REGULATORY RESEARCH COMMITTEE
VIRGINIA BOARD OF HEALTH PROFESSIONS
VIRGINIA DEPARTMENT OF HEALTH PROFESSIONS

Invitation for Public Comment on the Review of the Feasibility of Licensure of Certified Anesthesiologist Assistants

The Virginia Board of Health Professions Regulatory Research Committee has scheduled a public hearing to receive comment on the feasibility of Virginia's regulation of Certified Anesthesiologist Assistants. The meeting will be held on June 27, 2017 beginning at 9:00 a.m. at the address listed below.

The Virginia Board of Health Professions is authorized by statute to advise the Governor, the General Assembly, and Department of Health Professions' Director on matters related to the regulation or deregulation of health care professions and occupations (see §54.1-2510 of the *Code of Virginia*).

This study is being conducted by the Board at the request of Senator Stephen Newman and Delegate Robert D. Orrock, Sr. The Board assigned it to the Board's Regulatory Research Committee at its February 23, 2017 meeting.

The Committee requests that information provided by commenters be responsive to the seven standard evaluative criteria ('the Criteria") listed below and as further detailed in the above-referenced report.

(1) The risk of harm posed by the unregulated practice of the profession must be identifiable;
(2) Specialized skills and training are needed which require assurance of initial and continued competency;
(3) Autonomous practice exists for the occupation which requires independent judgment and functioning;
(4) The scope of practice is distinguishable from other regulated professions, despite possible overlapping professional duties, methods of examination, instrumentation, or therapeutic modality;
(5) The economic cost to the public of restricting the supply of practitioners and cost of board and agency operations to regulate the occupation are outweighed by the benefit to the public;
(6) There are no alternatives to regulation which adequately protect the public; and
(7) If regulations are required, the least burdensome level of regulation which will protect the public will be recommended.

The location of the hearing is:

Virginia Department of Health Professions
9960 Mayland Drive, 2nd Floor Conference Center, Board Room #4
Henrico, Virginia 23233-1463

For map and directions, see http://www.dhp.virginia.gov/about/directions.htm

Written comment will be accepted until 5:00 p.m. **July 31, 2017** and should be sent to Elizabeth A. Carter, Ph.D. at the Virginia Board of Health Professions, 9960 Mayland Drive, Suite 300, Richmond, VA 23233-1463. Comment may also be sent via e-mail to Elizabeth.Carter@dhp.virginia.gov or faxed to (804) 527-4466.

Virginia Department of Health Professions
Virginia Board of Health Professions

Feasibility of Licensure of Certified Anesthesiologist Assistants

Background and Authority

The Virginia Board of Health Professions is evaluating the feasibility of state licensure for certified anesthesiologist assistants (CAAs) pursuant to requests from Senator Stephen Newman and Delegate Robert Orrock to the Department of Health Professions. At its February 24, 2017 meeting, the Board assigned the review to the Regulatory Research Committee.[1]

Code of Virginia §54.1-2510 authorizes the Board of Health Professions to advise the Governor, the General Assembly, and the Department Director on matters related to the regulation and level of regulation of health care occupations and professions in the Commonwealth. It also authorizes the Board to examine and advise on scope of practice conflicts involving regulated and unregulated professions.

Methodology

To guide such reviews, the Board applies the principles, standard evaluative criteria, and research methods detailed in its *Policies and Procedures for Evaluation of the Need to Regulate Health Occupations and Professions, 1998.* [2] This standard approach leads to evaluation of factors that are key to the public's protection and determination of the least level of regulation necessary. It is in keeping with regulatory principles established in Virginia law and accepted in the national community of regulators.

NOTE: This first draft report provides a general overview of the anesthesiologist assistant (AA) profession based upon objective, publically available information researched, to date, responsive to the standard criteria. As the study proceeds, additional information will be incorporated as will subjective insights gained through public comment. For ease of reference, the "Criteria for Evaluating the Need for Regulation" table is on the following page. It provides a brief summary of the meaning of the respective seven criteria (the Criteria).

[1] See the correspondence from Senator Newman, Delegate Orrock and Department Director Dr. David Brown's response is provided in Appendix 1 and workplan in Appendix 2.
[2] Published as Guidance Document 75-2 accessible at http://www.dhp.virginia.gov/bhp/guidelines/75-2.doc.

Criteria for Evaluating the Need for Regulation
Criterion One: Risk for Harm to the Consumer -The unregulated practice of the health occupation will harm or endanger the public health, safety or welfare. The harm is recognizable and not remote or dependent on tenuous argument. The harm results from: (a) practices inherent in the occupation, (b) characteristics of the clients served, (c) the setting or supervisory arrangement for the delivery of health services, or (d) from any combination of these factors.
Criterion Two: Specialized Skills and Training - The practice of the health occupation requires specialized education and training, and the public needs to have benefits by assurance of initial and continuing occupational competence.
Criterion Three: Autonomous Practice -The functions and responsibilities of the practitioner require independent judgment and the members of the occupational group practice autonomously.
Criterion Four: Scope of Practice - The scope of practice is distinguishable from other licensed, certified and registered occupations, in spite of possible overlapping of professional duties, methods of examination, instrumentation, or therapeutic modalities.
Criterion Five: Economic Impact -The economic costs to the public of regulation the occupational group are justified. These costs result from restriction of the supply of practitioner, and the cost of operation of regulatory boards and agencies.
Criterion Six: Alternatives to Regulation -There are no alternatives to State regulation of the occupation which adequately protect the public. Inspections and injunctions, disclosure requirements, and the strengthening of consumer protection laws and regulations are examples of methods of addressing the risk for public harm that do not require regulation of the occupation or profession.
Criterion Seven: Least Restrictive Regulation -When it is determined that the State regulation of the occupation or profession is necessary, the least restrictive level of occupational regulation consistent with public protection will be recommended to the Governor, the General Assembly and the Director of the Department of Health Professions.

If it is determined that the profession requires state regulation, selection of the *least* level of regulation is guided by consideration of the characteristics of licensure, state certification, and registration (the three most commonly used methods of professional regulation) and the specific criteria that apply to each.[3] See the Application of the Criteria table on the following page.

[3] NOTE: The descriptions are intended to differentiate *general* levels of professional regulation.

Application of the Criteria

Licensure

Licensure confers a monopoly upon a specific profession whose practice is well-defined. It is the most restrictive level of occupational regulation. It generally involves the delineation in statute of a scope of practice reserved to a select group based upon their possession of unique, identifiable, minimal competencies for safe practice. In this sense, state licensure typically endows a particular occupation or profession with a monopoly in a specific scope of 00practice.

RISK: High potential, attributable to the nature of the practice.
SKILL & TRAINING: Highly specialized accredited post-secondary education required; clinical proficiency is certified by an accredited body.
AUTONOMY: Practices independently with a high degree of autonomy; little or no direct supervision.
SCOPE OF PRACTICE; Definable in enforceable legal terms.
COST: High
APPLICATION OF THE CRITERIA: When applying for licensure, the profession must demonstrate that Criteria 1 through 6 are met.

Statutory Certification

Certification by the state is also known as "title protection." No scope of practice is reserved to a particular group, but only those individuals who meet certification standards (defined in terms of education and minimum competencies which can be measured) may title or call themselves by the protected title.

RISK: Moderate potential, attributable to the nature of the practice, client vulnerability, or practice setting and level of supervision.
SKILL & TRAINING: Specialized; can be differentiated from ordinary work. Candidate must complete education or experience requirements that are certified by a recognized accrediting body.
AUTONOMY: Variable; some independent decision-making; majority of practice actions directed or supervised by others.
SCOPE OF PRACTICE: Definable but not stipulated in law.
AUTONOMY: Variable; some independent decision-making; majority of practice actions directed or supervised by others.
COST: Variable, depending upon the level of restriction of supply of practitioners.
APPLICATION OF CRITERIA: When applying for statutory certification, a group must satisfy Criterion, 1, 2, 4, 5 and 6.

Registration

Registration requires only that an individual file his name, location, and possibly background information with the state. No entry standard is typically established for a registration program.

RISK: Low potential, but consumers need to know that redress is possible.
SKILL & Training: Variable, but can be differentiated from ordinary work and labor.
AUTONOMY: Variable.
APPLICATION OF CRITERIA: When applying for registration, Criterion 1, 4, 5, and 6 must be met.

The remainder of this report provides an overview of the profession, including origins, functions, private credentialing requirements, the current number credentialed, regulation in other states, and available disciplinary information. It also highlights comparisons with other anesthesiology providers, Anesthesiologists and Certified Registered Nurse Anesthetists. Lastly, because there is not yet a standard, universally accepted means for assessing healthcare workforce supply and demand, the report will reference findings from multiple independent resources with current and/or projected practitioner supply vs. population or job openings. These references are drawn from the U.S. Health and Human Services Human Resources Services Administration, U.S. Department of Economics Bureau of Labor Statistics, Virginia Employment Commission Labor Market Information, Department of Health Professions Healthcare Workforce Data Center and relevant information from the Cecil G. Sheps Center FutureDocs supply and demand projections for Anesthesiologists.

Regulatory Research Committee feedback from the May 9, 2017 meeting have been incorporated into the report which is posted with the public hearing notice. The public hearing is slated for June 27, 2017. Written comment will also be received until July 31, 2017.

Overview of the Profession

The profession now known as Anesthesiologist Assistant (AA) was first conceived in the 1960s by three Anesthesiologists in response to anesthesia provider shortage concerns at the time. Drs. Joachim S. Gravenstein, Joe E. Steinhaus, and Perry P. Volpitto envisioned the role of an "anesthesia technologist" to serve as an applied physiologist on the anesthesia team.[4] This mid-level profession was envisioned to support the anesthesiologist similarly to certified registered nurse anesthetists (CRNAs) but with an educational curriculum that required a foundation in pre-medical school coursework. This was intended to help pave the way to future medical school application for those who might wish to become Anesthesiologists.[5]

The first AA education program at Emory University in Atlanta, Georgia began accepting students in 1969, followed by Case Western Reserve in Cleveland, Ohio in 1970. [6] Today, there are 11 anesthesiologist assistant programs, with ten accredited and one pending accreditation. Accreditation is through the Commission on Accreditation of Allied Health Education Programs (CAAHEP) in conjunction with the Accreditation Review Committee for the Anesthesiologist Assistant (ARC-AA). [7, 8] ARC-AA is comprised of members from the American Academy of

[4] Kentucky Legislative Review Commission. (2007). *A study of anesthesiology assistants.* (Research report No. 337). Retrieved from http://www.lrc.ky.gov/lrcpubs/RR337.pdf.

[5] Current estimates are that approximately 10% of AAs apply for medical school admission.

[6] Department of Veterans Affairs. (2006). *Qualification Guidelines for the Position of Anesthesiologist Assistant, GS-0601.* Human Resources Management Letter No. 05-06-12. Retrieved April 18, 2017.

[7] Staff search of CAAHEP Accredited Program site accessed March 21, 2017: http://www.caahep.org/Find-An-Accredited-Program/.

Anesthesiologist Assistants (AAAA) and the American Society of Anesthesiologists (ASA). The Current Anesthesia Assistant Education Programs table on the next page lists them by state and accreditation status. Programs award a Master's degree upon completion.

Current Anesthesia Assistant Educational Programs			
State	**Program**	**Accreditation Status**	**Notes**
Colorado	University of Colorado School of Medicine http://www.ucdenver.edu/academics/colleges/medicalschool/departments/Anesthesiology/Education/aaprogram/AAadmission/Pages/Admission-Requirements.aspx	Initial 2013	
Connecticut	Quinnipiac University https://www.qu.edu/schools/medicine/programs/anesthesiologist-assistant-program.html#admissionsrequirements	Initial 2014	
D.C.	Case Western Reserve University https://case.edu/medicine/msa-program/admissions/requirements/	Continuing 2012	First of two Case Western Reserve expansions
Florida	NOVA Southeastern University – Tampa http://healthsciences.nova.edu/healthsciences/anesthesia/tampa/requirements.html	Continuing 2009	Two campuses
	NOVA Southeastern University – Ft. Lauderdale http://healthsciences.nova.edu/healthsciences/anesthesia/fort_lauderdale/requirements.html	Continuing 2009	
Georgia	Emory University https://med.emory.edu/aa_program/admissions/prereq.html	Continuing 1969	First AA program
	South University https://www.southuniversity.edu/savannah/areas-of-study/anesthesiologist-assistant/anesthesiologist-assistant-master-of-medical-science-mmsc/admissions	Continuing 2004?	
Missouri	University of Missouri Kansas City School of Medicine http://med.umkc.edu/msa/requirements/	Continuing 2008	
Ohio	Case Western Reserve University https://case.edu/medicine/msa-program/admissions/requirements/	Continuing 1970	
Texas	Case Western Reserve University https://case.edu/medicine/msa-program/admissions/requirements/	Continuing 2008	Second Case Western Reserve expansion program. Partnered with the University of Texas Houston Medical Center
Wisconsin	Medical College of Wisconsin http://www.mcw.edu/Medical-School/Home/Master-of-Science-in-Anesthesia-Program/Apply.htm	Initial Pending	

AA program admissions candidates must have a Bachelor's degree and completed coursework that would qualify the student to pursue a post-baccalaureate degree in medicine, dentistry or

[8] Minimum standards for CAAHEP anesthesiologist assistant accreditation are available at http://www.caahep.org/arc-aa.

one of the basic medical sciences. [9] Specific courses may vary but generally include biology, chemistry, organic chemistry, physics and advanced mathematics topics. Candidates must also submit Graduate Record Examination (GRE) or Medical College Admission Test (MCAT) scores, most programs accept either examination, but the University of Missouri-Kansas, and Case Western programs accept only MCAT.[10] Preferred scores are generally at the 55th percentile or higher.

According to the American Academy of Anesthesiologist Assistants "Frequently Asked Questions" summary, approved training programs must include a minimum of 24-28 months at the Master's level and be based at or in collaboration with a university with a medical school and academic anesthesiologist physician faculty. Each program must have at least one director who is a licensed, board certified anesthesiologist. Clinical training sites must be academic medical centers.[11] Further, the programs must provide a minimum of 63 didactic hours and 2000 clinical training hours with clinical anesthesia experience in all of the surgical specialties including: ambulatory, cardiothoracic, general, gynecology, neurosurgery, obstetrics, orthopedics, pediatrics, and vascular. [12] Appendix 3 contains a sample curriculum with course descriptions from the Case Western Reserve program.

The National Commission for Certification of Anesthesiologist Assistants (NCCAA) founded in 1989 is the national certifying organization for the profession. In addition to graduation from an accredited program, NCCAA requires passing an initial written certifying examination, NCCAA CERT. If successful, the NCCAA awards the AA with a time-limited certificate. To maintain certification requires 40 hours of Continuing Medical Education (CME) every two years and passage of the Continued Demonstration of Qualifications (CDQ) examination every six years is required to maintain NCCAA certification. [13]

The NCCAA examinations were developed in concert with the National Board of Medical Examiners (NBME). In 1990, they helped develop the first CERT based upon job analysis with AAs and sponsoring physicians; the content domains and item bank were first established then. In 1997, they conducted a subsequent job analysis for the CDQ exam which was first administered in 1998. Each year, NCCAA appoints test committees to prepare the CERT and CDQ in consultation with NBME and psychometric experts. Exams are offered annually in February and June. [14] The test blueprints for both examinations are in Appendix 4.

