anesthesia Program with Harlem Hospital Center Kings County Hospital Center, 450 Clarkson Avenue, Box 22, 11203-2098; Jennifer Harvey, CRNA, MS; Laila N. Sedhom PhD, RN; (212) 939-3575; Fax: (212) 939-3574; E-mail: visitacion.arirao@downstate.edu  
L27; SD SEP  
DLR 10/2003 NRD 10/2007  
Master of Science Nurse Anesthesia  
~ Master of Science Nurse Anesthesia

**Buffalo** - University at Buffalo State University of New York Nurse Anesthetist Program, 1116 Kimball Tower, 3435 Main Street, 14214-3079; Thomas E. Obst, CRNA, PhD; (716) 829-2410; Fax: (716) 829-2021; E-mail: tobst@buffalo.edu  
L28; SD SEP  
DLR 09/1997 NRD 10/2005  
Master of Science

**New York** - Columbia University School of Nursing Program in Nurse Anesthesia, 617 West 168th Street, 10032; Timothy J. Lehey, CRNA, MS; Maribeth L. Massie, CRNA, MS; (212) 305-5756; Fax: (212) 305-6937; E-mail: nursing@columbia.edu

SD MAY  
DLR 10/2000 NRD 10/2008  
MS in Nursing  
(Post-Master's Certificate also available)  
~ Master's Completion Degree for CRNA's

**North Carolina**

**Charlotte** - Carolinas HealthCare System Nurse Anesthesia Program/UNCC, P.O. Box 32861, 28232-2861; Karen E. Lucisano, CRNA, MSN; (704) 355-2375; Fax: (704) 355-7263; E-mail: Karen.lucisano@carolinashealthcare.org  
L27; SD JAN AUG  
DLR 05/2004 NRD 05/2014  
Master of Science in Nursing  
(Post-Master's Certificate also available)

**Durham** - Duke University Nurse Anesthesia Program, Box 3322 DUMC, 27710; Mary Karlet, CRNA, PhD; (919) 684-3786 Ext. 237; (877) 415-3853; Fax: (919) 681-8899; E-mail: mary.karlet@duke.edu  
L27; SD JAN  
DLR 10/2003 NRD 10/2013  
Master of Science in Nursing  
(Post-Master's Certificate also available)

**Greenville** - East Carolina University School of Nursing Nurse Anesthesia Program, Doctor's Park #5A, 27834; Maura S. McAuliffe, CRNA, PhD, FAAN; (252) 328-2917; Fax: (252) 328-0885; E-mail: mcauliffem@mail.ecu.edu  
L28; SD JAN  
DLR 10/2002 NRD 10/2006  
Master of Science in Nursing  
(Post-Master's Certificate also available)

**Raleigh** - Raleigh School of Nurse Anesthesia/ University of North Carolina at Greensboro, 23 Sunnybrook Road, Suite 163, 27610; Nancy Bruton-Maree, CRNA, MS; (919) 250-9740; Fax: (919) 250-0348; E-mail: mhunter@rsna-edu.org  
SD AUG  
DLR 05/2002 NRD 05/2012  
Master of Science in Nursing  
(Post-Master's Certificate in Nurse Anesthesia also available)  
~ MSN degree with a concentration in Nurse Anesthesia

**Winston-Salem** - Wake Forest University Baptist Medical Center, The University of North Carolina at Greensboro Nurse Anesthesia Program, Medical Center Boulevard, 27157-1118; Sandra M. Ouellette, CRNA, MEd, FAAN; Raymond R. Roy, PhD, MD; (336) 716-1411; Fax: (336) 716-1412; E-mail: vcbeane@wfubmc.edu

SD AUG  
DLR 05/1998 NRD 10/2005  
Master of Science in Nursing (MSN)  
(Post-Master's Certificate in Anesthesia Nursing also available)  
~ MS in Nursing

**North Dakota**

**Grand Forks** - University of North Dakota, Box 9025, College of Nursing, 58202-9025; Darla Adams, CRNA, MS; (701) 777-4509; Fax: (701) 777-4096; E-mail: darlaadams@mail.und.nodak.edu  
SD AUG  
DLR 05/2001 NRD 05/2011  
MS with Major in Nursing  
(Post-Masters Certificate also available also available)

**Ohio**

**Akron** - The University of Akron College of Nursing Graduate Anesthesia Program, 209 Carroll Street, 44325-3701; Charles R. Barton, CRNA, MSN, MEd; Cynthia Capers, PhD, RN; (330) 972-5406; Fax: (330) 972-6632; E-mail: Barton@uakron.edu  
L27; SD JUN  
DLR 09/1997 NRD 05/2006  
Master of Science in Nursing  
(Post-Master's Certificate also available)  
~ Master of Science in Nursing

**Cincinnati** - University of Cincinnati, College of Nursing Masters Program-Nurse Anesthesia Major, Procter Hall, 3110 Vine Street, P.O. Box 210038, 45221-0038; Wanda O. Wilson, CRNA, PhD; (513) 558-5500; Fax: (513) 558-7523; E-mail: wanda.wilson@uc.edu  
L27; SD SEP  
DLR 10/2001 NRD 10/2011  
Master of Science in Nursing  
~ MSN in Nursing

**Cleveland** - Cleveland Clinic Foundation/Frances Payne Bolton School of Nursing/Case Western Reserve University School of Nurse Anesthesia, 9500 Euclid Avenue, E-31, 44195-5154; Paul R. Blakeley, CRNA, MSN; John E. Tetzlaff, MD; (216) 444-6547; (800) 223-2273; Fax: (216) 444-9247; E-mail: blakelp@ccf.org  
L28; SD AUG  
DLR 05/2003 NRD 05/2013  
MS in Nursing  
(Post-Master's Certificate also available)  
~ MS in Nursing

**Cleveland** - Frances Payne Bolton School of Nursing Program of Nurse Anesthesia/ Case Western Reserve University, 10900 Euclid Avenue, 44106-4904; Jack R. Kless, CRNA, MSN, MA; May L. Wykle, PhD, RN, FAAN; (216) 368-0221; (800) 825-2540; Fax: (216) 368-3542; E-mail: jrk@cwru.edu  
L28; SD AUG  
DLR 05/2001 NRD 05/2011  
MS in Nursing  
~ MS in Nursing

**Youngstown** - St. Elizabeth Health Center School for Nurse Anesthetists, Inc., 1044 Belmont Avenue, PO Box 2165, 44504-2165; Beverly A. Rodgers, CRNA, MEd; Ron F. Mullis, MD; (330) 480-3444; Fax: (330) 480-5202; E-mail: brodgers@belpark.net  
SD AUG  
DLR 05/2003 NRD 05/2013  
MS in Nursing

## Pennsylvania

**Erie** - Hamot Medical Center School of Anesthesia Gannon University, 201 State Street, 16550-0001; K. Stephen Anderson, CRNA, MEd; Valerie Y. Hoover, BS; (814) 877-2938; (800) 937-9133; Fax: (814) 877-6070; E-mail: Steve.Anderson@Hamot.org  
L28; SD JAN  
DLR 05/2001 NRD 05/2011  
Master of Science in Nursing  
(Post-Master's Certificate also available)  
~ RN to MSN

**Greensburg** - Westmoreland-Latrobe Hospitals School of Anesthesia/La Roche College, 532 West Pittsburgh Street, 15601; Howard F. Armour, CRNA, MS; J L. Chang, MD; (724) 832-4144; Fax: (724) 832-4164; E-mail: harmour@westmoreland.org  
L28; SD AUG  
DLR 10/2000 NRD 10/2010  
Master's in Health Science

**Natrona Heights** - Allegheny Valley Hospital/La Roche College School of Nurse Anesthesia, 1301 Carlisle Street, 15065-1152; Deborah A. Davison, CRNA, MS; (724) 226-7013; Fax: (724) 226-7199; E-mail: dadcrna@hotmail.com  
SD AUG  
DLR 05/1998 NRD 05/2005  
MS in Health Sciences

**Norristown** - Frank J. Tornetta School of Anesthesia at Montgomery Hospital, 1301 Powell Street, P.O. Box 992, 19404-0992; Michael T. Kost, CRNA, MS, MSN; Jason J. Brajer, MD; (610) 270-2139; Fax: (610) 270-2318; E-mail: philacrna@aol.com  
L27; SD SEP  
DLR 05/2003 NRD 05/2013  
MS in Nursing  
(Post-Master's Certificate also available)

**Philadelphia** - Drexel University Nurse Anesthesia Program, 245 N. 15th Street, MS 501, 19102-1192; John R. Wisniewski, CRNA, MS, MSN; (215) 762-4039; Fax: (215) 762-1259; E-mail: wisniewski@drexel.edu  
L27; SD JAN  
DLR 05/2000 NRD 05/2010  
MS in Nursing  
(Post-Master's Certificate also available)  
~ MSN

**Philadelphia** - Nazareth Hospital School of Nurse Anesthesiology, 2601 Holme Avenue, 19152-2007; Joan E. Woods, CRNA, MS; Jack Newhouse, Ed.D; (215) 335-6217; Fax: (215) 335-6668; E-mail: jwoods@che-east.org  
L27; SD SEP  
DLR 09/1997 NRD 10/2005  
MS in Nurse Anesthesia  
(Certificate of Completion for Clinical Work also available)

**Philadelphia** - University of Pennsylvania School of Nursing Nurse Anesthesia Program, Nursing Education Building, 420 Guardian Drive, 19104-6192; Arthur Zwerling, CRNA, MS, MSN, FAAPM; Grace Colman; (215) 829-3320; Fax: (215) 829-8757; E-mail: colman@nursing.upenn.edu  
SD MAY  
DLR 10/2002 NRD 10/2005  
MS in Nursing  
(Post-Master's Certificate also available)

**Pittsburgh** - University of Pittsburgh School of Nursing  
Nurse Anesthesia Program, 3500 Victoria Street, 336  
Victoria Building, 15261-0001; John M. O'Donnell, CRNA,  
MSN; Bettina A. Dixon, CRNA, MSN; (412) 624-4860; Fax:  
(412) 383-7227; E-mail: napcrna@pitt.edu  
L28; SD AUG  
DLR 10/1999 NRD 10/2009  
Master's of Science in Nursing

**Upland** - Crozer Chester Medical Center/ Villanova  
University Nurse Anesthesia Program, 1 Medical Center  
Blvd., 19013; Bette M. Wildgust, CRNA, MS, MSN; (610)  
619-7321; Fax: (610) 619-7322; E-mail:  
bette.wildgust@crozer.org  
L27; SD AUG  
DLR 10/2000 NRD 10/2010  
MSN  
(Post-Master's Certificate also available)

**Wilkes-Barre** - Wyoming Valley Health Care  
System/University of Scranton School of Nurse Anesthesia,  
575 North River Street, 18764-0001; Eileen Y. Evanina,  
CRNA, MS; Joseph Filler, MD; (570) 552-3680; Fax: (570)  
552-3690; E-mail: eevanina@wvhcs.org  
L25; SD AUG  
DLR 10/2002 NRD 10/2012  
Master of Science with a Major in Nursing  
(Post-Master's Certificate also available)  
~ Master of Science Major in Nursing

## **Puerto Rico**

**Arecibo** - InterAmerican University of Puerto Rico Master of  
Science in Anesthesia, P.O. Box 4050, 00614-4050; Josue  
R. Ramos, CRNA, MS; (787) 878-5475 Ext. 2504; Fax: (787)  
881-3831; E-mail: jramos@arecibo.inter.edu  
SD AUG  
DLR 10/2004 NRD 10/2008  
Master of Science in Anesthesia

**San Juan** - University of Puerto Rico Medical Sciences  
Campus School of Nursing, P.O. Box 365067, 00936-5067;  
Crucita Mattei, CRNA, MSN; Maria Delet, MSN, PhD; (787)  
758-2525 Ext. 5613; Fax: (787) 281-0721; E-mail:  
cmattei@rcm.upr.edu  
L25; SD AUG  
DLR 05/2004 NRD 05/2008  
MSN with Specialty in Anesthesia

## **Rhode Island**

**North Providence** - St. Joseph Hospital School of  
Anesthesia for Nurses, 200 High Service Ave., 02904-5113;  
Lucille S. Buono, CRNA, MEd; (401) 456-3639; Fax: (401)  
752-8140; E-mail: Saintjoes@aol.com  
L28; SD SEP  
DLR 02/1998 NRD 05/2006  
MS in Nurse Anesthesia

**Pawtucket** - Memorial Hospital of Rhode Island School of  
Nurse Anesthesia, 111 Brewster Street, 02860; Mark A.  
Foster, CRNA, MA; Peter Baziotis, MD; (401) 729-2485;  
Fax: (401) 729-3476; E-mail: mark\_foster@mhri.org  
L29; SD MAY  
DLR 05/2001 NRD 05/2011  
MS Biology/Anesthesia

## **South Carolina**

**Charleston** - Medical University of South Carolina  
Anesthesia for Nurses Program, 165 Cannon Street, Suite  
402, P.O. Box 250855, 29425; Anthony J. Chipas, CRNA,  
PhD; (843) 792-3785; Fax: (843) 792-1984; E-mail:  
sniderj@musc.edu  
L28; SD AUG  
DLR 05/1999 NRD 05/2009  
Master of Science in Nurse Anesthesia

**Columbia** - USC/PRMH Graduate Program in Nurse  
Anesthesia, 15 Medical Park, Suite 221, 29203-6897; Kristi  
H. Williams, CRNA, MN; James Buggy, PhD; (803) 434-  
6344; Fax: (803) 434-4099; E-mail: kwilliam@gw.mp.sc.edu  
L27; SD JAN  
DLR 10/1999 NRD 10/2009  
Masters of Nurse Anesthesia

## **South Dakota**

**Sioux Falls** - Mount Marty College Graduate Program in  
Nurse Anesthesiology, 3932 South Western Avenue, 57105-  
6513; Larry L. Dahlen, CRNA, MS; (605) 322-8090; (877)  
727-8672; Fax: (605) 322-8095; E-mail: msna@mtmc.edu  
L30; SD AUG  
DLR 10/2004 NRD 10/2014  
Master of Science

## Tennessee

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**Chattanooga** - The University of Tennessee at Chattanooga/ Erlanger Health System Nurse Anesthesia Concentration, School of Nursing, 615 McCallie Ave., 37403-2598; Steve Arnold, CRNA, MSN; (423) 778-7760; Fax: (423) 778-7259; E-mail: steve-arnold@utc.edu  
L27; SD MAY  
DLR 05/2002 NRD 05/2012  
MSN: Concentration in Nurse Anesthesia  
(Post-Master's Certificate also available)

**Knoxville** - The University of Tennessee College of Nursing Nurse Anesthesia Concentration, 1924 Alcoa Hwy., Box U-109, 37920-6999; John C. Preston, CRNA, DNSc; Joan L. Creasia, RN, PhD; (865) 544-9222; Fax: (865) 544-6852; E-mail: jpreston@mc.utmc.edu  
L31; SD JAN  
DLR 10/2004 NRD 10/2014  
Master of Science in Nursing  
(Post-Master's Certificate also available)

**Madison** - Middle Tennessee School of Anesthesia, P.O. Box 6414, 37116; Mary E. DeVasher, CRNA, MEd, MS; (615) 868-6503; (888) 353-6872; Fax: (615) 868-9885; E-mail: ikey@mtsa.edu  
L28; SD JUL AUG  
DLR 05/2000 NRD 05/2008  
Master of Science (with a focus in Nurse Anesthesia)  
~ Master of Science (with a focus in Nurse Anesthesia)

**Memphis** - The University of Tennessee Health Science Center College of Nursing Nurse Anesthesia Option, 877 Madison Avenue, 38163; Jill S. Detty Oswaks, CRNA, DNSc; (901) 448-6136; Fax: (901) 448-4121; E-mail: joswaks@utmeh.edu  
L30; SD JUL  
DLR 10/1999 NRD 10/2009  
MSN  
(Post-Master's Certificate in Nurse Anesthesia also available)  
~ MSN

## Texas

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**Fort Worth** - Texas Christian University School of Nurse Anesthesia, TCU Box 298626, 2800 W. Bowie Street, Annie Richardson Bass Building, 76129; Kay K. Sanders, CRNA, MHS; (817) 257-7887; Fax: (817) 257-5472; E-mail: c.womack@tcu.edu  
L28; SD AUG  
DLR 05/2003 NRD 10/2006  
Master Science Nurse Anesthesia

**Fort Worth** - Texas Wesleyan University Graduate Program of Nurse Anesthesia, 1201 Wesleyan Street, 76105-1536; John E. Martin, CRNA, MSN, MSNA; Debra L. Baggott, CRNA, MSN; (817) 531-4406; Fax: (817) 531-6508; E-mail: jmartin@txwes.edu  
L28; SD AUG  
DLR 10/2003 NRD 10/2005  
Master of Science in Nurse Anesthesia  
(Master of Health Science also available)  
~ Master of Health Science

**Houston** - Baylor College of Medicine Graduate Program in Nurse Anesthesia, 6550 Fannin, Suite 1003, 77030-2404; James R. Walker, CRNA, MS; Sally R. Raty, MD; (713) 873-2860; Fax: (713) 873-2867; E-mail: jrwalker@bcm.tmc.edu  
L30; SD JUL  
DLR 05/2004 NRD 05/2014  
Master of Science in Nurse Anesthesia