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[9] American Academy of Anesthesiologist Assistants *Frequently Asked Questions* accessible at https://aaaa.memberclicks.net/faqs.

[10] Further details on respective programs pre-requisite courses, GPA and exam score requirements are available from the respective program's websites.

[11] http://www.anesthetist.org/faqs accessed December 5, 2016 .

[12] American Academy of Anesthesiologist Assistants. *Career information for prospective anesthesiologist assistants* accessible at: https://aaaa.memberclicks.net/assets/docs/aaaa_career_information%20flyer.pdf.

[13] NCCAA website: http://www.aa-nccaa.org.

[14] "History and Operations" section of the NCCAA website accessed April 18, 2017.

NCCAA accepts CME credit for programs approved for continuing medical education credit by the following organizations: American Medical Association, American Association of Physician Assistants, Accreditation Council for Continuing Medical Education. Of the 40 hours required every two years, content for 30 hours must be in the field of anesthesiology or one of its sub-specialties. The remaining hours can be in any medical topic. NCCAA conducts a random audit on an annual basis. For further details concerning CAA continuing education, see http://www.aa-nccaa.org/about/cme.

To determine an estimate on the overall number of AAs, Board staff contacted NCCAA. On April 5, 2017, NCCAA reported there were approximately 2,200 CAAs nationwide, and based upon the last certification period in June 2016, 16 CAAs had Virginia mailing addresses.[15] Further information on practice location was not available.

Obtaining information on the number of AAs (including CAAs) in the U.S. and individual states' workforces is a challenge. The U.S. Health and Human Services National Practitioner Identifier (NPI)[16] system and U.S. Bureau of Labor Statistics (BLS) reporting have data that can help provide some insights.

NPI online registry data [17] were accessed in April and searched using the term "Anesthesiologist Assistant." The data are current as of January 2017. The table is Appendix 5 contains details overall and by state on the number and percent of registered practitioners and businesses. There were 2,411 listed for the U.S. overall, and for Virginia four. The majority of states had fewer than 20 practitioners listed. Only two states, had more than half (56%) of all Anesthesiologist Assistant registrations. Georgia at 43% (1031), and Florida at 12.77% (308). Direct comparisons with NCCAA figures are difficult because credential entry was not mandatory in NPI, but the NPI's 2411 and NCCAA's approximate 2,200 are close and provide a good idea of the likely number of AAs practicing in the U.S.

BLS continuously tracks national and state labor market data related to industry sectors, individual occupations, geographic areas, and timeframes with multiple, interrelated publications and interactive tools. The AA national job market data is relatively sparse. But there are state-level data available for jobs using the title "Anesthesiologist Assistant."

In conjunction with BLS, the Virginia Employment Commission hosts the "Labor Market Information" (LMI)[18] interactive tool. One of its key features is real-time tracking of open jobs and candidates posted online. On April 18, 2017, Virginia had five open jobs and four candidates seeking employment as "Anesthesiologist Assistant." Two jobs of those jobs were

[15] From e-mails received from NCCAA Executive Director Cynthia Maraugha on April 5, 2017.
[16] In October 2006, the Centers for Medicare and Medicaid Services first issued NPI numbers as a means to uniquely identify individual health care providers and organizations. The 10-digit NPI has been required for reimbursement since 2008 for all standard HIPPA transactions. Anesthesiologist Assistants are included and coded under the 367H00000X Series. Note that individuals may or may not list credentials such as CCA, PA-C, etc.
[17] Queried April 6-10, 2017. Accessible at: https://npid.org.
[18] Virginia LMI reports are accessible at https://data/virginialmi.com/vosnet/lmi/default.aspx?pu=1&plang=E.

in the City of Richmond, two in Montgomery County, and one in Fairfax County.[19] The estimated median annual wage in 2015 was $91,984 and range of $63,051 to $104,229. Note that these figures are based on analysis of Physician Assistant not Anesthesiologist Assistant jobs due to their small number. Other states also have LMI similar tools. North Carolina had 11 open jobs and seven candidates and Kentucky had four open jobs with no candidates.[20]

A later section of this report will address additional federal, state, and independent academic workforce data, estimates and projections. These relate directly to the Criteria's requirement that the potential impact licensure may have on the scope of practice, marketability, economic and social status of other, similar groups, and economic costs to the public.

Typical AA Functions

The American Society of Anesthesiologists (ASA) "Statement on the Anesthesia Care Team" (ACT) [21] and American Academy of Anesthesiologist Assistants' (AAAA) "Certified Anesthesiologist Assistants: AA Scope of Practice/Job Description."[22] provide their professional perspectives on what constitutes appropriate AA functions and duties. They are both rooted in the ASA's view that Anesthesiologists should be involved in the perioperative care of every anesthesia patient, either as provider or as director of an Anesthesia Care Team also comprised resident physicians in training in anesthesia care as well as non-physician anesthesia providers. The Anesthesiologist may delegate patient monitoring and tasks deemed appropriate to the non-physician providers but retains overall responsibility for the patient. Members of the ACT are to work together to provide optimal patient care. Team members include physicians (Anesthesiologists, anesthesiology fellows, anesthesiology residents) and non-physicians (AAs, AA students, CRNAs, student nurse anesthetists, and dental anesthesia students). See the full Statement for further details. The AAAA's job description lists functions that could be delegated to AAS. The list is not intended to be exhaustive, but provides insights into the duties expected of AAs.

- **Obtain an appropriate an accurate pre-anesthetic health history; perform an appropriate physical examination and record pertaining data in an organized and legible manner,**
- **Perform diagnostic laboratory and related studies as appropriate, such as drawing arterial and venous blood samples,**
- **Administering anesthetic agents and any controlled substances, including but not limited to, administration of induction agents, maintaining and altering anesthesia levels, administering adjunctive treatment and providing continuing of anesthetic care into and during the post-operative recovery period,**
- **Establishing airway interventions and perform ventilator support,**
- **Apply, perform, and interpret advanced monitoring techniques,**

[19] LMI searches of two surrounding states, North Carolina and Kentucky were done on April 24, 2017. North Carolina listed 11 jobs and seven candidates while Kentucky listed four openings with no candidates.
[20] Queried April 24, 2017.
[21] Available at http://www.asahq.org.
[22] Available at http://www.memberclicks.net

- **Use advanced life support techniques, such as high frequency ventilation and intra-arterial cardiovascular assist devices,**
- **Make post-anesthesia patient rounds by recording patient progress notes, compiling and recording case summaries, and by transcribing standing and specific orders,**
- **Evaluate and treat life-threatening situations, such as cardiopulmonary resuscitation, on the basis of established protocols (BLS, ACLS and PALS),**
- **Perform duties in intensive care units, pain clinics, and other settings, as delegated by the physician anesthesiologist,**
- **Train and supervise personnel in the calibration, troubleshooting, and use of patient monitors.**
- **Perform administrative duties in an anesthesiology practice or anesthesiology department such as patient record management, procedure coding and billing, and management of personnel,**
- **Participate in the clinical instruction of others, and**
- **Perform and monitor regional anesthesia to include, but not limited to, spinal, epidural, IV regional, and other special techniques such as local infiltration and nerve block**

AA Regulation by States and other U.S. Jurisdictions

The scope of permissible AA clinical practice from the perspective of the states is defined in statutes and regulations. AAs are regulated in 18 states, the District of Columbia, and Guam as a profession (licensure or certification) or through physician delegated authority. That is, there are specific enabling statutes in those jurisdictions that permit AA practice. Appendix 6 indicates the type of regulation[23], education accreditation, examination and fees required in addition to a summary of the permitted scope, supervision and continuing education and recertification requirements.

There is some variability from state-to-state. But regardless of jurisdiction, AAs are permitted to practice only under the direction of Anesthesiologists, not other types of physicians or CRNAs. In most instances, the supervising Anesthesiologist must be physically present and "immediately available." For the majority of states, certification through the NCCAA is required for initial and ongoing licensure, certification or physician delegation.

The states most restrictive to practice entry are Georgia and Kentucky in that they require physician assistant licensure as well. Four states, Alabama, Ohio, Texas, and Wisconsin place restrictions on employment. Ohio and Texas permit AAs to bill for services, but the reimbursement goes to the employing entity. Although West Virginia does not regulate AAs as a profession, it should be noted that their statutes expressly permit AAs to bill for service.

Discipline for misconduct is also a responsibility of state boards. But obtaining disciplinary information on AAs can be challenging. It requires review of publically available board minutes, newsletters and online reporting. To date, staff have determined the following:

[23] Note Michigan shifted from physician delegation to licensure in late 2016.

Colorado has sanctioned two (2) for impairment issues, Alabama had one (1) for practicing prior to licensure, and Wisconsin one (1) for co-worker harassment. Kentucky provides links to 21 orders and Ohio shows six (6) cases but no further details are available without in depth review of each order.[24]

Other Anesthesia Care Providers: Anesthesiologists and Certified Registered Nurse Anesthetists

Criteria 4 and 5, requires consideration of the impact on Virginia's other licensed professions that perform similar functions and the potential economic impact regulation of the new group might entail. Although anesthesia care may be provided by practitioners[25] other than Anesthesiologists and CRNAs, they are the predominant professions most likely to be affected by AA licensure.

Anesthesiologists are licensed physicians who provide anesthesia for patients undergoing surgical, obstetric, diagnostic, or therapeutic procedures and currently monitor the patient's condition and supporting vital organ functions. They also diagnose and treat various forms of pain, including that associated with cancer. They also provide resuscitation and medical management for patient with critical illness and severe injuries.[26] Anesthesiologist training typically involves four years of college, four years of medical school, one year of internship and four years of residency through an accredited program. Although one may practice anesthesiology without specialty certification, certification through the American Board of Anesthesiology (ABA) permits use of "Board Certified" or "Diplomate" titling.[27] In a recent media release, the American Society of Anesthesiologist reports that about 75% of Anesthesiologists are ABA certified.[28]

The Accreditation Council for Graduate Medical Examination (ACGME) reports that there are 147 Anesthesiologist specialty education programs in the U.S., with six pending approval in 2017. [29] There are two programs in Virginia, at the University of Virginia and Virginia Commonwealth University Medical College of Virginia. According to the American Osteopathic College of Anesthesiologists 2015 Annual Report, there were 13 Anesthesiologist Osteopathic residency programs nationwide, none in Virginia. [30]

In addition to graduation from an accredited Anesthesiologist program, ABA requires a series of examinations to gain and maintain certification. Certification in critical care medicine, hospice

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[24] Georgia's online license lookup subsumes AAs within Physician Assistant listings which require in depth case-by-case research and the payment of processing fees.
[25] Dentists, for example.
[26] American Board of Medical Specialties. (2017). *ABMS Guide to Medical Specialties 2017.* American Board of Anesthesiologist, pp. 5-6. accessible at: https://www.abmsdirectory.com/pdf/Resources_guide_physicians.pdf
[27] http://www.theaba.org/ABOUT/About-the-ABA
[28] https://www.asahq.org/For-the-Public-and-Media/About-Profession.aspx
[29] http://www.acgme.org/ - accessed April 18, 2017
[30] http://c.ymcdn.com/sites/www.aocaonline.org/resource/resmgr/AOCA_Annual_Report_2015.pdf - accessed April 18, 2017.

and palliative care, and pain medicine, pediatric anesthesiology, and sleep medicine. and subspecialties are also available through ABA. Further details are available upon request from ABA.

Nurses have been providing anesthesia care in the U.S. for over 150 years. Historically, trained nurses under the supervision of surgeons provided nearly all anesthesia care for surgical patients until anesthesiology was established as a medical specialty. Today, all 50 states permit CRNAs to perform various types of anesthesia care, under medical supervision of anesthesiologists or other physicians, or independently without medical supervision in 16 states.[31]

In Virginia, they are licensed by the joint Boards of Nursing and Medicine as Nurse Practitioners (NPs) but with this specialty area. They practice under the supervision of doctors of medicine, osteopathy, podiatry or dentistry but are not governed by the practice agreement requirements required of other NPs.[32] [33] An applicant for initial licensure must hold a current license as a registered nurse in Virginia or through multistate licensure privilege, have graduated from an a nurse anesthesia program accredited by the Council on Accreditation of Nurse Anesthesia Educational Programs (COA)[34] or its predecessor, and provide proof of certification from the National Board of Certification and Recertification for Nurse Anesthetists (NBCRNA). It should also be noted that acceptance into a COA accredited program first requires the candidate have at least one year's full-time or part-time equivalent work experience in a critical care setting.

As of December 2016, there were 115 accredited programs in the U.S., with two in Virginia, at Old Dominion University and Virginia Commonwealth University.[35] The latest COA standards require programs to prepare students at the doctorate level by 2018. VCU's program admitted their last Master of Science in Nurse Anesthesia student cohort in August 2016 and began matriculating doctoral students in January 2017. [36]

Certification through the NBCRNA also requires passage of the National Certification Examination. Further details concerning the examination are available if requested.

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[31] Tashaki, M & Tetsuro, S. (2011). The role of Certified Registered Nurse Anesthetists in the United States. *Journal of Anesthesia, 25(5),* 734-740.

[32] Regulations Governing the Licensure of Nurse Practitioners §18VAC 90-30 10 *et seq.*

[33] Nurse practitioner (NP) practice agreements are jointly developed by the collaborating patient care team physician(s) and the NP. The agreement describes procedures to be followed and acts appropriate to the specialty area in the care and maintenance of patients. Where applicable, practice agreement describe the NPs prescriptive authority.

[34] COA is the sole accrediting body for nurse anesthesia education programs recognized by the U.S. Department of Education and the Council on Higher Education

[35] http://home.coa.us.com/accredited-programs/Pages/List-of-Recognized-Programs-(LORP).aspx

[36] VCU School of Allied Health Professions Nurse Anesthesia Programs: http://www/.sahp.vcu.edu/departments/nrsa.programs/ accessed April 5, 2017.

Anesthesiologist and CRNA Workforce Estimates and Projections

Because the impact of a new group of providers may affect the existing anesthesia workforce, it is important to understand what is known concerning the number and distribution of providers. Because healthcare workforce research is a new field, the existing literature is sparse, disconnected, an often the result of work done in response to grants and other ad hoc funding opportunities. It tends to focus on samples of a handful of large professions and specialty areas. Methodologies vary widely even within the same profession and there are often years separating data collection and reporting.

Currently, the most reliable federal sources of information come from U.S. Department of Health and Human Services Health Resources Services Administration (HRSA) and the U.S. Department of Labor Bureau of Labor Statistics (BLS). Note that even their methodologies in that BLS tracks *employee* data and excludes from the counts those practitioners who are their own bosses.

The following describes the existing estimates and projections for the respective Anesthesiologist and CRNA workforces from both agencies. This will be followed by Virginia Department of Health Professions Healthcare Workforce Data Center results and a discussion of FutureDocs estimates and projections for Anesthesiologist services in Virginia.