**Houston** - University of Texas at Houston Health Science Center, School of Nursing Nurse Anesthesia Division, 6901 Bertner, Room 684, 77030-3907; Rodney C. Lester, CRNA, PhD; Patricia L. Starck, RN, DSN; (713) 500-2159; Fax: (713) 500-2171; E-mail: Rodney.C.Lester@uth.tmc.edu  
L32; SD AUG  
DLR 10/2001 NRD 10/2011  
Master of Science in Nursing in Nurse Anesthesia  
~ Master of Science in Nursing in Nurse Anesthesia

**@San Antonio** - U.S. Army Graduate Program in Anesthesia Nursing, MCCS-HNE (ATTN: Anesthesia Branch), 2250 Stanley Road Suite 214, 78234-6140; COL Normalynn Garrett, CRNA, PhD; George W. Weightman; (210) 221-6014; Fax: (210) 221-8114; E-mail: norma.garrett@amedd.army.mil  
L30; SD JUN  
DLR 05/2001 NRD 05/2011  
MSN  
~ MSN

## Virginia

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**Norfolk** - Old Dominion University, School of Nursing Nurse Anesthesia Program, Spong Hall, Hampton Blvd., 23529-0500; Michael W. Jackson, CRNA, MSNA; Richardean Benjamin, RN, PhD; (757) 683-5068; (800) 572-2762; Fax: (757) 683-5124; E-mail: mwjackso@odu.edu  
L28; SD AUG  
DLR 10/1998 NRD 05/2006  
Master's of Science in Nursing  
(Post-Master's Certificate in Nurse Anesthesia also available)  
~ MS in Nursing

**Richmond** - Virginia Commonwealth University Department of Nurse Anesthesia, P.O. Box 980226, 23298-0226; Michael D. Fallacaro, CRNA, DNS; (804) 828-9808; Fax: (804) 828-0581; E-mail: NUAAPPLY@hsc.vcu.edu  
L28; SD AUG  
DLR 05/2001 NRD 05/2011  
MS in Nurse Anesthesia

## Washington

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**Spokane** - Sacred Heart Medical Center/Gonzaga University Master of Anesthesiology Education Program, 101 West 8th Ave., P.O. Box 2555, 99220-2555; Margaret R. Meyers, CRNA, MAE; Thomas R. Boubel, MD; (509) 474-4971; Fax: (509) 474-3113; E-mail: meyersmr@shmc.org  
L28; SD JAN  
DLR 10/2000 NRD 10/2008  
Master of Anesthesiology Education

## West Virginia

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**Beckley** - Mountain State University Nurse Anesthesia Program, 609 S. Kanawha Street, P.O. Box 9003, 25802-9003; Wayne E. Ellis, CRNA, PhD, ARNP; (304) 929-1576; (800) 766-6067; Fax: (304) 929-1601; E-mail: noakes@mountainstate.edu  
L30; SD JAN  
DLR 10/2004 NRD TBD  
Master of Science in Nursing: Nurse Anesthesia  
(Post-Master's Certificate also available)

**Charleston** - Charleston Area Medical Center School of Nurse Anesthesia, 3110 MacCorkle Ave., SE, Room 2041, 25304; Nancy L. Tierney, CRNA, MS; Robert T. Westmoreland, MD; (304) 388-9950; Fax: (304) 388-9955; E-mail: nancy.tierney@camc.org  
L27; SD MAY  
DLR 05/1999 NRD 05/2009  
MS Health Care Administration

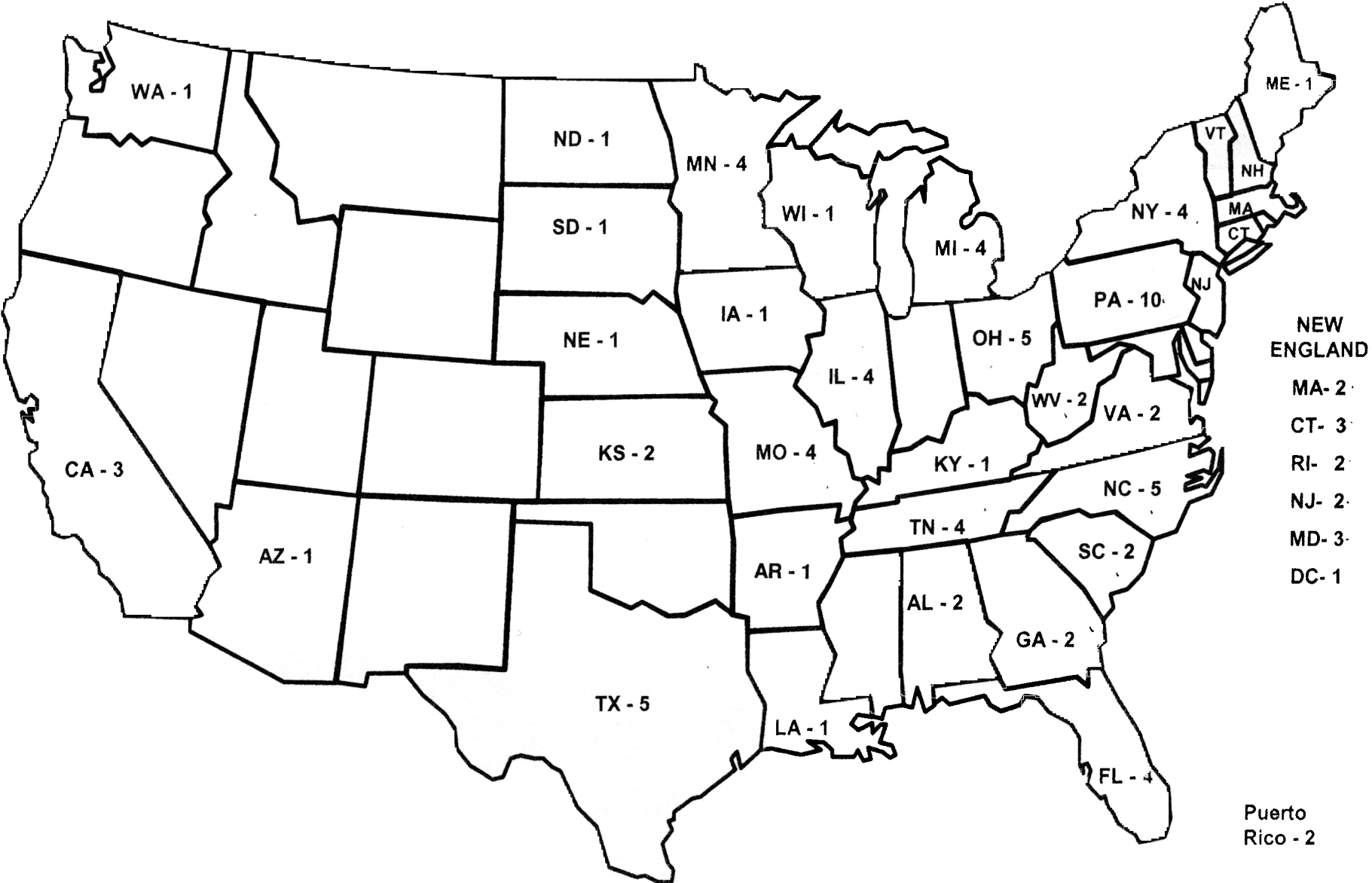
## Wisconsin

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**La Crosse** - Franciscan Skemp Healthcare School of Anesthesia, 700 West Avenue, 54601; Barbara J. Jochman, CRNA, MS; Sandeep Sharma, MD; (608) 785-0940 Ext. 2803; Fax: (608) 791-9799; E-mail: jochman.barbara@mayo.edu  
L27; SD JUN  
DLR 10/1998 NRD 05/2006  
MS in Biology

**CODE: L** – length of course in months. All schools are 24 months unless otherwise indicated, for example, L27. **SD** – starting dates, months are indicated. If no month is given, contact the school. **DLR** – dates of last review by the Council. **TBA** – to be announced. – – CRNA graduate completion degree program. **@** – indicates applicants accepted only from Commissioned Nurse Corps Officers of their respective branch of the Federal Uniformed Services. **PROBATION** – date probation is effective. **REVOCAATION** – date revocation is effective.

# Locations of Nurse Anesthesia Programs



## APPENDIX C

- ↻ The cost of starting a nurse anesthetist educational program





# THE COST OF STARTING A NURSE ANESTHESIA EDUCATIONAL PROGRAM

Kathleen Fagerlund, CRNA, PhD

## INTRODUCTION

This monograph is a review of what it costs to start a nurse anesthesia educational program, including administrative, clinical and academic costs. Estimates are presented for a set of startup cost categories. An individual involved in planning a nurse anesthesia program could use the categories as a checklist and the cost estimates as a guide for time and expense planning. A blank worksheet is included as an attachment.

The start up cost estimates are based on the insights of CRNAs who have recently started nurse anesthesia programs, and previous research. Also included are brief discussions of how to finance the start up costs, the ongoing costs and benefits of a nurse anesthesia program, and tips from the program directors who have recently started programs.

The concept or definition of cost used in this monograph is out-of-pocket expense rather than economic or opportunity cost. For a discussion of the latter, see Fagerlund (1998).

Starting a nurse anesthesia educational program is a rewarding experience that takes energy, enthusiasm, and perseverance. It also requires organization and knowledge of the many facets of such a program.

## START UP COSTS

The costs of starting a new nurse anesthesia educational program can be divided into three categories: administrative, clinical and academic. In each of the three categories there are monetary expenditures and time expenditures of the organizer. While the monetary expenditures may be the most visible, it is also important to plan for time expenditures. The time expenditures for setting up a new program can be converted to monetary expenditures by using salary estimates.

It should be understood that the time and out-of-pocket expense estimates for a category are estimates under the assumption that some effort in that category will be necessary. It may be that circumstances allow some categories to be omitted by a program organizer. It is unlikely that any new program will have time or money expenditures in every category. On the other hand, it is unlikely that the minimum level in every category can be achieved.

### **Administrative**

The administrative costs of starting a nurse anesthesia program include (1) drawing up the proposal (in some cases this includes a feasibility study), (2) working to obtain final approval from the university or other agencies, (3) finding and/or remodeling office space, (4) establishing the program staff (director, assistant director and secretary), (5) researching and writing policies, (6) student recruiting costs such as brochure developing and mailing, (7) obtaining accreditation, and (8) traveling and consultant costs. Estimates of time and expense for these categories are given in Table I.

Based on the experience of CRNAs who have recently started programs, the time needed for the administrative categories ranges from 260 to 610 hours. The out-of-pocket expenditures range from \$3,850 to \$28,500. The ranges for time and expense are influenced by several variables, including how many entities are involved in the governance of the program (i.e., university, hospital and/or corporation).

The time spent drawing up the initial proposal includes the time needed to think through how the program will work and sketching out the basic plan, including a rough budget. Often the process of drawing up a proposal is preceded by a feasibility study, formal or informal. The category of obtaining final approval includes the time necessary to meet with all involved parties to come to agreement on the responsibilities each entity will undertake. Developing a more detailed budget and negotiating the contribution of each entity to the startup costs are included here. Hours related to planning are also included in the academic and clinical sections.

The time and money needed to secure office space are quite variable, depending upon whether existing office space can be allocated to the nurse anesthesia program, or office space has to be newly created by remodeling. Some programs can acquire office space with very little out-of-pocket expense, while other programs may have to spend as much as \$20,000 getting office space ready.

Establishing the faculty/staff for the new school may or may not require much time. If a CRNA organizes the program, he or she may become the first program director. Nurse anesthesia educational programs are required to have an assistant director who is appointed to serve in the absence of the director. Time to recruit and interview a CRNA for this position should be considered in start up costs. As with the program director and secretary, the actual salary of the assistant director is considered an on-going cost, not a start up cost.

The cost of establishing secretarial support for a new program will not be great in those cases where the program can rely on an existing secretary (e.g., anesthesia department or school of nursing secretary). It is imperative that the secretarial support be adequate, so the program director is not burdened with secretarial duties.

The time needed for researching and writing policies for the new program is variable. Program Directors who have recently been through the process suggest that it can be helpful to get ideas by reviewing the policies of other nurse anesthesia programs. Of course, adopting another program's policies and procedures verbatim should not be done without permission.

Student recruitment time and expense are partially dependent on how much advertising is needed. If the news of a program spreads by word-of-mouth, recruitment costs may be low.

An application fee and an on-site visit by the Council on Accreditation of Nurse Anesthesia Educational Programs are required. The amount charged by the Council of Accreditation for the on-site visit is based on a formula that can be found in *Accreditation Policies and Procedures (1996)*. The Council on Accreditation allows five months for completion of the self-study.

Finally, it is important to consider some other administrative costs such as travel to training workshops, consulting with the Council on Accreditation by telephone or in person, visits to other programs, and a consultant if needed. An Assembly of School Faculty is held each year in the winter, and an educators' session is a feature of every annual meeting of the AANA. These meetings are excellent places for prospective program directors to meet faculty from other programs.

Table I lists estimates of the hours and expenses for each administrative task.

**Table I: ADMINISTRATIVE COSTS**

Cost Categories	Start-up time spent (in hours)	Start-up expenses in addition to time (in \$)
<b>Drawing up the initial proposal</b>	<b>15 - 30</b>	
<b>Developing the proposal and working to obtain final approval</b>	<b>35 - 170</b>	
Obtaining hospital approval	5 - 10	
Obtaining academic institution approval	10 - 30	
Working with hospital anesthesia dept.	5 - 40	
Developing the budget and funding sources	5 - 30	
Other meetings of any kind	5 - 50	
Other start-up processing	5 - 10	
<b>Establishing office</b>	<b>5 - 15</b>	<b>\$ 200 - 20,000</b>
Finding & refurbishing office space		
Furniture, supplies		
<b>Establishing the program staff</b>	<b>10 - 20</b>	
<b>Researching and writing up policies</b>	<b>50 - 100</b>	
EEO, Drug free environment, etc.		
Vacation/sick leave policies		
Policies required by COA		
Other policies		
<b>Start-up recruiting cost</b>	<b>40 - 60</b>	<b>\$ 750 - 1,500</b>
Brochure writing, printing and mailing		
Other first year recruiting expense		
<b>Obtaining COA accreditation</b>	<b>100 - 200</b>	<b>\$2,400 - 3,500</b>
On-site visit by COA		
Completing eligibility application and self study		
Consultation with COA		
Developing other required materials		
<b>Other start up cost</b>	<b>5 - 15</b>	<b>\$ 500 - 3,500</b>
COA training program; visit other programs	5 - 15	50 - 1,000
Consultant		500 - 2,500
<b>Subtotal for Administrative</b>	<b>260 - 610 hrs</b>	<b>\$ 3,850 - 28,500</b>

## Clinical

The clinical costs of starting a nurse anesthesia program can be divided into the categories of (1) setting up clinical procedure with anesthesia and nursing staff, (2) appointing clinical coordinators, (3) training clinical instructors, (4) acquiring clinical affiliations (includes appointing a clinical coordinator), and (5) establishing evaluation procedures.

Developing solid, mutually beneficial clinical affiliations takes time. Every CRNA, nurse, physician, anesthesia aide, and scheduling clerk can affect the quality of the student experience, and the hours spent talking about how students will fit into the clinical setting will be time well spent. The details of scheduling, supervision, clinical instructor expectations, and other staff concerns need to be addressed.

In some cases recruiting and training of clinical instructors may be necessary. At some clinical sites, for example, not all CRNAs will work with students. For the CRNAs who do the clinical education, it is helpful to discuss issues such as adult learning styles, fairness in evaluation, and teaching techniques.

Most programs use more than one clinical site, and it is necessary to visit the potential sites, secure the clinical agreements, perhaps have the agreement reviewed by the legal department, and appoint a clinical coordinator at each affiliation. The clinical coordinators must be educated on the importance of adhering to the *Council on Accreditation's Standards for Nurse Anesthesia Educational Programs (1999)*. In some cases programs are able to pay off-site clinical coordinators, but this is not always the case. Clinical affiliation sites may see that having student nurse anesthetists is a very good way to save on recruitment costs. In some cases it may be necessary to arrange for student housing at the affiliation site.

Writing the clinical evaluation procedure and training the clinical staff to properly use the evaluation tool also takes time. The individual developing the clinical evaluation procedures and instruments in the new program may get some ideas by asking to review these materials from an established program. Permission should be obtained prior to using the materials developed by another program.

Table II summarizes the time and monetary costs associated with the development of the clinical part of the program. As with the other tables, in some cases the only cost is time, but in other areas there are out-of-pocket expenditures.

**Table II: CLINICAL COSTS**

Cost Categories	Start-up time spent (in hours)	Start-up expenses in addition to time (in \$)
<b>Setting up clinical procedure</b>	<b>15 – 40</b>	
Working out details with anesthesia dept	10 – 30	
Working out details with nursing staff	5 – 10	
Other		
<b>Clinical instructors</b>	<b>35 – 70</b>	
Recruiting clin. instructors, appoint clin. coord.	20 – 40	
Training clinical instructors	15 – 30	
Other		
<b>Clinical affiliations</b>	<b>40 – 300</b>	<b>\$ 50 - 1,000</b>
Finding clinical affiliations		
Visiting clinical affiliations		50 - 1,000
Securing affiliation agreements, legal review		
Appointing clinical coordinators		
Other		
<b>Clinical evaluation procedures</b>	<b>20 – 120</b>	
Writing clinical evaluation procedures	15 – 80	
Training clinical staff	5 – 40	
Other		
<b>Subtotal for Clinical</b>	<b>110 – 530 hrs</b>	<b>\$ 50 – 1,000</b>

**Academic**

The academic costs of starting a nurse anesthesia program include (1) establishing an academic affiliation, (2) establishing the curriculum, (3) acquiring classroom space, (4) acquiring classroom and teaching equipment (including library books), and (5) recruiting and training classroom instructors.