HRSA's Chartbook and State Profiles

The U.S. Health Workforce Chartbook and its state-level breakout supplement "The U.S. Health Workforce – State Profiles," were both published in 2014. The *Chartbook* and *State Profile* provide a wealth of information on multiple health professions. Of most direct relevance for the current study is information from the *State Profiles* with estimates of practitioner counts and practitioner per 100,000 working age population ratios for each state. The source data are from 2008 to 2010. Although a bit dated, the results provide a much-needed standard, federal estimate of the nation's health workforce.[37] The table on the following page lists the CRNA count and CRNA ratio per 100,000 working age population.

These estimates indicate approximately 35,570 CRNAs were in the U.S. workforce in the 2008 to 2010 timeframe, with a mean of 13.5 CRNAs per 100,000 working age population. There is a great deal of variability among the states in both the number and ratio. As few as 24 CRNAs were in Vermont to as many as 2,488 in Florida and the population ratios ranged from 3.0 (Nevada and California) to 35.2 (South Dakota). When states are ranked from the smallest to largest ratios, the median is Georgia with 10.9. Virginia ranks just below in the 26th place at 11.3.

[37] There is no breakout by Physician specialty. There are also breakouts available by Physician (overall) Nurse Practitioner and Physician Assistant if needed.

As will be discussed in the section on the Virginia Department of Health Professions Healthcare Workforce Data Center, the State Profile may have underestimated the number of CRNAs in Virginia.

State	# CRNA estimated	CRNA to 100K working age Population	State	# CRNA estimated	CRNA to 100K working age Population
Alabama	1180	24.7	Montana	69	7.0
Alaska	41	5.8	Nebraska	289	15.8
Arizona	233	3.6	Nevada	81	3.0
Arkansas	346	11.9	New Hampshire	161	12.2
California	1125	3.0	New Jersey	462	5.2
Colorado	329	6.5	New Mexico	152	7.4
Connecticut	430	12.0	New York	1027	5.3
Delaware	234	26.1	North Carolina	2016	21.1
D.C.	65	10.8	North Dakota	224	33.3
Florida	2488	15.2	Ohio	1656	14.4
Georgia	1053	10.9	Oklahoma	319	8.5
Hawaii	98	7.2	Oregon	225	5.9
Idaho	196	12.5	Pennsylvania	2703	21.3
Illinois	1029	8.0	Rhode Island	137	13.0
Indiana	269	4.2	South Carolina	927	20.0
Iowa	310	10.2	South Dakota	287	35.2
Kansas	469	16.4	Tennessee	1504	23.7
Kentucky	706	16.3	Texas	2551	10.1
Louisiana	1067	23.5	Utah	153	5.5
Maine	253	19.0	Vermont	24	3.8
Maryland	418	7.2	Virginia	905	11.3
Massachusetts	640	9.8	Washington	394	5.9
Michigan	1848	18.7	West Virginia	420	22.7
Minnesota	1505	28.4	Wisconsin	564	9.9
Mississippi	507	17.1	Wyoming	37	6.6
Missouri	1084	18.1			

SOURCE DATA: "The U.S. Health Workforce: State Profiles" https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/state-profiles/usworkforcestateprofiles.pdf. Published August 2014 - accessed February 2, 2017

HRSA Supply and Demand Projections

Also in 2014, HRSA launched their multifactorial Health Workforce Simulation Model (HWSM) to help establish a more uniform, national approach to estimating and projecting health profession workforce supply and demand now and in the future. [38] Since then, they have evaluated several health professions and specialties, including CRNAs, with data drawn from the Area Health Resources File (AHRF) State and National data files.

HRSA's "Health Workforce Projections: Certified Nurse Anesthetists" [39] was published in

[38] For specific details on the model, see the " Technical Documentation for Health Resources Service Administration's Health Workforce Simulation Model" accessible at: https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/projections/simulationmodeldocumentation.pdf.

[39] https://bhw.hrsa.gov/sites/default/files/bhw/health-workforce-analysis/research/projections/crna-fact-sheet.pdf

December 2016, and suggests that the U.S. should have an adequate supply of CRNAs to meet future demand out to the year 2025. HWSM yields a national CRNA supply estimate of 44,660 in the base year 2013. It projects a growth at 38% 2013 and 2025, and projects growth in demand at 16% for that same period. The supply projection takes into account growth in the annual number of new CRNAs trained over the past decade, attrition through retirement or mortality, and projected drop in average work hours due to predicted demographic labor force factors. The projected demand is linked to assumptions of increased surgeries attributable to an aging and growing population, increases in chronic diseases requiring surgery, and increases in insurance coverage.

BLS Occupational Employment and Wage Statistics, Current Job Openings and Short- and Long-term Projections

The following findings are drawn from multiple standard BLS sources, each addressing slightly different aspects of the anesthesia care provider workforce.

Virginia's Labor Market Information (LMI)

As discussed with regard to AAs, Virginia's LMI provides real-time information on job openings, candidates, compensation estimates, and geographic distribution data. [40] The table below lists: the number of job openings and candidates posted online in mid-April, 2015 compensation median and range estimates for jobs under the BLS titles "Nurse Anesthetist" and "Anesthesiologist." [41]

Virginia LMI Results for Nurse Anesthetist and Anesthesiologist April 18, 2017

Occupational Title	Online Posted Job Openings April 18, 2017	Candidates Seeking Employment in this Occupation	Estimated Median (Range) Salary/Wage May 2015	Job Locations
Nurse Anesthetist	116	1	$157,257 ($118, 797 - $196,142)	Fairfax County (15), Richmond (14), Newport News (8), Hampton (7), Winchester (5), Norfolk (5) Roanoke (5), Alexandria (5), Fredericksburg (5)
Anesthesiologist	92	1	N/A $86,901 - $262,642)	Richmond (13), Alexandria (8), Virginia Beach (6), Manassas (4), Newport News (3), Spotsylvania County (3), Harrisonburg (3), Fairfax County (3), Chesterfield County (2), James City County (2)

[40] See the full array of reports retrievable from LMI accessible at https://data.virginialmi.com/vosnet/lmi/default.aspx?pu=1&plang=E.

[41] Note these results relate to *employee* jobs and exclude practitioners who own or are partners in practice.

LMI characterizes the current Virginia job market for both Anesthesiologists and Nurse Anesthetists as in "medium demand" and "low supply," but for Anesthesiologist Assistants as in "low demand" and "low supply." Both Nurse Anesthetists and Anesthesiologist jobs are projected to grow as described in the following BLS short- and long-term projection results.

National occupational employment and wage estimates for May 2016 are available through Occupational Profiles reporting[42] and additional estimates for Virginia, specifically, through the May 2016 State Occupational and Wage Estimates: Virginia.[43]

Short- and Long-Term Projections

The following tables detail BLS short-term projections for Nurse Anesthetists (CRNAs) and Anesthesiologists in Virginia and surrounding states and long-term projections for the U.S., Virginia, and surrounding states. No separate breakout for Anesthesiologist Assistants is available. BLS subsumes them under the title "Physician Assistants."

BLS Short-Term Projections for CRNAs and Anesthesiologists

U.S., Virginia, and Surrounding States

	Nurse Anesthetists				Anesthesiologists			
	2015	2017	% Change	Avg. Job Openings	2015	2017	% Change	Avg. Job Openings
Virginia	1410	1470	4.50%	60	570	600	4.40%	30
DC	110	120	0.90%	0	240	250	2.90%	10
KY	1130	1160	2.60%	30	710	720	1.80%	20
MD	380	390	4.20%	10	400	420	5.00%	50
NC	2730	2810	3.00%	100	970	1010	3.20%	40
TN	2070	2160	4.70%	80	630	640	1.30%	20
WV	570	580	1.80%	20	260	260	0.80%	20

BLS Long-Term Projections for CRNAs and Anesthesiologists

U.S., Virginia, and Surrounding States

	Nurse Anesthetists				Anesthesiologists			
	2014	2024	% Change	Avg. Job Openings	2014	2024	% Change	Avg. Job Openings
U.S.	38300	45600	19.30%	N/A	33700	40800	21.0%	N/A
Virginia	1390	1700	28.70%	70	570	720	25.90%	30
DC	110	120	6.10%	N/A	250	270	10.10%	10
KY	1930	2380	23.10%	90	730	910	24.90%	40
MD	670	840	23.90%	30	N/A	N/A	N/A	N/A
NC	2740	3360	22.60%	130	970	1200	24.10%	50
TN	2210	2920	32.30%	110	470	600	29.20%	30
WV	520	550	6.20%	10	150	150	4.10%	10

Source: Projections Central accessed at http://www.projectionscentral.com/Projections/ShortTerm. Accessed: February 13, 2017

[42] Accessible at: https://www.bls.gov/oes/current/oes_stru.htm#29-0000. For Anesthesiologist at https://www.bls.gov/oes/current/oes291061.htm, and Nurse Anesthetist at: https://www.bls.gov/oes/current/oes291151.htm.

[43] Accessible at: https://www.bls.gov/oes/current/oes_va.htm#29-0000

Current estimates for both professions and projection timeframes indicate growing demand, with Virginia expected to experience a 4.50% (60) short-term growth in Nurse Anesthetist average annual job openings and 4.40% growth (30) in Anesthesiologist jobs. Long-term projections to 2024 anticipate an overall 28.70% increase for Nurse Anesthetist jobs and 25.90% for Anesthesiologist jobs, both outpacing the rate of growth projected for the U.S.

Virginia's projected long-term growth *rate (*% change) for both Nurse Anesthetists and Anesthesiologists surpasses surrounding states except Tennessee and the U.S. overall. However, there are greater overall *numbers* of both professions in other surrounding states, including North Carolina.

Virginia DHP Healthcare Workforce Data Center Supply-Side Surveys

The Department of Health Professions Healthcare Workforce Data Center (DHP HWDC) improves data collection and measurement of Virginia's healthcare workforce through regular assessment of workforce supply and demand issues among the professions licensed by boards within the Department. Its profession-specific workforce surveys are part of the licensure renewal processes for over 30 professions, including Nurse Practitioners and Physicians (M.D.s and D.O.s). The surveys have items regarding specialty areas: primary and secondary "specialty" for Nurse Practitioners and primary and secondary "board certification" for Physicians.

The respective tables below show the number of practitioners of each profession who reported an anesthesia-related specialty area in recent survey years. [44] [45] The tables also provide the percentage anesthesia-related specialties comprise all specialty areas for the respective profession. These figures provide valuable insight into Virginia's actual anesthesia workforce because survey response rates are consistently high (ranging from 73% to 86% and rising over time).

These data reflect a gradual decline in the number of CRNA working in Virginia accompanied by a drop in the percent of primary specialties attributable to CRNA. For Anesthesiologists, however, the reverse is indicated. Although the renewal timeframes are slightly different, Anesthesiologist practitioners have been increasing with a slight increase in Anesthesiology among all Board Certifications.

[44] See the following sites for more details on DHP HWDC (http://www.dhp.virginia.gov/hwdc/default.htm), the research methodology (http://www.dhp.virginia.gov/hwdc/docs/MethodologyandGlossary.pdf), and profession-specific findings http://www.dhp.virginia.gov/hwdc/findings.htm. will be published in June

[45] The licensure renewals for Nurse Practitioners are conducted over a two-year period by birth month. Beginning in 2013, DHP HWDC implemented a schedule of annual catchments and reporting. So, approximately half of NPs are surveyed and reports of their results are published each year.

DHP HWDC Nursing and Physician Survey Results Related to Anesthesia Care Providers

Nurse Practitioners

	2011-13	2014	2015	2016
# Nurse Practitioners with CRNA Primary Specialty	1462	1428	1400	1382
% Primary Specialties CRNA Constitutes	24%	24%	23%	20%

Physicians

	2012	2014	2016[46]
# Physicians with Anesthesiology Board Certification	780	1017	1073
% Board Certifications Anesthesiology Constitutes	4%	4%	5%

Because the supply and demand can vary by geographic areas, it is important to understand how the anesthesia workforce is distributed. Appendix 7 provides mapping for CRNAs and Anesthesiologists based upon DHP HWDC's standard full-time equivalencies (FTEs). Appendix 7 also provides County/City tables with details. Both CRNAs and Anesthesiologists cluster largely in metropolitan areas but there are practitioners of either type distributed throughout the state.

[46] The 2016 Physician draft report is complete and will be presented for Board of Medicine approval in late June and thereafter posted to the DHP HWDC findings website.

FutureDocs

One of the nation's most experienced and well-regarded healthcare workforce research institutions is the Cecil G. Sheps Center for Health Services Research at the University of North Carolina, Chapel Hill. (Sheps Center). Founded in the 1970's, the Sheps Center remains a vanguard in the development of applicable research. A key example is their innovative, online interactive tool, FutureDocs.

FutureDocs [47] is a multifactorial statistical model and interactive web-based forecasting tool designed specifically to aid healthcare workforce policy development. Among its features are tools to estimate physician specialty supply (head count and patient-care to population ratios), the use of healthcare services, and the capacity of the physician workforce to meet the current and future use of health services at the national, state, and regions within states.[48] It provides user-friendly customizable scenarios and interactive online visualizations to display current results and estimated projections for the 2013 to 2030 timeframe. The system allows selection of over 30 different physician specialties, including Anesthesiology and estimates and projections resulting from a number of different scenarios. [49] The following are the results of staff queries related to physician supply

The following provides results of querying the model for estimates of the current (2013) Anesthesiologist workforce by state and projections for Virginia to 2030. The tool permits selections of head counts, head counts per 10,000 population, patient-care full time equivalencies (FTEs),[50] and patient care FTEs per 10,000 with displays through maps, line charts and age/gender pyramids.

2013 Estimates[51]

To help provide context concerning the Virginia Anesthesiologist workforce, staff analyzed the head count, head count per 10,000 population for the Commonwealth in relation to the other states. The table on the following page shows the estimate of 1035 Anesthesiologists in Virginia by head count. Virginia ranks 14th among the states. California ranks 1st with almost 5500 Anesthesiologists and North Dakota in last place with a little over 50.

To provide a sense of relative patient population coverage, the table includes Anesthesiologist head count per 10,000 population. On this measure, Virginia at 1.26/10k drops to 28th ranking. Surrounding states vary, with Massachusetts (2.17/10k) topping the list and Maryland (2.04/10K) in 2nd place.

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[47] The FutureDocs model, and project and technical documentation are accessible at: https://www2.shepscenter.unc.edu/workforce/index.php. For the greatest detail on methodology, see https://www.2.shepscenter.unc.edu/workforce/about.php

[48] Tertiary Service Area (TSA) region levels.

[49] Baseline, Medicaid expansion, Retirement rates, and increased NP and PA assistance, for example.