Nurse anesthesia programs can be completely housed within a university, governed by a hospital or corporation, or have a shared governance. When a hospital or corporation governs the program, an academic affiliation with a university must be established to provide the graduate degree.



Establishing a curriculum that meets the *Standards for Accreditation of the Council on Accreditation of Nurse Anesthesia Educational Programs (1999)* is essential. When setting up a new nurse anesthesia program it is sometimes possible to access already-established courses, but for more specialized subjects it is necessary to design entirely new courses. The time needed to design the curriculum depends in large part on how many established courses can be used. The wide range of time estimates in Table III reflects the differences in established courses that program organizers have been able to access.

Acquiring or remodeling classroom space, and purchasing room and teaching equipment are costs to consider when setting up a new nurse anesthesia program. In situations where new programs are developed within a university with classroom space and equipment already available, the out-of-pocket cost is minimal. However, if the addition of the nurse anesthesia program creates the need to find rental space or remodel existing space, the start-up cost is higher. For most new programs, purchasing some specialized teaching equipment is necessary (i.e. mannequins, projectors, computers, scanner, library textbooks, etc.). Some programs are able to purchase or rent an anesthesia simulator, but this is not a typical expense and is not included in the cost estimates.

Table III summarizes the approximate time spent on academic categories by the program directors of recently started nurse anesthesia programs. In some cases, the only cost was time; in other cases, there are out-of-pocket expenses.

**Table III: ACADEMIC COSTS**

Cost Categories	Start-up time spent (in hours)	Start-up expenses in addition to time (in \$)
<b>Academic affiliation</b>	<b>5 - 10</b>	
Finalizing academic affiliation		
<b>Establishing Curriculum</b>	<b>100 - 300</b>	
Developing the curriculum		
Finding established classes		
Setting up new courses		
Writing testing policy and other policies		
Other		
<b>Classroom space</b>	<b>5 - 10</b>	<b>\$ 5,000 - 60,000</b>
Acquiring space for classrooms	5 - 10	
Remodeling expense		500 - 60,000
Other		
<b>Classroom equipment</b>		<b>\$ 3,000 - 5,000</b>
Writing boards		
Screens		
Tables and chairs		
Cabinets/book shelves		
Other		
<b>Teaching Equipment</b>		<b>\$ 10,000 - 20,000</b>
Mannequins		
Slide projector and overhead projector		
Computers and printers		
Scanner		
Library materials and textbooks		
Other		
<b>Classroom instructors</b>	<b>20 - 40</b>	
Recruiting classroom instructors	10 - 20	
Training classroom instructors	10 - 20	
Other		
<b>Subtotal for Academic</b>	<b>130 - 360 hrs</b>	<b>\$ 18,000 - 85,000</b>
<b>Total for Admin, Clinical &amp; Academic</b>	<b>500 - 1,500 hrs</b>	<b>\$ 21,900 - 114,500</b>
<b>Monetary value of the hours</b>	<b>\$24,000 - 72,000</b>	
<b>Total expense and \$ value of hours</b>		<b>\$ 45,900 - 186,500</b>

### **Total Cost of Setting Up a Program**

The total of the administrative, clinical and academic start-up costs are from 500 to 1,500 hours of time and from \$21,900 to \$114,500 of out-of-pocket expenditures. Again, it is unlikely that it will be necessary for a new program to have time or money expenditures in every category.

The estimated hours of time to start a nurse anesthesia program translate into .24 - .72 FTE. Most of the work is likely to be done by CRNAs earning approximately \$85,000 per year. This is reduced to \$80,000 to reflect that some of the work in setting up a program can be done by persons with lower salaries, and increased to \$100,000 to represent salary plus benefits. The time estimates convert to monetary estimates of \$24,000 to \$72,000. The total range for the out-of-pocket expenses and the monetary value of the time spent is \$45,900 to \$186,500. Because no new program is likely to incur the minimum time and money expenditures in every category or the maximums in every category, the actual cost of starting the new program probably lies within a narrower band that includes the midpoint of the range - \$116,200.

An individual (typically, but not always, a CRNA) should not be expected to simply donate the time to organize a new education program. When presented with a well-documented plan, administrators in the sponsoring institution will have realistic expectations of the resources needed for program start up, and be more likely to provide the necessary support.

### **FINANCING THE START UP COSTS**

Who pays for the time and out-of-pocket expense for setting up a program? The CRNAs who recently started programs report that they received some clinical time off, did much of the work on their own time, or were compensated by a development grant. They also reported that the out-of-pocket start-up expenses were covered by contributions from the hospital, university, anesthesia group, or a grant. With time, nurse anesthesia educational programs become self-

supporting primarily through student tuition, and may become financially beneficial for the academic and clinical institutions.

Some program start-up funding is available on a competitive basis from the Bureau of Health Professions of the Health Resources and Services Administration. More information is available on their website: <http://www.hrsa.gov/grants.htm>. The AANA's Director of Accreditation and Education can also be helpful in this area.

### **THE COSTS AND BENEFITS OF AN ONGOING PROGRAM**

While some of the start-up cost categories involve unique, one-time expenditures, many items will continue as ongoing or annual costs. For a complete discussion of the on-going costs and benefits of a nurse anesthesia program, see *An Economic Analysis of the Investment in Nurse Anesthesia Education*, in the April, 1998, *AANA Journal*.

The benefits of a nurse anesthesia program include benefits to the clinical site and the academic institution, as well as to the students. Knowledge of these benefits and an estimate of their value can be helpful for promoting a new program. The benefits include the following:

#### Benefits of an on-going program to the Clinical Sites

Student clinical contribution - hours in the operating room as well as pre- and post-operative visits. There are reimbursement issues, but students can extend staff.

- (2) Saving money on recruiting by hiring students.
- (3) Fulfillment of a portion of the clinical institution's stated education mission.
- (4) Serving a community/state/national need.
- (5) Boosting the morale of staff CRNAs by keeping knowledge up to date.

Working with students on research projects.

#### Benefits of an on-going program to the Academic Institution

Addition of a program for the academic institution.

Additional advanced practice specialty if the program resides in a nursing department.

More students for current classes.

Additional classes that other students may take.

- (5) Additional tuition.
- (6) Grant monies to the institution, which may help with program development.
- (7) Expanded research opportunities.

### **TIPS FROM RECENT NEW PROGRAM ORGANIZERS**

When starting a nurse anesthesia program, it will be helpful to turn to individuals who have recently started a program themselves. The Council on Accreditation of Nurse Anesthesia Educational Programs can direct you to those individuals. Here are some tips from the program directors who contributed to this monograph.

- Talk with a program director who has either made a major change in a program or who started a program.
- If you need help, hire a consultant.
- Make sure you have support from the community of interest.
- Plan on spending twice as much time as intended.
- Do not try to reinvent the process or curriculum. Find out what resources/courses are already available.
- Develop a vision for the program.
- Be prepared with a solid academic program proposal and financial budget plan that will sustain the program. ("Data, data, data.")
- Be sure your budget generates adequate income beyond direct & indirect expenses.

Plan for unexpected expenses as well.

The less you depend on academic or affiliated hospitals for funds, the more secure the program will be.

Get people on your side and in support of your endeavor.

It is personally rewarding to be a part of the education of nurse anesthetists. The Councils and the AANA are very supportive of educators. As a program director you will meet the leaders in the profession and can become a contributor in nurse anesthesia educational policy. You will have the opportunity to work with some of the most talented and highly motivated students you'll ever meet, and you will have a chance to influence the future of the profession of nurse anesthesia.

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## APPENDIX D

↪ An economic analysis of the investment in  
nurse anesthesia education

# An economic analysis of the investment in nurse anesthesia education

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*Increased public attention to the costs of healthcare in the United States has resulted in greater scrutiny of all aspects of the health industry, including the education of healthcare providers. Because Certified Registered Nurse Anesthetists will, as in the past, have a major role in healthcare delivery systems of the future, knowledge of the educational costs and resulting benefits of this advanced practice nurse is important. This is the first comprehensive study of the economic investment in nurse anesthesia education.*

*This study sought to determine the costs, benefits, and net benefits of nurse anesthesia education to four entities: (1) students, (2) clinical institutions, (3) academic institutions, and (4) others, primarily taxpayers. Considering these four entities together, the costs, benefits, and net benefits to society as a whole can be estimated.*

*A prototypical nurse anesthesia educational program was developed, using the most common characteristics found among such programs in the United States. Data were then collected to estimate the costs and benefits to the four entities as they function within this prototypical program.*

*The study concluded that all entities realize a net benefit from the investment by sponsorship or association with nurse anesthesia education, except the academic*

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*institution, which is a nonprofit institution and does not show a gain. Nurse anesthesia students show the highest internal rate of return on their investment, followed by others (primarily other taxpayers), and the clinical institution.*

*Key words:* Costs and benefits, economics of healthcare education, nurse anesthesia education.