[50] FutureDocs' FTE is not on the same scale as DHP HWDC (1 FTE = 2000). Rather it references North Carolina health Professions Data System data that details patient care hours by sex, age and specialty. For further details

Anesthesiologist Head Count and Head Count per 10,000 Population by State Estimates for 2013[52]

State	Anesthesiologist Head Count	Anesthesiologist Head Count Rank	Anesthesiologist Head Count per 10k	Anesthesiologist Patient Care FTE Rank
Alabama	468	28	0.92	49
Alaska	96	48	1.32	26
Arizona	1053	13	1.57	9
Arkansas	287	34	1	45
California	5492	1	1.43	16
Colorado	879	18	1.65	7
Connecticut	628	22	1.7	5
Delaware	103	47	1.03	44
Florida	2718	4	1.39	22
Georgia	1026	15	1.03	43
Hawaii	191	40	1.36	24
Idaho	143	44	0.94	48
Illinois	1882	6	1.5	13
Indiana	1021	16	1.55	10
Iowa	346	32	1.17	34
Kansas	338	33	1.04	42
Kentucky	560	25	1.26	29
Louisiana	499	26	1.05	41
Maine	194	38	1.4	20
Maryland	122	11	2.04	2
Massachusetts	1455	9	2.17	1
Michigan	1147	10	1.16	36
Minnesota	614	24	1.15	37
Mississippi	257	35	0.92	49
Missouri	771	20	1.24	31
Montana	145	43	1.4	21
Nebraska	237	37	1.24	32
Nevada	412	30	1.48	15
New Hampshire	191	41	1.41	19
New Jersey	1696	7	1.8	3
New Mexico	238	36	1.17	35
New York	3656	2	1.87	4
North Carolina	985	17	0.98	46
North Dakota	58	51	0.66	51
Ohio	1624	8	1.38	23
Oklahoma	448	29	1.2	33
Oregon	622	12	1.49	14
Pennsylvania	1954	5	1.5	12
Rhode Island	133	45	1.25	30
South Carolina	489	27	1.07	40
South Dakota	68	50	0.7	50
Tennessee	771	21	1.07	40
Texas	3451	3	1.31	27
Utah	406	31	1.34	25
Vermont	107	46	1.53	11
Virginia	1035	14	1.26	28
Washington	1083	12	1.6	8
West Virginia	194	39	1.09	38
Wisconsin	803	19	1.43	17
Wyoming	73	49	1.41	18

[52] For further context, FutureDocs was also queried for "*all* specialties, as well. Virginia's head count of all physician specialists is 19,625, with a ranking at 14th among the states, also. For all specialties per 10,000 population, Virginia has 23.97 specialists per 10,000 populations and ranked at 28th. A separate table of these results can be made available upon request.

Anesthesiologist Patient Care FTE and Patient Care FTE per 10,000 Population by State Estimates for 2013

State	Anesthesiologist Patient Care FTE	Anesthesiologist Patience Care FTE Rank	Anesthesiologist Patient Care FTE per 10K	Anesthesiologist Patient Care FTE Rank
Alabama	291.51	28	0.6	47
Alaska	59.3	48	0.82	26
Arizona	660.8	12	0.99	8
Arkansas	177.49	34	0.62	45
California	3374.39	1	0.88	18
Colorado	546.57	18	0.88	20
Connecticut	398.24	22	1.08	5
Delaware	61.91	47	0.62	44
Florida	1685.92	4	0.86	22
Georgia	637.36	15	0.64	43
Hawaii	119	40	0.85	24
Idaho	87.33	44	0.57	49
Illinois	1158.34	6	0.93	13
Indiana	631.23	16	0.96	10
Iowa	217.8	32	0.74	34
Kansas	208.27	33	0.64	42
Kentucky	347.97	25	0.79	28
Louisiana	312.95	26	0.66	40
Maine	122.33	38	0.89	17
Maryland	700.63	11	0.78	29
Massachusetts	904.9	9	1.35	1
Michigan	719.76	10	0.73	36
Minnesota	388.65	23	0.73	37
Mississippi	160.16	35	0.57	48
Missouri	480.87	20	0.78	30
Montana	91.42	43	0.88	19
Nebraska	146.45	37	0.77	32
Nevada	259.71	30	0.93	12
New Hampshire	118.25	41	0.87	21
New Jersey	1037.75	7	1.15	4
New Mexico	149.92	36	0.73	35
New York	2265.81	2	1.16	3
North Carolina	615.65	17	0.61	46
North Dakota	36.11	51	0.41	51
Ohio	1002.96	8	0.86	23
Oklahoma	276.46	29	0.74	33
Oregon	385.36	24	0.92	15
Pennsylvania	1196.62	5	0.92	14
Rhode Island	82.7	45	0.79	31
South Carolina	308.96	27	0.68	38
South Dakota	43.36	50	0.45	50
Tennessee	470.68	21	0.65	41
Texas	2149.27	3	0.81	27
Utah	253.15	31	0.84	25
Vermont	65.92	46	0.95	11
Virginia	638.95	14	0.78	29
Washington	660.11	13	0.98	9
West Virginia	119.33	39	0.57	39
Wisconsin	499.27	19	0.89	16
Wyoming	45.29	49	0.88	20

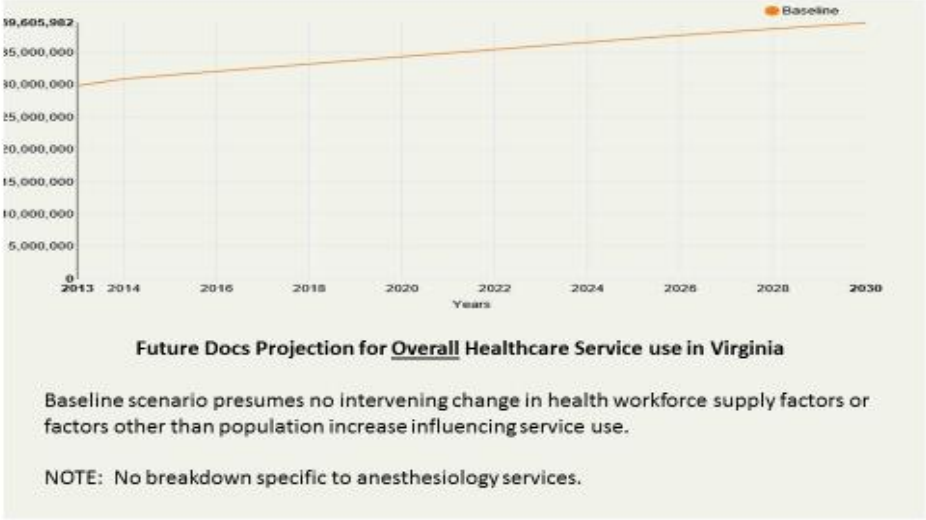
When compared with other states, Virginia's 2013 Anesthesiologist supply appears close to the middle (ranked 28th – median ranked 25). In terms of head counts ranks better than the top third.

Projections

The FutureDocs model includes factors relating to demand as well as supply in its projections from 2013 to 2030. The following charts and graphs depict anticipated trends for overall healthcare service use in Virginia, for Anesthesiologist patient care FTE supply vs. demand between 2013 and 2030 under a high (earlier) and low (later) retirement scenarios and give insights into future Anesthesiologist age and gender distribution with through a population pyramid.

The overall demand for healthcare services is anticipated to gradually increase. Under the baseline assumptions growing and aging population factors drive the model.

Projected Overall Healthcare Service Use in Virginia[53]



Future Docs Projection for Overall Healthcare Service use in Virginia

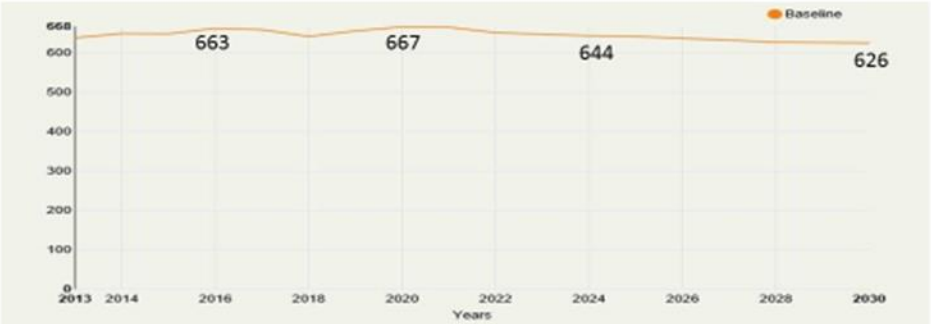
Baseline scenario presumes no intervening change in health workforce supply factors or factors other than population increase influencing service use.

NOTE: No breakdown specific to anesthesiology services.

The projected supply and demand for Virginia Anesthesiologist is projected to remain in alignment except under an early retirement scenario. None of the other scenarios, including increased use of NPs and PAs or Medicaid expansion affected the model.

[53] The y-axis is the number of patient care visits

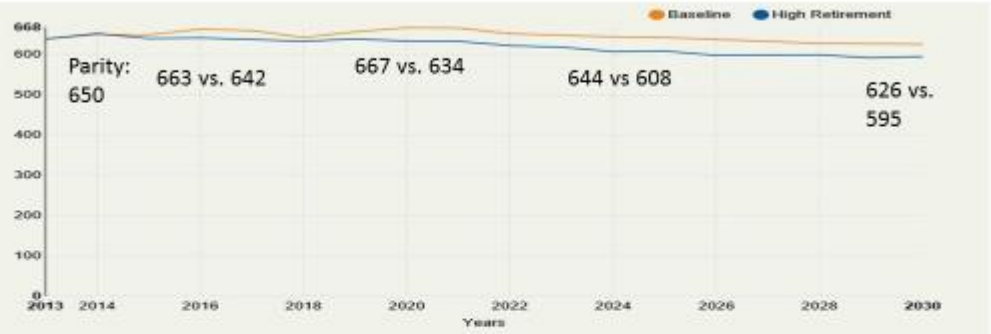
Anesthesiologist Supply - Baseline



FutureDocs projected Patient Care FTE Anesthesiologist Supply for Virginia

Baseline Scenario: assumes no changes in healthcare workforce supply factors or services use between 2013 and 2030.

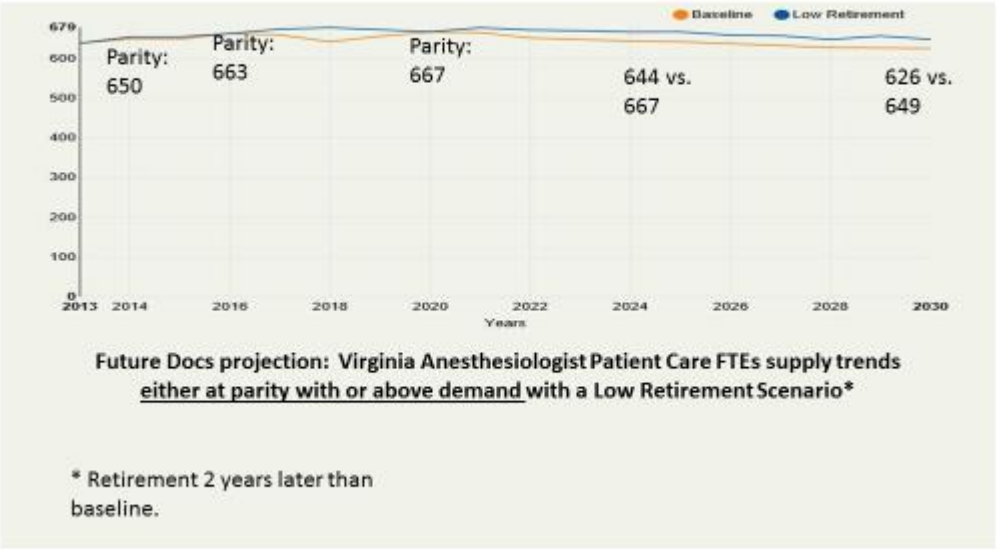
Anesthesiologist Supply vs. Demand – Early Retirement



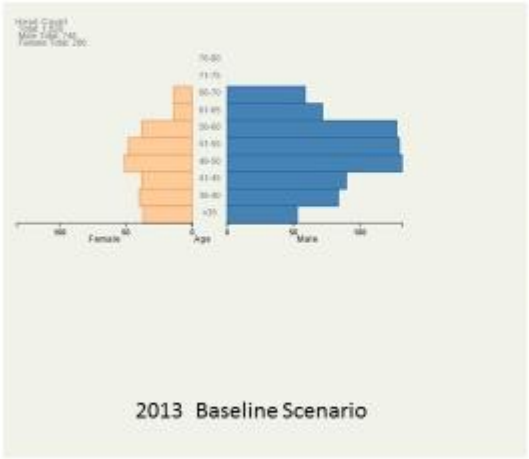
Future Docs projections: Virginia Anesthesiologist Patient Care FTEs supply trends below demand with an Early Retirement Scenario

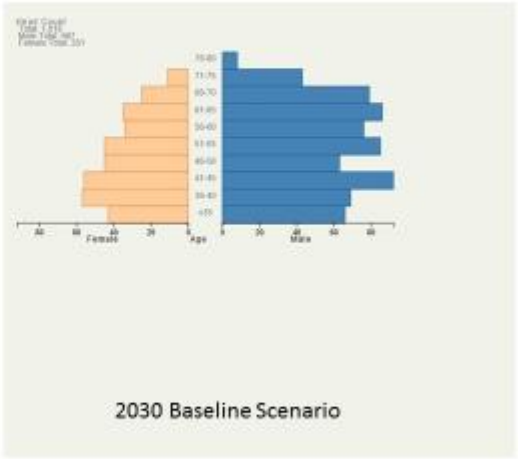
Early Retirement models retirement 2 years earlier than baseline.

Anesthesiologist Supply vs. Demand – Later Retirement



Anesthesiologist Age and Gender Pyramid





NOTE: The next section of the report will incorporate comment received from the Public Hearing scheduled for June 27, 2017 and additional written comment received until July 31, 2017. The Regulatory Research Committee's next meeting is scheduled for August 31, 2017 where is will consider recommendations to the full Board.

Appendix 1 – Workplan Draft – Committee Revision

VIRGINIA BOARD OF HEALTH PROFESSIONS
VIRGINIA DEPARTMENTOF HEALTH PROFESSIONS

STUDY WORKPLAN

Feasibility of Licensure of Certified Anesthesiologist Assistants

April 3, 2017
DRAFT

Background & Authority.

By virtue of its statutory authority in §54.1-2510 of the *Code of Virginia* to advise the Governor, the General Assembly, and the Department Director on matters related to the regulation and level of regulation of health care occupations and professions in the Commonwealth, the Virginia Board of Health Professions is conducting a review into the feasibility of state licensure for certified anesthesiologist assistants. This study is pursuant to the attached requests from Senator Stephen Newman and Delegate Robert Orrock dated November 16, 2016 and response from Dr. David Brown, Director of the Department of Health Professions dated November 29, 2016.