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## Introduction

We've all heard these questions. From the standpoint of the nurse anesthesia student, "Is it worth all the money I'm spending to go to anesthesia school?" From the hospital administrator, "Nurse anesthesia students slow down the turnover time in the operating room. Are they cutting into the hospital's profits?" From the legislators, "Does society receive enough benefits from the support that taxpayers provide for nurse anesthesia education?" All of these questions are really asking one thing—*are we getting our money's worth from investing in nurse anesthesia education?* While these questions are well known to Certified Registered Nurse Anesthetists (CRNAs) involved in nurse anesthesia education, the factual answers are not. This article presents the results of a study designed to explore the benefits and costs of nurse anesthesia education.

CRNAs earn less on average than anesthesiologists, and the educational process for nurse anesthetists is shorter than that for anesthesiologists.



For CRNAs to promote themselves as high quality, lower-cost providers, it is important for nurse anesthetists to speak the language of the healthcare business—the language of efficiency and cost-effectiveness (Table I). It may be of interest to use the results of this study in the broader study of the efficient mix of nurse anesthetists and anesthesiologists in the provision of the anesthesia services.

### Purpose of the study

The purpose of this study was to evaluate the economic investment in nurse anesthesia education by estimating the costs and the benefits to four entities; (1) students, (2) clinical institutions, (3) academic institutions, and (4) others, primarily the taxpayers who often subsidize nurse anesthesia education. After identifying the costs and the benefits to each entity, the benefit-cost ratio and the internal rate of return were calculated. When all four entities were considered together, the costs and benefits, benefit-cost ratio, and internal rate of return to society as a whole for the investment in nurse anesthesia education were estimated.

To study the worth of nurse anesthesia education in the United States, the costs and benefits of a *prototypical* nurse anesthesia educational program were estimated. For benefit-cost analysis, it is necessary to compare the program or service against an alternative program or service. In this study, the net benefit of obtaining an education in nurse anesthesia was compared with continuing a career as an intensive care nurse, because most nurse anesthesia students come from that field.

### The prototype

A great deal of variation between nurse anesthesia educational programs exists in structure, governance, and financing, so design of the prototype was very important. To survey in depth *all* nurse anesthesia educational programs in the United States to estimate average costs and benefits is difficult because the detailed questions require searching old records and calculating expenses. Randomly selecting just a *few* programs to study in depth may have resulted in a skewed view of the costs and/or benefits because of the variability in program structure. Therefore, a decision was made to construct a prototypical program based upon the most common characteristics of nurse anesthesia educational programs in the United States. Many of the prototype characteristics were derived from data kept by the American Association of Nurse Anesthetists, so that whenever possible, the most common or average characteristics could be used.

The program prototype used for estimating

## Table I

### Economic definitions used in this study

#### Cost-effectiveness analysis

Cost-effectiveness analysis evaluates the costs of alternatives among outcomes that are equal under each alternative.

Example: Assume that students learn equally well from watching a video or live demonstration on proper gowning and gloving. Whichever teaching method uses fewer resources (cost of video versus cost of supplies, instructor time, etc.) is considered the more cost-effective.

#### Benefit-cost analysis

Benefit-cost analysis evaluates alternatives based on a comparison of their costs and benefits. Costs and benefits must be expressed in monetary terms.

Example: To update the CRNA staff on the price of various anesthesia drugs, the pharmacist may give a short talk. For the instructor time, the time away from the operating room required for each CRNA to receive the training, the time required by the pharmacist to update the drug pricing list, etc., the cost of the training is \$4,000. The training results in \$2,000 less being spent on anesthesia drugs. The benefit-cost ratio is \$2,000/\$4,000, or 0.5, not a good investment. However, if the drug pricing list is updated by the pharmacist and taped to the anesthesia machine, the result is a benefit of \$1,500, a cost of \$1,000, and a benefit-cost ratio of \$1,500/\$1,000, or 1.5; a better investment.

#### Present value

One dollar is worth more today than it will be in the future and is worth more today than it was in the past. For benefits and costs of a project to be compared, the benefits and costs must all be discounted or inflated to one point in time. The benefits and costs are then said to be in present value.

Example: After spending approximately \$114,000 (including foregone income) on an education, a nurse anesthesia student can expect to earn approximately \$993,000 more than she/he would have as a critical care nurse during a 25-year work life. However, to account for the time value of money, it is necessary to choose one point in time to which to discount the costs and benefits that occur in the future and inflate the costs and benefits that occurred in the past. The present value benefits and present value costs can then be compared.

#### Internal rate of return

The internal rate of return (IRR) of a project is the discount rate at which the present value of costs equals the present value of benefits.

Example: Buying an annuity for \$10,000 that returns \$1,000 per year for 20 years yields an IRR of 7.75%. Likewise, spending \$10,000 on an educational program that increases net income by \$1,000 per year for 20 years yields an IRR of 7.75%.

the economic investment in nurse anesthesia education was 27 months long, hospital based, and affiliated with a school of nursing in a university.

The prototype program admitted 12 new students each year: the students began their clinical training after 3 months in the program. The prototype had 1 full-time program director, 1.5 clinical/educational directors, and 1 administrative assistant. Students in the prototype relocated to attend the nurse anesthesia program and then relocated for employment following graduating. The prototype program characteristics are listed in detail in Table II.

Two existing nurse anesthesia educational programs were studied in depth to estimate as accurately as possible the costs and benefits as they were actually experienced by program participants. Students and program directors completed an extensive questionnaire, and the students kept clinical activity logs. On-site visits were made to the two programs so that students and program directors had an opportunity to clarify their responses and talk about any items that were not clear in the questionnaire.

### Costs

The estimation of economic costs requires the determination of (1) which resources are used in an educational program, (2) how much of each resource is used, and (3) the value of each resource component. If budget records, rather than these resource components, are used to estimate costs, some major costs may be missed. For example, budget records will not include foregone earnings of students in an educational program, but foregone earnings may well represent the greatest cost for most students. A detailed listing of annualized and program costs to the students, clinical institution, academic institution, and others can be found in Table III. A complete description of the calculation of each cost estimate in Table III can be found in *Economic Investment in Nurse Anesthesia Education*.<sup>2(p52-70)</sup>

■ *Students.* The costs incurred by students in the prototype nurse anesthesia educational program can be grouped into six categories:

1. Direct educational expenses, such as tuition, fees, books, supplies, tutoring, and examination fees.
2. Incremental day-care, transportation, and health insurance expenses.
3. Clinical residency fees.
4. Foregone income and benefits.
5. Interest paid on educational loans.
6. Relocation costs for attending the program and after graduation.

■ *Clinical institution.* Costs to the prototypical clinical institution of operating a nurse anesthesia educational program fall into five major categories:

**Table II**

### Detailed description of prototype nurse anesthesia educational program

Characteristics of the nurse anesthesia educational program prototype:

1. Hospital based, with the hospital incurring costs of the administration and clinical instruction.
2. Affiliated with a school of nursing located within a university that is partially supported by taxpayer funds.
3. 27 months long.
4. Students complete 50 semester credits.
5. CRNAs given clinical release time to teach some classes.
6. One full-time program director, one full-time associate director, one half-time clinical director, and one administrative assistant.
7. Hospital receives reimbursement by Medicare for a portion of the classroom and clinical costs.
8. Clinical education begins after students have been in the program 3 months. Students are in the operating room 3 days per week during the first year and 4 days per week during the second year.
9. The students provide service to the clinical institution by staffing the operating rooms, but they cause some delay.
10. 12 students admitted per year; students average 7 years' nursing experience and forego an average annual salary of \$38,344.
11. Nurse anesthesia students relocate to attend the program and relocate again to find employment after graduation.
12. All students receive one or more grants and scholarships; some may participate in a work pay-back program for tuition support and/or obtain subsidized or unsubsidized student loans.
13. Students take one certification examination review course before graduation.

Note: With the exception of numbers 1 and 2, all prototype characteristics were based on what was found to be most common in the published literature or surveys conducted for the study. Constructing the prototype as a hospital-based program provided for clarity in separating the hospital and academic institution costs. At the time of this study, 36 (40%) of nurse anesthesia educational programs were housed within or affiliated with schools of nursing. Of these 36 programs, 56% were located within and governed by the school of nursing.<sup>1</sup> A detailed description of the program prototype characteristics and their derivation can be found in *Economic Investment in Nurse Anesthesia Education*.<sup>2(p42-45)</sup>

1. Clinical release time in which CRNAs are given nonoperating room time to prepare for or to teach classes for the nurse anesthesia students.

2. Operating room delay time that can be attributed to having student nurse anesthetists involved in administering the anesthetic.

**Table III**

**Annual cost (per student) of nurse anesthesia education and distribution of cost (cost elements in dollars, using 1995 prices)**

	<i>Social costs</i>	<i>Student</i>	<i>Clinical institution</i>	<i>Academic institution</i>	<i>Others</i>
<b>Academic institution</b>					
Instruction .....	16,487			16,487	
<b>Clinical institution</b>					
Operating room delay time .....	6,619		6,619		
Clinical release time .....	167		167		
Program director .....	3,997		3,997		
Assistant director .....	3,704		3,704		
Other CRNA director .....	1,852		1,852		
Administrative assistant .....	1,389		1,389		
Stipend from program to student .....		(1,436)	1,436		
Classroom space .....	144		144		
Office space .....	173		173		
Equipment .....	111		111		
Liability insurance .....	134		134		
Accreditation .....	44		44		
<b>Student</b>					
Tuition .....		7,287		(7,287)	
Student fees .....	729	729			
Books and supplies .....	899	899			
Review course .....	165	165			
Certification examination .....	187	187			
Incremental transportation .....	2,184	2,184			
Incremental day care .....	216	216			
Incremental health insurance .....	(594)	(594)			
Interest on educational loans .....	2,442	2,442			
Clinical residency fee .....		1,124	(1,124)		
Foregone income .....	38,344	38,344			
Foregone fringe benefits 25% .....	9,586	9,586			
Relocation cost: attend program .....	388	388			
<b>Others</b>					
Relocation cost: first job .....	1,215	233			992
State legislature .....				(7,881)	7,881
Endowments and grants .....				(1,319)	1,319
Nurse anesthetist traineeships .....		(444)			444
Scholarships .....		(106)			106
Work pay-back programs .....		(1,681)			1,681
Medicare reimbursement: education .....			(2,266)		2,266
Foregone taxes .....		(8,819)			8,819
<b>Total annual cost per student .....</b>	<b>90,582</b>	<b>50,694</b>	<b>16,380</b>	<b>0</b>	<b>23,508</b>
<b>Total program cost per student .....</b>	<b>203,810</b>	<b>114,062</b>	<b>36,855</b>	<b>0</b>	<b>52,893</b>

Note: All costs were estimated based on the published literature or surveys conducted for the study. All cost calculations and supporting documentation can be found in detail in *Economic Investment in Nurse Anesthesia Education*.<sup>2(p77)</sup>

3. Administration of the program and classroom instruction (e.g., teaching classes, scheduling, record keeping, maintaining accreditation standards).

4. Stipends paid to students.

5. Overhead (e.g., cost of clinical administration, maintenance).

Nurse anesthesia educational faculty are familiar with the criticism that having students in the operating room adds to the total operating room

time, leading to higher costs to the clinical institution. This study estimated the average delay time that could be attributed to one nurse anesthesia student. The first step was to survey 19 nurse anesthetists and anesthesiologists from a large urban medical center that had a high percentage of patients with multisystem disease. The nurse anesthetists and anesthesiologists completed a survey in which they were asked to estimate the average delay caused by first- or second-year students in

five surgical case scenarios (e.g., second-year student, general anesthesia, normal airway, prone position). The average delay caused by student nurse anesthetists was estimated to be 7.01 minutes per case. The patient acuity probably resulted in an above-average delay caused by students learning procedures (e.g., more difficult airway management, intravenous access difficulties).

Second, an interview with the clinical director in another large nurse anesthesia educational program with less acutely ill patients resulted in an estimate of 4- to 5-minute delays for very new students and an average of a 0- to 1-minute delay for more advanced students. By considering new and experienced students and the estimates from the two large teaching institutions, a delay of 3 minutes was considered to be average and reasonable for use in this study. According to Zaglaniczny, nurse anesthesia students complete an average of 696 cases during their training.<sup>3</sup> It was calculated, therefore, that education of a nurse anesthesia student in a 27-month program, causes approximately 918 minutes of delay time annually.

According to data generated at a large urban teaching hospital, the direct and indirect cost per minute of keeping an operating room open is \$7.21, including nurses, anesthesia, supplies, equipment, and physicians. Therefore, the annualized delay time per student per year is estimated to be  $918 \times \$7.21 = \$6,619$ .

■ *Academic institution.* It was assumed that the academic institution was a school of nursing in a publicly operated, nonprofit university. In the study prototype, all nursing courses, basic science

courses, and anesthesia courses were taught through the university school of nursing. The costs to the academic institution were based on data from the University of Minnesota Instructional Costs Study for 1993-1994.<sup>4</sup>

■ *Others.* Others, primarily taxpayers, incur cost burdens associated with nurse anesthesia education. Examples include tax-funded grants, scholarships, military programs, loan interest subsidies, state legislative appropriations, and Medicare reimbursement. Because the costs to taxpayers result in direct benefits to students, academic institutions, or clinical institutions, they do not appear as net costs to society, but rather as financing mechanisms. For example, a student may receive a \$1,000 federal grant that is then used to pay tuition. In this way, the cost burden to the taxpayers directly benefits the student and, finally, the academic institution.

One cost item appeared as a real economic cost to others in this study. This is the partial financing by new employers of the moving expenses of nurse anesthesia graduates who must relocate.

### Benefits

As with the costs, benefits of nurse anesthesia education accrue to the students, clinical institution, academic institution, and others. A detailed listing of benefits of the four entities can be found in Table IV.

■ *Students.* Benefits to students of nurse anesthesia educational programs accrue largely in one category: salary and fringe benefits over a lifetime career. For this study, salary and fringe benefits

**Table IV**

**Benefits (per student) of nurse anesthesia education and distribution of benefits of 27-month program (in dollars, using 1995 prices)**

	<i>Direct benefits</i>	<i>Social</i>	<i>Student</i>	<i>Clinical institution</i>	<i>Other</i>
Increased earnings in work life .....		448,517	448,517		
Increased fringe benefits (25%) .....		112,129	112,129		
Increased taxes (23%) .....			(103,159)		103,159
Student labor value .....		39,574		39,574	
<i>Indirect benefits</i>					
Recruitment .....		1,182		1,182	
Orientation .....		yes		yes	
Staff skills .....		yes		yes	
Department morale .....		yes		yes	
Professionalism .....		yes	yes	yes	
Enhanced social and economic status .....			yes		
Total present value of measurable benefits for the program .....		601,402	457,487	40,756	103,159

Note: Benefit calculations and supporting documentation can be found in *Economic Investment in Nurse Anesthesia Education*.<sup>2(p86)</sup>

were calculated for an estimated 25-year work life. Because nurse anesthesia students usually come from a critical care nursing background, the typical income stream of a critical care nurse was compared with the typical income stream of a CRNA, and the net difference between the two income streams plus 25% in fringe benefits was calculated over a 25-year work life after nurse anesthesia training. The difference in the CRNA salary and the critical care nurse salary over the 25-year work life represents the net benefit that can be attributed to the nurse anesthesia education. This incremental earnings differential for CRNAs was used as an estimate of the incremental value of the work by a CRNA. Before discounting to present value, the net difference in salary and fringe benefits between a CRNA and a critical care nurse was \$993,478 over a 25-year period.

■ *Clinical institution.* Benefits to the clinical institution accrue in two tangible ways:

1. Labor provided by students in the operating room.
2. A decrease in recruitment costs for nurse anesthetists.

Benefits to the clinical institution also include intangibles such as the following:

1. Decreased orientation costs.
2. Improved staff skills when teaching students.
3. Improved morale related to having learners in the department.
4. Increased professionalism of a staff nurse anesthetist that derives from being a faculty member.

To estimate the worth of labor provided by students, 32 nurse anesthesia students kept track of how they spent their clinical time for 5 days each. The students estimated the amount of time they spent on anesthesia-related activities under the following conditions:

1. With a CRNA and anesthesiologist present.
2. With only a CRNA present.
3. With only an anesthesiologist present.
4. With neither a CRNA nor an anesthesiologist present.