Scope & Methodology:

The purpose of this study is to evaluate the need to regulate anesthesia assistants in the Commonwealth of Virginia. The Board has adopted a formal evaluative criteria and methodology to guide all such reviews as set forth in its published *Policies and Procedures for the Evaluation of the Need to Regulate Health Occupations and Professions, 1998.* (Guidance Document 75-2 accessible at http://www.dhp.virginia.gov/bhp/guidelines/75-2.doc). Referred to hereinafter as "the Criteria," these policies and procedures provide a standard conceptual framework with proscribed questions and research methods that have been employed for over two decades to objectively inform key policy issues related to health professional regulation. This standard is in keeping with regulatory principles established in Virginia law and is accepted in the national community of regulators. The approach is designed to lead consideration of the least governmental restrictions possible that is consistent with the public's protection. The Criteria address: (1) Risk of Harm to the Consumer, (2) Specialized Skills and Training, (3) Autonomous Practice, (4) Scope of Practice, (5) Economic Costs, (5) Alternatives to Regulation, and (6) Least Restrictive Regulation.

The Regulatory Research Committee (Committee) will prepare the report for consideration by the full Board and transmission to Senator Newman and Delegate Orrock through the Department Director.

The following steps are recommended for this review:

1. Conduct a comprehensive review of the pertinent policy and professional literature.

2. Review and summarize available relevant empirical data as may be available from pertinent research studies, malpractice insurance carriers, and other sources.

3. Review relevant federal and state laws, regulations and governmental policies.

4. Review other states' relevant experiences with scope and practice.

5. Develop a report of research findings, to date, and solicit public comment on reports and other insights through hearing and written comment period.

6. Publish second draft of the report with summary of public comments.

7. Develop final report with recommendations, including proposed legislative language as deemed appropriate by the Committee.

8. Present final report and recommendations to the full Board for review and approval.

9. Forward to the Director and Secretary for review and comment

10. Submit final report to Senator Newman and Delegate Orrock and post

Timetable and Resources

This study will be conducted with existing staff and within the budget for FY2017-18 and according to the following tentative timetable (note schedule updates from February):

DATES	
Feb. 23	Full Board Meeting - Draft workplan reviewed and project assigned to the Regulatory Research Committee
Apr 3	Committee Meeting - review draft report and workplan updates
May 9	Full Board Meeting
June 27	Public Hearing & Committee Meeting (10:00 a.m.)
Aug. 31	Committee Meeting – final review and recommendations Full Board Meeting – Committee report for Board consideration
Sep. (TBD)	Board Report to the Director and Secretary for review and comment
Nov. 1	Final Report due to Delegate Orrock and Senator

Appendix 2 – Correspondence

COMMONWEALTH of VIRGINIA

David E. Brown, D.C.
Director

Department of Health Professions
Perimeter Center
9960 Mayland Drive, Suite 300
Henrico, Virginia 23233-1463

www.dhp.virginia.gov
TEL (804) 367-4400
FAX (804) 527-4475

November 29, 2016

The Honorable Stephen D. Newman
P. O. Box 480
Forest, VA 24551

The Honorable Robert D. Orrock, Sr.
P. O. Box 458
Thornburg, Virginia 22565

Dear Senator Newman and Delegate Orrock,

We are in receipt of your letters requesting that the Department of Health Professions undertake a study of the feasibility of licensure for certified anesthesiology assistants (CAAs). As you may know, the Code of Virginia authorizes the Board of Health Professions to conduct such studies in § 54.1-2510:

§ 54.1-2510. Powers and duties of Board of Health Professions.

2. To evaluate all health care professions and occupations in the Commonwealth, including those regulated and those not regulated by other provisions of this title, to consider whether each such profession or occupation should be regulated and the degree of regulation to be imposed. Whenever the Board determines that the public interest requires that a health care profession or occupation which is not regulated by law should be regulated, the Board shall recommend to the General Assembly a regulatory system to establish the appropriate degree of regulation;

To fulfill its statutory duty, the Board has applied seven criteria to any study of the feasibility of regulating a new profession; its criteria are: 1) risk of harm to the consumer, 2) specialized skills and training, 3) autonomous practice, 4) scope of practice, 5) economic impact, 6) alternatives to regulation, and 7) least restrictive regulation. For further explanation and description of the criteria, the Board has published Guidance Document 75-2, which is available on its website at: http://www.dhp.virginia.gov/bhp/bhp_guidelines.htm. The President of the Board of Medicine is also a member of the Board of Health Professions.

The Board will assume responsibility for a feasibility study but will not have the opportunity to adopt a workplan and timeline for its completion until its next scheduled meeting.

which is February 23, 2017. As soon as the Dr. Elizabeth Carter, Executive Director of the Board and her research staff have reviewed the scope of the work, we will share a preliminary schedule for a report of the study results, which will be provided by November 15, 2017. We have also received a copy of a letter sent to you from the Virginia Association of Nurse Anesthetists; it will be provided to the Board along with your letter of request for the study.

We hope that this information is helpful and appreciate the opportunity to respond to your request. Please let us know if there is anything further we can do to assist your office either between or during the upcoming Session of the General Assembly.

Sincerely,

David E. Brown, D.C.

cc: The Honorable William A. Hazel, M.D.
Elizabeth Carter, Ph.D.

SENATE OF VIRGINIA

STEPHEN D. NEWMAN
PRESIDENT PRO TEMPORE
23RD SENATORIAL DISTRICT
ALL OF DICKENSON AND CRAIG COUNTIES;
PART OF BEDFORD, CAMPBELL, AND ROANOKE
COUNTIES; AND PART OF THE CITY OF LYNCHBURG
P.O. BOX 340
FOREST, VIRGINIA 24551
EMAIL: SENATOR@SENATORNEWMAN.COM
(434) 385-1155

COMMITTEE ASSIGNMENTS:
EDUCATION AND HEALTH, CHAIR
COMMERCE AND LABOR
FINANCE
TRANSPORTATION
RULES

November 16, 2016

David E. Brown, D.C., Director
Virginia Department of Health Professions
Perimeter Center
9960 Mayland Drive, Suite 300
Henrico, Virginia 23233-1463

Dear Director Brown,

I am writing to request that the Department of Health Professions, with assistance from the Board of Medicine, undertake a study considering licensing a new class of anesthesia providers in the Commonwealth: Certified Anesthesiology Assistants (CAAs). As you know, there is a national shortage of anesthesia providers, including nurse anesthetists. Being able to employ a growing pool of CAAs would help address the present and future shortage of anesthesia providers. For this reason, I believe it would be prudent for the Department to study whether it would be beneficial to license CAAs in Virginia.

It is my understanding that seventeen jurisdictions as well as the District of Columbia currently allow CAAs to practice. Virginia is surrounded by other states that have already adopted the CAA approach (North Carolina, Washington, D.C., Kentucky and Ohio). Although some states have permitted CAAs to practice through delegatory authority, the Board of Medicine has advised that licensure would be required in Virginia.

CAAs work under the direction of licensed physician anesthesiologists to implement anesthesia care plans. CAAs work exclusively within the anesthesia care team environment and, unlike nurse anesthetists; they must be supervised by a physician anesthesiologist.

All CAAs possess a premedical background, a baccalaureate degree and also complete a comprehensive didactic and clinical program at the graduate school level. There are 10 accredited CAA educational programs in the U.S. There is interest in launching a CAA program in Virginia, as well.

There are nearly 2,000 CAAs already practicing throughout the nation. CAA students currently rotate through Virginia hospitals, but must go elsewhere to work when they finish training (i.e. there are currently 10 CAAs who are Virginia residents who have to travel to other states to work).

Because members of the Legislature are considering whether to introduce legislation on this topic, I kindly request that you let us know whether you are willing to undertake this study by December 15, 2016. If you do agree to undertake it, we would further request that you make the results of your study available no later than November 15, 2017.

With kind regards, I remain,

Sincerely yours,

Senator Stephen D. Newman

cc: William L. Harp, M.D., Executive Director of the Board of Medicine

COMMONWEALTH OF VIRGINIA
HOUSE OF DELEGATES
RICHMOND

ROBERT D. "BOBBY" ORROCK
POST OFFICE BOX 458
THORNBURG, VIRGINIA 22565

FIFTY-FOURTH DISTRICT

COMMITTEE ASSIGNMENTS:
HEALTH, WELFARE AND INSTITUTIONS (VICE CHAIRMAN)
FINANCE
COUNTIES, CITIES AND TOWNS
AGRICULTURE, CHESAPEAKE AND NATURAL RESOURCES

November 16, 2016

David E. Brown, D.C., Director
Virginia Department of Health Professions
Perimeter Center
9960 Mayland Drive, Suite 300
Henrico, Virginia 23233-1463

Dear Director Brown,

I am writing to request that the Department of Health Professions, with assistance from the Board of Medicine, undertake a study considering licensing a new class of anesthesia providers in the Commonwealth: Certified Anesthesiology Assistants (CAAs). As you know, there is a national shortage of anesthesia providers, including nurse anesthetists. Being able to employ a growing pool of CAAs would help address the present and future shortage of anesthesia providers. For this reason, it would be prudent for the Department to study whether it would be beneficial to license CAAs in Virginia.

There are 17 states, as well as the District of Columbia, currently allowing CAAs to practice. Virginia is surrounded by other jurisdictions that have already adopted the CAA approach (North Carolina, Washington, D.C., Kentucky and Ohio). Although some states have permitted CAAs to practice through delegated authority, the Board of Medicine has advised that licensure would be required in Virginia.

There are nearly 2,000 CAAs already practicing throughout the nation. CAA students currently rotate through Virginia hospitals, but must go elsewhere to work when they finish training (e.g., there are currently 10 CAAs who are Virginia residents who must travel to other states to work).

Because members of the Legislature are considering whether to introduce legislation on this topic, I am requesting that you let me know by December 15, 2016 whether you are willing to undertake this study. If you agree to do it, I would also ask that you make the results of your study available no later than November 15, 2017.

Sincerely,

Robert D. Orrock

Delegate Robert D. Orrock

cc: William L. Harp, M.D., Executive Director, Board of Medicine

DISTRICT: (540) 891-1322 • RICHMOND: (804) 698-1054 • E-MAIL: DEL_ORROCK@HOUSE.STATE.VA.US

VANA
Virginia Association of Nurse Anesthetists
1934
CRNA

November 22, 2016

The Honorable Steve Newman
Virginia Senate
P.O. Box 480
Forest, VA 24551

The Honorable Bobby Orrock
Virginia House of Delegates
P.O. Box 458
Thornburg, VA 22565

Dear Senator Newman and Delegate Orrock,

I am writing on behalf of the Virginia Association of Nurse Anesthetists regarding your possible request to the Department of Health Professions ("DHP") to undertake a study regarding the licensing of Certified Anesthesiology Assistants ("CAA") in Virginia.

VANA represents the more than 1200 certified registered nurse anesthetists ("CRNA") who are licensed in Virginia and who serve as the primary providers of anesthesia care services in Virginia's rural surgical facilities.

As the numbers of people needing critical anesthesia care continues to grow in Virginia, it is important that we ensure a robust pipeline of anesthesia providers to meet current and future anesthesia needs. As such, we support the request for a CAA feasibility study, provided the study is comprehensive and provides clear guidance on whether the licensing of a third anesthesia provider will provide greater access to anesthesia care in Virginia.

To this end, we would kindly ask that, in the event a request for a study moves forward, you would consider the following as part of the request:

1. That DHP consider whether an anesthesia provider shortage currently exists in Virginia and if so, whether there are any immediate steps that can be taken (in terms of CRNA or anesthesiologist practice) to mitigate the shortage.

250 West Main Street, Suite 100, Charlottesville, VA 22902
Tel: (434) 977-3716 Fax: (434) 979-2439
www.vana.org

VANA
Virginia Association of Nurse Anesthetists
1934
CRNA

2. That DHP consider whether the current and future numbers of CRNA and anesthesiologist students and graduates will meet the projected demand for anesthesia care services in the coming years.

3. That DHP include, as part of any licensing feasibility study, an assessment of the anesthesia delivery costs of CRNAs, anesthesiologist and CAAs.

4. That, given the limited number of clinical sites currently available to health care provider students and new graduates, DHP consider the impact a third anesthesia provider may have on site availability and how this will impact the ability of Virginia's CRNA and anesthesiologist students and new graduates to obtain required clinical experience.

5. The impact, if any, a third anesthesia provider may have on current anesthesia jobs in Virginia.

6. The impact, if any, the licensing of a third anesthesia provider will have in terms of access to anesthesia care, particularly in Virginia's rural regions.

7. That the Virginia Board of Nursing, which licenses CRNAs, assist in the study.

We applaud your interest in ensuring Virginia's citizens have access to anesthesia care and we appreciate your consideration of this request.

Sincerely,

Peter

Peter Deforest
President
Virginia Association of Nurse Anesthetists

cc: Dr. David Brown, Director, Department of Health Professions
Jay Douglas, Executive Director, Board of Nursing
Dr. William Harp, Executive Director, Board of Medicine
Michele Satterlund, McGuireWoods Consulting

250 West Main Street, Suite 100, Charlottesville, VA 22902
Tel: (434) 977-3716 Fax: (434) 979-2439
www.vana.org

Appendix 3 – Sample AA Curriculum and Course Descriptions

Extracted from Case Western-Reserve University School of Medicine's Certified Anesthesiologist Assistant Program Courses Website
https://case.edu/medicine/msa-program/education/courses/

Course Description

Clinical practicum provides the student with the opportunity to apply the principles of anesthesia to direct patient care. Students provide supervised care in a variety of settings. Students use advanced anesthetic techniques to challenge specialty rotations.

Clinical Experience	
ANES 461 – Orientation to Clinical Experience, Summer Semester	3 credits
ANES 463 – Anesthesia Clinical Experience I, Fall Semester	3 credits
ANES 465 – Anesthesia Clinical Experience II, Spring Semester	4 credits
ANES 467 – Anesthesia Clinical Experience III, Summer Semester	4 credits

Course Descriptions

ANES 440/441: Patient Monitoring and Instrumentation (2/2)

Students are taught the proper balance between circuits and engineering concepts and the clinical application of anesthesia instrumentation. Monitors and devices used in the operating room are studied with respect to principles of operation, calibration and interpretation of data. Principles, application, and interpretation of various monitoring modalities including ECG, invasive and non-invasive blood pressure, oximetry, cardiac output, respiratory gas analysis, and respiration are also key components of this course. Students will gain experience with intraoperative neurophysiology monitoring, temperature, renal function, coagulation/hemostasis, neuromuscular junction, transesophageal echocardiography, and ICP. This course covers advanced concepts of arterial pressure monitoring, ICP monitoring, transesophageal echocardiography, electric and radiation safety, and the hazards and complications of monitoring patients during anesthesia.

Prerequisites: **Consent of the department; successful completion of ANES 440 required for ANES 441.**

ANES 460: Introduction to Anesthesia (2)

This course introduces students to the operating room, emphasizing the fundamental procedures and techniques used in administering an anesthetic. One of the primary objectives of this class is to prepare and educate the student to work within the anesthesia care team. The course includes a preoperative patient evaluation, which involves recording medical history, performing physical examinations, reviewing charts and select laboratory and radiologic testing as well as history of anesthesia, anesthetic techniques, hazards and complications, universal precautions and infection control. The basic and advanced principles of elective and emergent airway management will be covered, including equipment and techniques. Course material encompasses recognition of the difficult airway, techniques to manage the difficult pediatric and adult airway, the ASA Difficult Airway Algorithm, physiologic response to intubation, fiber-optic techniques, retrograde techniques, and the surgical airway. Course will correlate with laboratory work for a better understanding and use of bag/ mask ventilation, oral and nasal airways, oral and nasal intubations techniques, lightwands, fiberoptic intubations, double lumen tubes, surgical airways, and application of laryngeal mask airway.