Based on these surveys, it was estimated that a first-year student spends an average of 2 hours per day as the sole anesthesia provider in a room; second-year students spend an average of 4 hours per day as the sole anesthesia provider. During this time, the supervising CRNA is immediately available should the student need assistance but can perform other anesthesia-related duties to benefit the department (e.g., starting lines or interviewing patients preoperatively). It was estimated that the supervising CRNA can be doing additional work for the department: about 50% of the time a

first-year student is the sole anesthesia provider in the room and about 88% of the time a second-year student is the sole provider in the operating room. To calculate what this additional productive CRNA time is worth to the department, the number of hours was multiplied by the average CRNA wage plus 25% benefits, amounting to a benefit to the clinical institution of \$39,574 per student over the entire program.

■ *Academic institution.* Because the prototype academic institution was nonprofit, it was assumed that any profit realized by the academic institution was put back into services. In a reapplication of this benefit-cost model, it would be possible to calculate the costs and benefits of a nurse anesthesia educational program to a for-profit university. Even nonprofit academic institutions may benefit from nurse anesthesia programs in several ways. For example, the number of partnerships with clinical institutions may increase, the level of grant and research funding may increase, and the school of nursing is likely to benefit from its association with the American Association of Nurse Anesthetists, which serves as a resource for nurse anesthesia information and consultation both in the United States and on an international level.

■ *Others.* Benefits accrue to others primarily in the form of increased taxes paid on the increased salary earned by the nurse anesthesia graduates. Note that the increased taxes paid by graduates are an offset to students but a benefit to others and, thus, are not a net social benefit.

## Findings

In evaluating the benefits and costs of nurse anesthesia education, three measures were used. The first was net benefits in present-value terms. The costs and benefits of educational programs occur over a period of time. In benefit-cost analysis, it is necessary to inflate past costs and benefits and discount future costs and benefits to one point in time, thus determining the present value of the costs and benefits of the program.<sup>26,27</sup> The present value of net benefits is calculated by subtracting the present value of the costs from the present value of the benefits. An appropriate discount rate for calculating the present value of costs and benefits was determined by selecting the approximate interest rate at which the government borrows money from the private sector to fund public projects.<sup>28</sup> In this study, a 5% discount rate was used.

The second measure was the benefit-cost ratio, which is calculated by dividing the net present value of benefits by the net present value of costs. The third measure used to evaluate the benefits and costs of nurse anesthesia education was the internal rate of return, which is the discount rate at

which the present value of the costs is equal to the present value of the benefits (Table V).

■ *Results for students.* Over a 25-year work life, a nurse anesthesia graduate's earnings are substantially greater than the earnings of a critical care nurse. The net present value benefit for a nurse anesthesia graduate is \$336,940. The benefit-cost ratio for the nurse anesthesia graduate is 3.8, and the internal rate of return is 23%. By comparison, Bednash et al estimate that for students entering a 4-year nursing program in a private college in 1987, the internal rate of return is approximately 9.5%.<sup>7</sup> For a student entering a 4-year accounting program in a private college, Bednash et al estimate the internal rate of return to be approximately 16%.<sup>7</sup> The economic returns for graduate education are typically lower than for baccalaureate education. After surveying the literature, Cohn and Geske found that private rates of return for graduate education were quite variable, ranging from 2% to 10%.<sup>5(p110)</sup>

■ *Results for the clinical institution.* For the prototype clinical institution, the net present value benefit per student is \$1,804. This estimate is based on conservative figures and is probably low. The benefit-cost ratio is 1.1, and the internal rate of return is 15.6%. The benefit to the clinical institution is in the form of student labor and savings on recruitment costs. The benefit-cost ratio is 1.1 for the clinical institution, which means that the present value cost and present value benefit per student are very close. The internal rate of return is somewhat higher than might be expected due to the return occurring in a short period *within* the 27-month program.

■ *Results for the academic institution.* The non-profit university in the prototype is financially structured to put all revenues back into services. All academic costs were offset by transfer payments from student tuition and fees and from endowments and grants. Therefore, the academic institution in the prototype received zero net benefits from the education of nurse anesthetists.

■ *Results for others.* Net benefits to others, primarily taxpayers, in the prototype accrue in the form of increased taxes paid by graduates who earn more money during the 25-year work life. Others (taxpayers) also bear some of the economic costs of educating nurse anesthetists by funding federal grant programs, subsidizing interest on student loans, and paying Medicare taxes, for example. The present value net benefit for others in this prototype is \$47,258 per nurse anesthesia student. The benefit-cost ratio is 1.9, and the internal rate of return is 11.5%.

■ *Results for society.* In this study, the present value net benefit to society for educating one nurse anesthetist is \$386,002. The benefit-cost ratio is 2.8, and the internal rate of return is 19.6%. The social rate of return is the return society receives on an annual basis as a result of its investment in nurse anesthesia education. By comparison, Cohn and Geske found that the highest social rate of return for graduates with a master's degree was 12.7%, the return expected for white males intending to complete a master's degree in accounting.<sup>5(p112)</sup> See Table V for a summary of the findings.

## Discussion

The findings in this study suggest several important policy implications. First, even if some of the estimates in this benefit-cost model were underestimated or overestimated, the internal rates of return for all entities are very large. It is hard to argue against investing in nurse anesthesia education in the United States. In particular, healthcare analysts and policymakers should be very interested in the return that society and taxpayers receive on their investment in educating nurse anesthetists when compared with the approximately 10% rate of return usually expected in the private sector.

Second, at a time when many discussions are taking place about who should bear the burden of educating healthcare professionals, it should be of interest to clinical institutions that the rate of return on their investment in nurse anesthesia edu-

**Table V**

Summary of present value benefits, costs, net benefits, present value benefit-cost ratio, and internal rate of return of nurse anesthesia education (program costs and benefits in dollars, using 1995 prices)

	Social	Student	Clinical institution	Other
Present value of benefit .....	601,400	457,500	40,800	103,200
Present value of cost .....	215,400	120,500	39,000	56,000
Present value of net benefit .....	386,000	337,000	1,800	47,200
Benefit-cost ratio (present value) .....	2.8	3.8	1.1	1.9
Internal rate of return .....	19.6%	23.0%	15.6%	11.5%

cation is 15.6%. Although the benefit-cost ratio is 1.1, and the net benefit is not great, the internal rate of return is substantial because the return on investment occurs quickly. Coupled with the intangible advantages of having an educational program, the tangible benefits strengthen the argument that clinical institutions should continue to participate in nurse anesthesia education.

Third, some insights resulting from this study may be of interest to program directors, the American Association of Nurse Anesthetists leadership, and future nurse anesthesia students. For example, only 5 of the 33 students surveyed reported having day-care expenses. Is this because the nurse anesthesia program is so time consuming that students with children cannot go to school? Anecdotally, it seems that nurse anesthesia students entering programs are increasingly older with grown children or younger with no children. Making nurse anesthesia education more obtainable for young adults with children may be possible by developing more part-time programs.

Fourth, this study illuminates the current paradoxical situation in which the high internal rate of return to individuals in nurse anesthesia educational programs offers a strong incentive for participation, but program directors are reporting decreased applications. Only a few years ago, in the early 1990s, some nurse anesthesia programs were reporting 10 applications for every position available. At that time, the National Commission on Nurse Anesthesia Education actively encouraged programs to increase their class size. In fact, the American Association of Nurse Anesthetists funded a project manager position to help new programs get started and existing programs increase their enrollment. With hospitals unable to hire nurse anesthetists at any salary, a true shortage existed. However, by 1995, a major topic of discussion among nurse anesthesia program directors at their yearly meeting was the precipitous decline in applicants. This decline seemed to relate directly to the changes in reimbursement patterns for anesthesia providers and the uncertainty about employment opportunities for nurse anesthetists in the future. The nurse anesthetist labor market is a topic that invites further study.

Opportunities exist for future application of this benefit-cost model. First, it would be interesting to apply the model to nurse anesthesia educational programs internationally. Although the profession of nurse anesthesia is more developed and organized in the United States, nurses administer anesthesia in other countries.<sup>8</sup> Comparison of costs and benefits internationally might be especially helpful in identifying differences in one system of

education compared with another, particularly in the area of finance. For example, do governments other than the U.S. government offer such strong disincentives to educate nurse anesthetists by not reimbursing for anesthesia care they give?

A second future application of this study might be to look at economies of scale in nurse anesthesia education. If clinical institutions are to continue their investment in nurse anesthesia education, it would be helpful to determine how cost per student varies with program size.

Third, this evaluation model could be applied to specific nurse anesthesia educational programs to determine the specific program's benefit-cost ratios and internal rates of return for all entities involved. Most useful would be the potential for identifying inefficiencies in how the particular program is structured or financed or how staff and students are used.

Finally, this benefit-cost model could be applied to other advanced practice nursing educational programs. Because of the large clinical component in the program, the nurse anesthesia education prototype is similar to prototypes for other clinical nursing specialties, such as nurse midwifery. In this way, commonalities and differences of the various clinical nursing specialties could be demonstrated so that advanced practice nursing groups could offer a stronger justification for their continued role in the marketplace.

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