Prerequisites: **Consent of the department.**

ANES 461: Introduction to Clinical Experience (3)

This course is a supplement to ANES 460, giving students additional experience in the operating room and with the practice of anesthesia. Preoperative assessment, IV placement techniques, intraoperative patient care and postoperative management, layout of the operating room, sterile fields and techniques, interacting with patients, starting intravenous catheters, and application of ASA-standard monitors are all emphasized in this course. Students will utilize anesthesia simulator to gain the basic knowledge and usage of monitors. BLS (Basic Life Support) certification is required for course completion.

Prerequisites: **Acceptance in the MSA Program.**

ANES 485: Introduction to Physiologic-Based Simulation (1)

In this course students will be introduced to physiological model-based simulation using on-screen computer simulation and mannequins. The key objectives of this class are to improve student's anesthesia-related basic science knowledge, manual skills in anesthesia machine checkout, drug and equipment set up, safety inspections and understanding of how anesthesia is performed for uncomplicated surgical cases.

ANES 403: Cardiac Electrophysiology (2)

This course focuses on basic and advanced ECG interpretation using simulators to understand an overview of heart anatomy, function, and electrophysiology. Students will also gain experience with diagnosis and practical applications of electrocardiography and echocardiography as monitoring techniques in the operating room.

Prerequisites: **Consent of the department.**

ANES 456/458: Applied Physiology for Anesthesiologist Assistants (3/3)

This course emphasizes pathophysiology in a systems approach – cardiovascular, pulmonary, renal, neuro, metabolic, and endocrine. This course focuses on those systems which affect evaluation and planning for anesthesia and those systems affected by the administration of anesthesia. Students will study basic and applied human systems physiology with an emphasis on topics and areas of special concern to the anesthetist. This class introduces advanced concepts relevant to anesthesia including hemodynamics, Starling forces, pulmonary responses, renal hemodynamics, temperature regulation, blood gases/pH, and maternal and fetal physiology. The purpose of the course is to introduce various pathologic conditions inherent to the patient population and how to provide information on those disease processes to alter anesthetic techniques.

Prerequisites: **Consent of the department; successful completion of ANES 456 required for ANES 458.**

ANES 462/464/468/470: Anesthesia Clinical Correlation (1/1/1/1)

This course is comprised of a series of conferences presented by students that apply to anesthetic theory as it relates to the clinical experience. Specific anesthetic situations are emphasized. This course provides a working knowledge of evidence based medicine. Cases will be used as the backbone of this course to assist the student in analyzing data to justify the treatments used in clinical practice. Students will also learn how to critically appraise the literature, evaluate diagnostic test performance, design clinical pathways and standards of care, and implement evidenced based medicine findings in their own clinical or administrative setting.

Prerequisites: **ANES 460; successful completion of ANES 462 required for ANES 464.**

ANES 475/476: Pharmacology for Anesthesiologist Assistants (2/2)

This course introduces students to the basic principles of pharmacology and focuses on those drugs most often used in the practice of anesthesia, including inhaled anesthetics, opioids, barbiturates, benzodiazepines, anticholinesterases and anticholinergics, neuromuscular blockers, and adrenergic agonists and antagonists. The course provides an overview of drug actions, interactions, metabolism, methods of administration, dosages, side effects, precautions, and contraindications. This course focuses on the pharmacokinetics and pharmacodynamics of major drug classifications and their interactions with anesthetic agents. Students will gain insight into the basic principles of drug action; absorption, distribution, metabolism, and excretion of drugs; mechanisms of drug action; toxicity. Students will also learn the basis for the use of medicines in pharmacologic therapy of specific diseases. ANES 475/476 emphasizes drugs utilized as adjunct therapies related to the practice of anesthesia, including non-steroidal anti-inflammatory drugs, antiarrhythmics, calcium channel blockers, diuretics, anticoagulants, antihistamines, and antimicrobials.

Prerequisites: **Consent of the department; successful completion of ANES 475 required for ANES 476.**

ANES 480/481/580/581: FUNDAMENTALS OF ANESTHETIC SCIENCE (1/1/1/1)

A continuum of courses over the fall and spring semesters that covers a series of topics in basic medical science with special emphasis on the effect of anesthetics on normal physiology. An examination is administered at the end of each semester.

Prerequisites: **Consent of the department; successful completion of each preceding course is necessary for advancement to subsequent coursework.**

ANES 486: Physiologic Model-Based Simulation I (1)

This course is a continuation of ANES 485. Students will have access to a state-of-the-art laboratory and an anesthesia simulator that will prepare them for the usage and complete understanding of monitoring and the practice of anesthesia. Students will apply their didactic knowledge to scenarios on the anesthesia simulator. Patient modalities are explored, such as pulse oximetry, capnography, echocardiography, regional anesthetic placement, blood pressure monitoring systems and invasive monitoring line placement and monitoring. Laboratory experiences are correlated to the clinical setting through actual patient vignettes and simulation scenarios. The course provides for the certification in Advanced Cardiac Life Support (ACLS) and Pediatric Advanced Life Support (PALS). The course will focus on assessment and management of adults, children, and infants in a cardiopulmonary crisis.

ANES 477: Clinical Decision Making in Anesthesia (2)

This course is an introduction to thinking about clinical problems and coming to safe and effective solutions to these problems. This course focuses on common clinical situations where appropriate decision making is important to the outcome of the case. Numerous areas of medicine and anesthesiology will be covered to provide the student with a wide sampling of decisions made each day with patient care. This course supplements the other courses offered during the spring semester by integrating and applying basic science knowledge to the care of patients. This course assists the student in integrating theory with practice by analyzing the anesthetic management of selected cases, utilizing a problem based learning approach. Relevant anatomy, physiology, pathophysiology, pharmacology, and anesthetic and surgical considerations are described and discussed. Patient care plans are reviewed, compared, and contrasted in light of actual or anticipated outcomes. Current standards of care are reviewed in terms of continuous quality improvement.

Prerequisites: **Consent of the department.**

ANES 488: Anesthesia Non-Technical Skills Lab (1)

A corollary simulation-based course introducing the student to non-technical skills that are used integrally with medical knowledge and clinical techniques. These non-technical skills can be defined as behaviors in the operating room environment that are not directly related to the use of medical expertise, drugs or equipment. Through this course the student will improve both interpersonal skills (e.g. communication, team working, and leadership) and cognitive skills (e.g. situation awareness, decision making).

ANES 490: Ethics, Law, and Diversity for Anesthesiologist Assistants (2)

This course will focus on three important topics within the field of anesthesiology. First, the course will focus on legal practice as it applies to health care including basics of medical jurisprudence, negligence, and how to avoid a lawsuit. Second, students will gain insight into ethical theory including the principles of medical ethics, do not resuscitate, truth telling, and assessment of competence. The course will close with a discussion on diversity that will focus on the differences and similarities among people and how these factors influence patient care. The final grade will be based on an essay and a multiple choice exam.
Prerequisite: **Consent of the department.**

ANES 584/585: Physiologic-Based Model Simulation III & IV (1/1)

This course is an extension of ANES 485 emphasizing physical techniques, aspects of crisis management, teamwork and rescue in anesthesia. This course will review concepts learned in BLS and ACLS training. Students will also gain experience with critical crisis management and rescue techniques, which are not often seen in practice.

Appendix 4 – Blueprint for NCCAA CERT and CDQ Examinations

NCCAA CERT Exam Blueprint

(est. May 2012)

Category	Total	Knowledge (K)	Numerical Problem Solving (N)	Clinical Management (C)	Interpretation (I)
01 Principles of Anesthesia	20	10-12	0-3	5-8	3-5
02 Cardiovascular	20	10-12	0-3	5-8	3-5
03 Hematology & Coagulation	10	6-8	0-1	2-4	1-2
04 Instrumentation, Monitoring, Anesthetic Delivery Systems, Physics	15	8-12	0-3	3-5	3-5
05 Metabolism & Endocrine	8	2-3	1-2	2-3	0-1
06 Neurology & Neuromuscular	15	5-10	0-1	5-10	2-3
07 Obstetrics & Perinatology	15	5-10	0	5-10	3-5
08 Pediatrics & Neonatology	15	5-10	0-2	5-10	3-5
09 Pharmacology	20	12-15	0-3	3-5	3-5
10 Regional Anesthesia & Pain Management	10	3-8	0-1	0-5	0-2

(please see back)

Category	Total	Knowledge (K)	Numerical Problem Solving (N)	Clinical Management (C)	Interpretation (I)
11 Renal, Genital, & Urologic	7	3-5	0-2	3-5	1-2
12 Respiratory System	20	10-12	0-2	6-10	2-3
13 Geriatric	5	3-5	0-1	1-2	0-1
14 Gastrointestinal & Hepatic	5	3-5	0-1	1-2	0-1
15 Bariatric	5	3-5	0-1	1-2	0-1
16 Clinical Subspecialties	10	5-7	0-2	3-5	1-2
TOTAL	200				

NCCAA CDQ Exam Blueprint

(est. May 2012)

Category	Total	Knowledge (K)	Numerical Problem Solving (N)	Clinical Management (C)	Interpretation (I)
01 Principles of Anesthesia	30	8-20	0-6	16-22	3-5
02 Cardiovascular	20	8-10	0-3	10-12	2-4
03 Hematology & Coagulation	10	4-6	0-1	4-6	1-2
04 Instrumentation, Monitoring, Anesthetic Delivery Systems, Physics	10	4-6	0-3	4-8	2-4
05 Metabolism & Endocrine	5	2-3	0	2-3	0-1
06 Neurology & Neuromuscular	10	3-5	0-1	5-8	2-3
07 Obstetrics & Perinatology	7	1-3	0	2-4	1-3
08 Pediatrics & Neonatology	8	1-4	0-2	2-5	1-3
09 Pharmacology	20	5-10	0-3	5-10	5-10
10 Regional Anesthesia & Pain Management	5	1-2	0-1	1-3	0-2

(please see back)

Category	Total	Knowledge (K)	Numerical Problem Solving (N)	Clinical Management (C)	Interpretation (I)
11 Renal, Genital, & Urologic	10	5-7	0-2	3-5	1-2
12 Respiratory System	15	3-10	0-2	5-10	0-3
13 Geriatric	5	1-2	0-1	3-5	0-1
14 Gastrointestinal & Hepatic	5	1-2	0-1	3-5	0-1
15 Bariatric	5	1-2	0-1	3-5	0-1
16 Clinical Subspecialties	15	2-8	0-2	5-10	0-4
TOTAL	180				

Appendix 5 – Anesthesiologist Assistant NPI Registration

Credentialing Recorded in the National Provider Identifier (NPI) Lookup for Anesthesiologist Assistant (367H00000X)

State of Address	Number Registered	No Credential Listed	AA or A.A.	AAC or AA-C	CAA	CRNA	RN, NP, APRN	PA	PAA	PA-AA or PAAA	Business	Other	% of Total
Alabama	24	2	8	1		1				1	11		1.00
Arizona	3					1					2		0.12
Arkansas	4	1				2					1		0.17
California	12	1				1	2				6	2	0.50
Colorado	46	4	17	12	10				1	2			1.91
Connecticut	13	4				8	1						0.54
Delaware	16					14					2		0.66
Florida	308	57	93	82	40	17		1		9	6	3	12.77
Georgia	1032	189	172	119	24	9	5	79	135	244	22	34	42.80
Idaho	1					1							0.04
Illinois	11			1	1	6					3		0.46
Indiana	3				1	1					1		0.12
Iowa	1										1		0.04
Kentucky	7	1	1		1		1			1	2		0.29
Louisiana	10					9					1		0.41
Maryland	8				1	4		2		1			0.33
Massachusetts	3					1					1	1	0.12
Michigan	21	1	4	3		3		1		1	6	2	0.87
Mississippi	8					2					5	1	0.33
Missouri	125	16	55	39	10	1					3	1	5.18
Nebraska	3					2						1	0.12
Nevada	1											1	0.04
New Hampshire	3					2	1						0.12
New Jersey	7					4					2	1	0.29
New Mexico	56	30	5	17	2						2		2.32
New York	10	2			1	4		1			1	1	0.41
North Carolina	26	1	11	7	3	1				3			1.08
North Dakota	4	1				3							0.17
Ohio	228	17	132	47	12	1	7			3	7	2	9.46
Oklahmoa	6	4	1									1	0.25
Oregon	2										2		0.08
Pennsylvania	13	1				10					2		0.54
Puerto Rico	1										1		0.04
Rhode Island	1					1							0.04
South Carolina	30	4	2	14	4	1			1		4		1.24
South Dakota	1					1							0.04
Tennessee	10		1			3					6		0.41
Texas	192	22	85	36	12	5	2			2	27	1	7.96
Utah	1	1											0.04
Vermont	16	4	7	2	1	1				1			0.66
Virginia	4					4							0.17
Washington	7					6					1		0.29
Washington, D.C.	43	10	11	17	2				2			1	1.78
West Virginia	4		1			3							0.17
Wisconsin	85	13	30	35	2	3				1	1		3.53
Wyoming	1										1		0.04
TOTAL	2411	386	636	432	127	136	19	84	139	269	130	53	
% OF TOTAL:		16.01	26.38	17.92	5.27	5.64	0.79	3.48	5.77	11.16	5.39	2.20	100%

Source data January 2017 NPI, downloaded April 6-10, 2017, accessed through https://npidb.org

NOTE: "Other" includes PA-C, RPA-C. & Misc.

Appendix 6 – State Regulation

Certified Anesthesiologist Assistant Regulating States and Territory

State/Territory Licensure(L), Certification (C) or Physician Delegation (PD)	Accredited Education / Exam	Fees: Licensure/ Renewal Schedule	Summary of Scope, Supervision, CE/Recertification
Alabama L	CAHEA / CEAA admin.by NCCAA	$200/ $100 Annual	**Regulation §540-X-7 et seq. pursuant to Code of Alabama §§34-24-290 et seq.** AA must be employed by an anesthesiologist or other specified employing organization with an anesthesiologist; No independent, unsupervised activity permitted; Up to 4 AAs may be supervised at a time. State's own CE requirements.
California C	CAAHEP/ NCCAA	N/A	**Code §§ 7.75-3550 to 3554** Title protection exists. AA must work under the direction and direct supervision of an anesthesiologist who is physically present and accepts responsibility for medical services rendered by the AA. AA may assist the supervising anesthesiologist in developing and implementing an anesthesia care plan for a patient. Must maintain NCCAA certification and follow CE/recertification according to NCCAA requirements.
Colorado L	CAAHEP/ NCCAA	$262/ N/A Even year	**Colorado Medical Board Regulations (3 CCR 713-40)** Anesthesiologist or group practice member may act as supervising physician. Maximum of 4 AAs may be supervised at a time (as of July 1, 2016). Both supervising physician and AA are accountable for rule violations. Mechanism for annual performance review required; assessment subject to Board audit. Supervising physician to be "immediately available." Authorized to administer drugs and CS under supervision, but no prescriptive authority.
District of Columbia L	CAAHEP/ NCCAA	$85/ $145 Even year	**D.C. Code Chapter 5100** Prohibits independent practice. Supervising anesthesiologist must be "immediately available"—further defined as present in the building or facility and able to provide assistance according to specified standards. Supervising anesthesiologist must be present during induction and emergence phases. Authorized to administer drugs and CS under supervision, but no prescriptive authority. No faculty of an AA program may concurrently supervise more than two AA students who are delivering anesthesia. NCCAA recertification requirements.
Florida L	CAAHEP + Advanced Cardiac Life Support Cert/ NCCAA	$300/ $500 Biennial	**Florida Statutes §458.3475 & §459.023; Board of Medicine regulations §64B8-31 and Board of Osteopathic Medicine regulations §64B15-17** No independent practice. Supervising anesthesiologist must be on-site and immediately available: present in the office during a procedure and present in the surgical or obstetric suite to provide assistance and direction to the AA while anesthesia services are being performed. State's own CE requirements for licensure renewal.

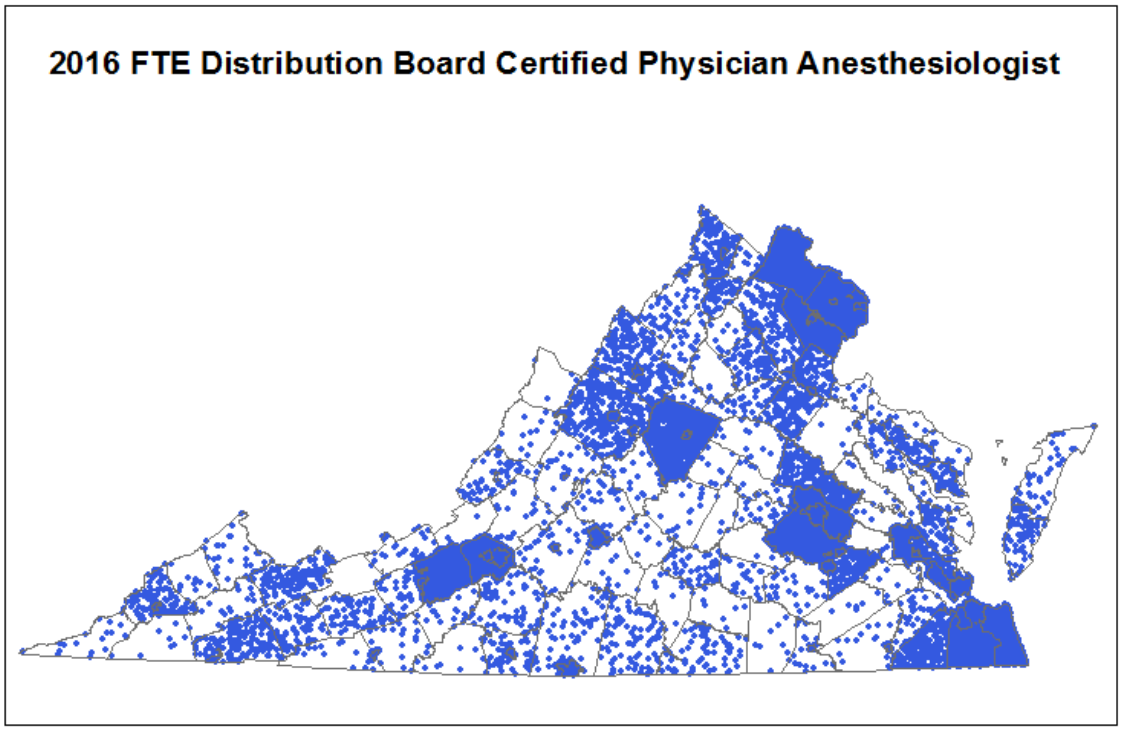
Georgia L	"Approved by the Board/ NCCAA	$300/ $105 Biennial	**Rules and Regulations of the State of Georgia §360-5 et seq.** Title: "Physician Anesthesiologist Assistant." Requires physician assistant (PA) and AA licensing. Practice is under supervision according to a completed Job Description. In the case of AAs delivering general and/or regional anesthesia, a primary or alternate supervising physician must be immediately available in person. Maximum of 2 or 4 AAs may be supervised at once as specified. State's CE requirements.
Guam L	CAAHEP + Advanced Cardiac Life Support Cert. domestic violence, medical errors/ NCCAA	NA/NA Biennial	**Guam Code §12-25 et seq.** Direct supervision on-site, supervising anesthesiologist must be immediately available: present in the office during a procedure and present in the surgical or obstetric suite in all instances available to provide assistance and direction to the AA while anesthesia services are being performed. Protocol with supervising anesthesiologist or supervising group of anesthesiologists must be filed annually with the Board of Medical Examiner and updated biennially. Supervising anesthesiologist must not only be physically present during induction and emergence and available to provide immediate "physical presence in the room" but not concurrently performing any other anesthesiology procedures independently upon another patient. Maximum 3 or AAs at a time as specified in protocol. Territory's CE requirements.
Indiana L	CAAHEP/ NCCAA	$100/ $50 Biennial	**Indiana Code §25-3.7 et seq.; Administrative Code 844IAC 15-1.1 et seq.** Scope of practice lists permissible activities and excludes interventional pain management. Protocol required with supervising anesthesiologist and all group members who may supervise. Supervising anesthesiologist maintains immediate physical proximity. Maximum 4 AAs concurrently. CE according to NCCAA recertification requirements.
Kentucky L	NCCPA CAAHEP/ NCCAA	$100/ $150 Biennial	**Kentucky Revised Statutes §311-800 et seq. Kentucky Administrative Regulations §201 KAR 9:084.** Licensure as a primary care physician assistant is required in addition to AA licensure. There are provisions for CAAHEP/NCCAA requirements for those not practicing as an AA prior to July 15, 2002.
Michigan PD shifted to L	CAAHEP/ NCCAA	$20/ $50 Annual	Legislation passed in late 2016, earliest form of House Bill available, but final version not yet published.
Missouri L	CAAHEP/ NCCAA	$25/ $25 N/A	**Missouri Revised Statutes §334.400.1 et seq.** Authorized Title: "Licensed Anesthesiologist Assistant." Code lists authorized and prohibited activities. Written practice protocol required, supervising anesthesiologist may medically direct a maximum of 4 AAs concurrently. Protocol must delineate the services the AAs may provide and the manner in which they are supervised (may include medical records review and meeting relevant quality assurance standards). Missouri statute §54.1-334.426 expressly states that the governing body of every hospital has authority to limit AA functions and activities.

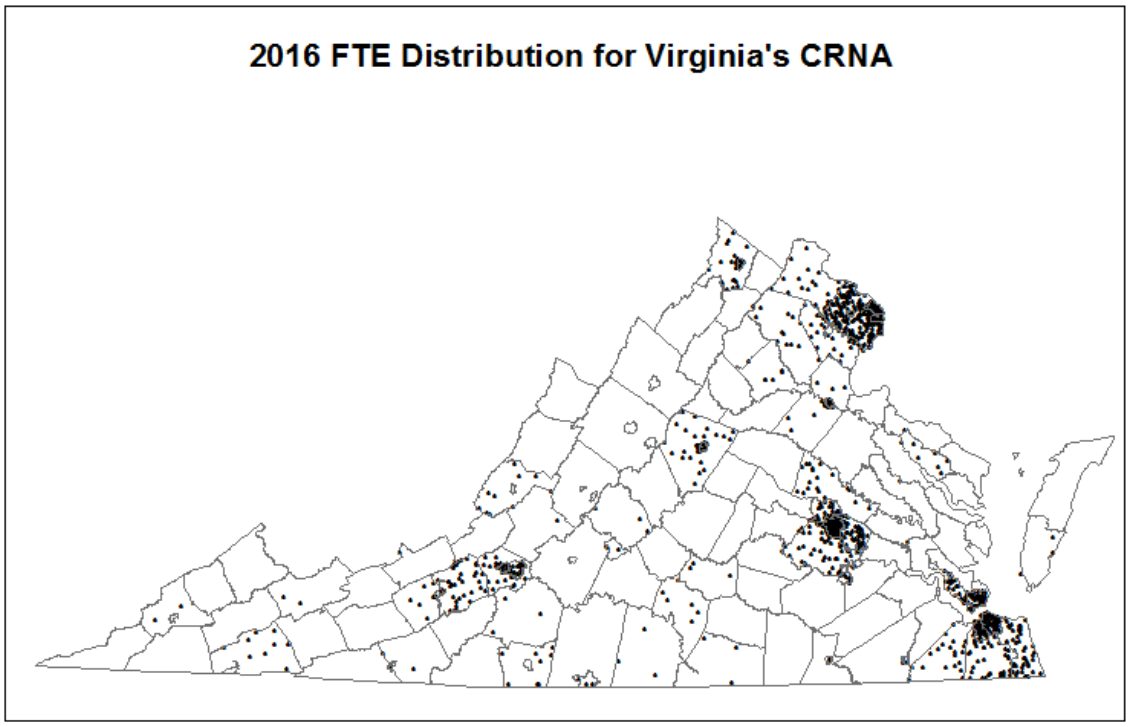
New Mexico L	CAHEA/ NCCAA	$100/ N/A Even year	**New Mexico Statutes §61-6-10.3 et seq. Occupational and Professional Licensing Regulations §16.10.19 et seq.** Code lists authorized activities. Supervising anesthesiologist must be approved by the board and allowed to supervise up to 3 AAs. The supervising anesthesiologist is individually responsible and liable for the AA's acts and omissions. Written notice of intent to supervise is required. If it is during the AA's first year of practice, the application must include a plan for enhanced supervision. Except in emergencies, the supervising anesthesiologist must be present in the operating room during induction of a general or regional anesthetic and during emergence from general anesthetic (presence documented in the patient record). Otherwise supervisor must be in operating suite and immediately available to the operating room when the AA is performing anesthesia procedures. 40 hours of CE biennially also current ACLS certification. AA employment locations restricted to universities, medical schools, and other specified situations.
North Carolina L	CAAHEP/ NCCAA	$150/ $150 or $125 if 1st renewal within 30 days of birthday Annual	**North Carolina G.S. §90-11 et seq. and Regulations §21 NCAC 32W.0101 et seq.** Scope of practice in written agreement with Supervising anesthesiologist. Provisions exist for a "Primary Supervising Anesthesiologist" who accepts primary responsibility for the AA's professional activities. Supervising anesthesiologist must be actively engaged in clinical practice and immediately available onsite to provide assistance to the AA. May supervise up to 4 AAs. AA must wear name tag with the protected title. AA's in-patient chart entries are governed by hospital or long-term care facility rules. 40 hours CE every two years. NCCAA recertification required.
Ohio C	CAAHEP (also recognizes programs prior to 2000, specifies course content in statute)/ NCCAA	$100/ N/A Even year	**Ohio Administrative Code §4760.01 et seq. §5160-4-21 (Medicaid)** Code lists permissible AA duties. Written practice protocol further details scope as well as a prescribed, personalized plan for each patient determined by the supervising anesthesiologist. The supervisor must be actively engaged in clinical practice, provide immediate and direct supervision and be present for the most demanding procedures, including induction and emergence. The Code lists what "immediate and direct" **excludes** – not necessarily in the same room, for example. First year AAs must have enhanced supervision. All AAs may only must practice in a hospital or ambulatory surgical facility and must display title. NCCAA recertification required. AAs are permitted to bill Medicaid for services but payment goes to employing hospital.
Oklahoma L	NCCAA / CLS Cert. HIV/AIDs domestic violence, & medical error prevention	$100/$100 Biennial	**Oklahoma statutes §3201 et seq. and Board of Medical Licensure and Supervision regulations §435:65-1-1** Code contains permissible duties. Supervisory anesthesiologist or group files written protocol with the board detailing AA's duties and functions and conditions or procedures requiring anesthesiologist care. AA must carry malpractice insurance, but supervisor retains responsibility for patient care. Anesthesiologist must provide on-site, personal supervision being present in the office or surgical suite when procedures are performed and immediately available to provide assistance and direction to the AA while anesthesia services are being performed. 4 AAs maximum.

South Carolina L	Specific Undergrad coursework & CAAHEP/ NCCAA	$300/ $295 Biennial	**South Carolina statutes §40-47-1205 et seq.** Code lists generally permissible AA duties and functions. Supervising anesthesiologist must be in active practice, medically direct and accept responsibility for the anesthesia services rendered by the AA in a manner approved by the board. Supervising anesthesiologist must be in the hospital and in the anesthetizing or operative area so as to be immediately available to participate directly in patient care. Written protocol must be approved by the board.
Texas PD	N/A	N/A	**Texas Occupations Code §§157.001 et seq. and 563.051 et seq.; Administrative Code §§193.1 et seq. and §354.1065(Medicaid)** Describes physician's general authority to delegate medical acts to specially trained individuals who are instructed and directed by the physician. This includes administration and provision of dangerous drugs. Permits tasks that are administrative, technical or clinical but involving the exercise of medical judgment. Physician accepts responsibility and board determines delegation appropriateness. Standing order written protocols included. Medicaid allows AA services to be billed. Reimbursement in Texas goes to the AA, hospital, physician, group practice or other provider with which the AA has an employment or contractual relationship.
Vermont C	CAAHEP/ NCCAA	$120, additional $55 per if multiple/ $120/$55 per Biennial	**Vermont Statutes §26.29-1651 et seq.** AAs certified under Commissioner of Health adopted rules on training, practice supervision, qualification, scope of practice, places of practice, protocols, patient notification and consent. Board of Medicine then regulates accordingly. AA application includes supervision protocol(s) detailing scope and employment contract(s). Board determines maximum number of AAs per supervisor. Supervising anesthesiologist must be readily available at the facility for consultation and intervention and retains legal liability. Title protection noted, and supervising anesthesiologist must notify patients about AA services. NCCAA certification must be maintained.
Wisconsin L	CAAHEP/ NCCAA	$75/ $82 Even year	**Wisconsin Code § 448.00 et seq.** Scope of practice restricted to assisting supervising anesthesiologist as described in a supervision agreement. Code specifies range of assistive duties that may be included but the actual scope for an individual AA may be less as determined by the supervising anesthesiologist and detailed in the agreement. The supervision agreement must be with an anesthesiologist who represents the AA's employer. The supervising anesthesiologist must be immediately available in the same physical location or facility in which the AA assists in delivery of medical care such that the supervising anesthesiologist is able to intervene if needed.

LEGEND: CAHEA (Committee on Allied Health Education and Accreditation) (AMA)
CAAHEP (Commission on Accreditation of Allied Health Education Programs)
CEAA (Certifying Examination for Anesthesiologist Assistants)
NCCAA (National Commission for Certification of Anesthesiologist Assistants)
NCCPA (National Commission on Certification of Physician Assistants)

Appendix 7 – DHP HWDC Anesthesiologist and CRNA FTE Distributions





2016 Healthcare Professionals in Anesthesiology: Total Full Time Equivalency (FTE) and FTE Per 1,000[54]

	Certified Registered Nurse Anesthetists				Anesthesiologist			
Locality	Total	FTE /1000	Primary	Sec	Total	FTE/1000	Primary	Sec
Accomack County	0.00	0.00	0.00	0.00	37.51	1.14	32.03	5.48
Albemarle County	22.50	0.22	22.35	0.15	964.63	9.23	919.89	44.74
Alleghany County	9.11	0.58	9.11	0.00	53.42	3.38	50.29	3.13
Amelia County	0.00	0.00	0.00	0.00	4.14	0.32	3.17	0.97
Amherst County	2.64	0.08	2.64	0.00	24.57	0.77	23.98	0.59
Appomattox County	0.00	0.00	0.00	0.00	8.84	0.58	8.82	0.02
Arlington County	32.91	0.15	32.87	0.04	686.65	3.03	644.72	41.93
Augusta County	0.00	0.00	0.00	0.00	291.16	3.94	278.77	12.39
Bath County	0.00	0.00	0.00	0.00	12.88	2.82	12.55	0.33
Bedford County	0.00	0.00	0.00	0.00	33.11	0.43	30.67	2.44
Bland County	0.03	0.01	0.03	0.00	1.25	0.19	0.83	0.42
Botetourt County	1.68	0.05	1.68	0.00	21.42	0.65	19.08	2.34
Brunswick County	0.02	0.00	0.00	0.02	8.25	0.50	5.26	2.99
Buchanan County	0.00	0.00	0.00	0.00	25.01	1.08	21.90	3.11
Buckingham County	0.00	0.00	0.00	0.00	16.92	1.00	16.73	0.19
Campbell County	0.00	0.00	0.00	0.00	14.31	0.26	13.93	0.38
Caroline County	0.00	0.00	0.00	0.00	5.97	0.20	5.97	0.00
Carroll County	2.29	0.08	2.29	0.00	20.71	0.70	18.98	1.73
Charles City County	0.00	0.00	0.00	0.00	2.69	0.38	2.09	0.60
Charlotte County	4.81	0.39	4.81	0.00	11.02	0.90	10.51	0.51
Chesterfield County	41.89	0.13	31.68	10.21	664.85	2.00	619.64	45.21
Clarke County	0.00	0.00	0.00	0.00	8.90	0.62	5.68	3.22
Craig County	0.00	0.00	0.00	0.00	1.78	0.34	1.77	0.01
Culpeper County	5.73	0.12	5.73	0.00	84.17	1.71	71.17	13.00
Cumberland County	0.00	0.00	0.00	0.00	3.79	0.39	3.73	0.06
Dickenson County	0.00	0.00	0.00	0.00	11.13	0.73	8.24	2.89
Dinwiddie County	0.00	0.00	0.00	0.00	24.75	0.89	23.73	1.02
Essex County	1.05	0.09	1.05	0.00	42.64	3.84	37.89	4.75
Fairfax County	179.08	0.16	172.64	6.44	3709.03	3.26	3515.38	193.65
Fauquier County	12.09	0.18	12.09	0.00	128.85	1.89	117.84	11.01
Floyd County	0.00	0.00	0.00	0.00	14.46	0.93	14.26	0.20
Fluvanna County	0.00	0.00	0.00	0.00	9.80	0.38	9.80	0.00
Franklin County	3.29	0.06	3.29	0.00	63.58	1.13	58.32	5.26

[54] This document has been updated with 2016 data for both CRNAs and Board Certified Physician Anesthesiologist on May 18, 2017/\.

	Certified Registered Nurse Anesthetists				Anesthesiologist			
Locality	Total	FTE /1000	Primary	Sec	Total	FTE/1000	Primary	Sec
Frederick County	14.52	0.18	14.52	0.00	140.54	1.71	133.72	6.82
Giles County	0.91	0.05	0.00	0.91	22.62	1.35	20.02	2.60
Gloucester County	0.05	0.00	0.00	0.05	67.21	1.81	63.13	4.08
Goochland County	0.11	0.01	0.00	0.11	15.76	0.72	13.76	2.00
Grayson County	0.00	0.00	0.00	0.00	15.69	1.04	15.64	0.05
Greene County	0.00	0.00	0.00	0.00	7.07	0.37	7.07	0.00
Greensville County	0.00	0.00	0.00	0.00	19.41	1.66	18.76	0.65
Halifax County	3.44	0.10	3.44	0.00	81.89	2.33	80.08	1.81
Hanover County	18.64	0.18	15.57	3.07	235.89	2.31	221.42	14.47
Henrico County	69.64	0.22	66.47	3.16	869.47	2.70	821.47	48.00
Henry County	7.52	0.14	5.93	1.59	50.47	0.97	47.33	3.14
Highland County	0.00	0.00	0.00	0.00	3.76	1.67	3.76	0.00
Isle of Wight County	0.00	0.00	0.00	0.00	29.85	0.83	29.62	0.23
James City County	1.88	0.03	0.00	1.88	187.96	2.59	184.59	3.37
King and Queen County	0.00	0.00	0.00	0.00	1.74	0.24	1.74	0.00
King George County	0.00	0.00	0.00	0.00	8.82	0.35	8.82	0.00
King William County	0.00	0.00	0.00	0.00	7.97	0.49	7.97	0.00
Lancaster County	0.00	0.00	0.00	0.00	50.08	4.53	49.51	0.57
Lee County	0.00	0.00	0.00	0.00	18.30	0.73	17.47	0.83
Loudoun County	16.44	0.05	14.38	2.06	702.06	1.93	642.56	59.50
Louisa County	0.00	0.00	0.00	0.00	14.37	0.42	13.02	1.35
Lunenburg County	0.00	0.00	0.00	0.00	7.62	0.61	6.13	1.49
Madison County	0.00	0.00	0.00	0.00	6.51	0.49	6.51	0.00
Mathews County	0.00	0.00	0.00	0.00	3.97	0.45	3.56	0.41
Mecklenburg County	3.38	0.11	3.38	0.00	64.62	2.07	60.82	3.80
Middlesex County	0.00	0.00	0.00	0.00	8.44	0.79	8.37	0.07
Montgomery County	35.04	0.36	34.96	0.08	760.67	7.82	713.24	47.43
Nelson County	0.00	0.00	0.00	0.00	18.56	1.25	18.10	0.46
New Kent County	0.00	0.00	0.00	0.00	5.21	0.26	4.61	0.60
Northampton County	2.75	0.23	2.75	0.00	71.92	5.93	69.04	2.88
Northumberland County	0.00	0.00	0.00	0.00	9.49	0.77	9.42	0.07
Nottoway County	0.00	0.00	0.00	0.00	23.58	1.51	23.53	0.05
Orange County	0.00	0.00	0.00	0.00	34.75	0.99	33.83	0.92
Page County	0.00	0.00	0.00	0.00	23.29	0.98	22.43	0.86
Patrick County	0.00	0.00	0.00	0.00	8.97	0.49	7.56	1.41
Pittsylvania County	0.00	0.00	0.00	0.00	56.33	0.90	54.85	1.48
Powhatan County	0.00	0.00	0.00	0.00	22.22	0.78	21.59	0.63
Prince Edward County	3.64	0.16	3.51	0.13	49.66	2.15	44.75	4.91

	Certified Registered Nurse Anesthetists				Anesthesiologist			
Locality	Total	FTE /1000	Primary	Sec	Total	FTE/1000	Primary	Sec
Prince George County	0.00	0.00	0.00	0.00	134.53	3.60	128.75	5.78
Prince William County	19.06	0.04	18.27	0.79	724.04	1.62	669.20	54.84
Pulaski County	4.34	0.13	4.34	0.00	44.94	1.31	42.38	2.56
Rappahannock County	0.00	0.00	0.00	0.00	11.17	1.52	9.62	1.55
Richmond County	8.49	0.95	6.38	2.11	79.02	8.88	67.94	11.08
Roanoke County	16.08	0.17	15.71	0.37	325.19	3.47	308.55	16.64
Rockbridge County	0.00	0.00	0.00	0.00	19.78	0.89	15.55	4.23
Rockingham County	0.00	0.00	0.00	0.00	218.19	2.79	208.41	9.78
Russell County	0.00	0.00	0.00	0.00	16.03	0.57	15.12	0.91
Scott County	0.00	0.00	0.00	0.00	9.19	0.41	7.58	1.61
Shenandoah County	0.00	0.00	0.00	0.00	43.38	1.01	40.47	2.91
Smyth County	0.00	0.00	0.00	0.00	72.26	2.29	69.15	3.11
Southampton County	0.00	0.00	0.00	0.00	15.34	0.85	13.96	1.38
Spotsylvania County	2.66	0.02	0.00	2.66	130.51	1.01	122.07	8.44
Stafford County	3.35	0.02	3.35	0.00	94.25	0.67	73.80	20.45
Surry County	0.00	0.00	0.00	0.00	7.97	1.17	7.96	0.01
Sussex County	0.00	0.00	0.00	0.00	5.90	0.50	5.50	0.40
Tazewell County	1.97	0.05	1.97	0.00	128.20	2.95	114.56	13.64
Warren County	0.00	0.00	0.00	0.00	64.75	1.66	60.65	4.10
Washington County	9.00	0.16	8.32	0.69	147.21	2.69	140.26	6.95
Westmoreland County	0.00	0.00	0.00	0.00	5.31	0.30	5.29	0.02
Wise County	1.84	0.05	1.81	0.03	108.51	2.72	101.55	6.96
Wythe County	0.00	0.00	0.00	0.00	69.12	2.37	65.44	3.68
York County	0.00	0.00	0.00	0.00	77.36	1.17	73.52	3.84
Alexandria City	45.51	0.30	45.51	0.00	422.53	2.81	383.96	38.57
Bedford City	0.00	0.00	0.00	0.00	12.68	1.96	11.45	1.23
Bristol City	0.00	0.00	0.00	0.00	10.12	0.59	10.12	0.00
Buena Vista City	0.00	0.00	0.00	0.00	1.60	0.24	1.35	0.25
Charlottesville City	27.10	0.59	23.76	3.34	856.03	18.78	840.39	15.64
Chesapeake City	35.31	0.15	35.31	0.00	445.93	1.91	421.45	24.48
Colonial Heights City	0.12	0.01	0.00	0.12	70.26	3.96	64.54	5.72
Covington City	0.00	0.00	0.00	0.00	2.80	0.48	2.80	0.00
Danville City	3.30	0.08	3.30	0.00	157.97	3.72	155.47	2.50
Emporia City	0.96	0.18	0.96	0.00	13.60	2.49	11.61	1.99
Fairfax City	3.96	0.16	3.96	0.00	104.24	4.26	99.16	5.08
Falls Church City	13.43	0.99	13.43	0.00	183.70	13.51	171.49	12.21
Franklin City	2.81	0.33	2.58	0.23	21.32	2.50	19.19	2.13
Fredericksburg City	38.93	1.37	36.42	2.51	367.47	12.96	347.29	20.18

	Certified Registered Nurse Anesthetists				Anesthesiologist			
Locality	Total	FTE /1000	Primary	Sec	Total	FTE/1000	Primary	Sec
Galax City	0.51	0.07	0.51	0.00	52.54	7.49	48.29	4.25
Hampton City	42.23	0.31	41.30	0.94	395.37	2.89	376.43	18.94
Harrisonburg City	0.00	0.00	0.00	0.00	108.97	2.08	106.43	2.54
Hopewell City	2.93	0.13	2.93	0.00	47.54	2.14	43.95	3.59
Lexington City	0.00	0.00	0.00	0.00	26.01	3.56	24.20	1.81
Lynchburg City	2.60	0.03	2.60	0.00	376.82	4.77	353.84	22.98
Manassas City	0.06	0.00	0.06	0.00	71.63	1.70	69.60	2.03
Manassas Park City	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Martinsville City	0.00	0.00	0.00	0.00	44.86	3.27	42.60	2.26
Newport News City	26.35	0.14	25.55	0.80	569.50	3.11	523.90	45.60
Norfolk City	66.34	0.27	60.71	5.63	1129.80	4.60	1060.09	69.71
Norton City	0.00	0.00	0.00	0.00	27.61	6.85	26.14	1.47
Petersburg City	5.41	0.17	5.41	0.00	142.22	4.35	128.53	13.69
Poquoson City	0.00	0.00	0.00	0.00	5.75	0.48	5.75	0.00
Portsmouth City	35.30	0.37	33.90	1.40	899.37	9.37	873.41	25.96
Radford City	8.91	0.51	8.91	0.00	34.04	1.93	29.26	4.78
Richmond City	137.13	0.63	130.49	6.63	2152.29	9.88	2032.14	120.15
Roanoke City	22.14	0.22	21.88	0.26	702.52	7.07	666.13	36.39
Salem City	15.08	0.59	15.08	0.00	324.69	12.74	305.60	19.09
Staunton City	0.00	0.00	0.00	0.00	39.84	1.62	38.24	1.60
Suffolk City	18.48	0.21	16.40	2.07	257.50	2.97	236.74	20.76
Virginia Beach City	48.31	0.11	47.99	0.32	959.07	2.13	911.20	47.87
Waynesboro City	0.00	0.00	0.00	0.00	18.56	0.87	17.94	0.62
Williamsburg City	0.00	0.00	0.00	0.00	77.15	5.25	64.94	12.21
Winchester City	28.74	1.04	23.73	5.01	294.08	10.68	287.81	6.27
Total	**1,196**		**1,130**	**66**	**24,719**		**23,298**	**1,421**

LIST OF ACRONYMS

AAAA – American Academy of Anesthesiologist Assistants

AA/CAA – Anesthesiologist Assistant/Certified Anesthesiologist Assistant

ABA – American Board of Anesthesiology

ACGME – Accreditation Council for Graduate Medical Education

AHRF – Area Health Resource File

APRN – Advanced Practice Registered Nurse

ARC-AA – Accreditation Review Committee for Anesthesiologist Assistant

ASA – American Society of Anesthesiologists

BLS – Bureau of Labor Statistics of the U.S. Department of Labor

CAAHEP – Commission on Accreditation of Allied Health Education Programs

CAHEA – Committee on Allied Health Education and Accreditation

CEAA – Certifying Examination for Anesthesiologist Assistant

COA – Council on Accreditation of Nurse Anesthesia Education Programs

DHP HWDC – Virginia Department of Health Professions Healthcare Workforce Data Center

GRE – Graduate Record Examination

HRSA – Heath Resources and Services Administration of the U.S. Department of Health and Human Services

HWSM – Health Workforce Simulation Model

LMI – Labor Market Information

MCAT – Medical College Admission Test

NBCRNA – National Board of Certification and Recertification for Nurse Anesthetists

NCCAA – National Commission for Certification of Anesthesiologist Assistants

- NCCAA CERT - Certifying Examination for Anesthesiologist Assistants
- NCCAA CDQ – Continued Demonstration of Qualifications of Anesthesiologist Assistants

NCCPA – National Commission on Certification of Physician Assistants

NP – Nurse Practitioner

NPI – National Provider Identifier

PA – Physician Assistant