

Investigating and Measuring Certified Registered Nurse Anesthetist

Organizational Climate

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## ABSTRACT

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Approximately 40,000 certified registered nurse anesthetists (CRNAs) are included in the anesthesia workforce in the United States. They provide a critical portion of anesthesia care throughout the country often practicing in rural and underserved areas of America. CRNAs are educated and trained to provide high-quality, cost-effective care for patients. Policy makers and health care organizations consistently call for policies to enable these providers to deliver care to the full extent of their education and training. The National Academy of Medicine (former Institute of Medicine) recommends in their seminal report, *The Future of Nursing: Leading Change, Advancing Health*, that CRNAs practice to their full potential as full partners with physicians. In order to promote CRNA ability to practice to the full extent of their training and education and assure that patients have access to safe anesthesia services, both policy and organizational influences on their care provision and should be taken into account.

Whereas focus has been paid to policy restrictions and their influence on CRNA care, little is known about organizational influences on CRNA care or organizational structures that are present in the employment settings of CRNAs. Organizational climate, which is employees' perceptions of and experience with organizational structures within their employment settings, has been studied in healthcare settings. Studying organizational climate in healthcare settings is important because research concludes that organizational climate of healthcare settings impacts providers and patients. Registered nurse (RN) organizational climate has been well studied, and

researchers identified that important aspects of RN organizational climate include autonomy, control over practice, teamwork, and collaborative relationships with physicians and staff. When RN organizational climate is favorable, job satisfaction and nurse retention improve, and patients receive high-quality care. Researchers have also studied nurse practitioner (NP) organizational climate and have identified climate characteristics that enable NPs to function to their full capacity, while promoting job retention, decreasing costs, and improving access to care.

Whereas evidence is clear that organizational climate is an important concept to study within healthcare organizations, little is known about CRNA organizational climate or how it impacts CRNA outcomes or patient outcomes, nor do we know how to measure organizational climate and further assess it. Therefore, this dissertation investigates CRNA organizational climate and adapts a tool to measure CRNA organizational climate. In **Chapter 1**, a background on CRNA contributions to anesthesia care in the United States is presented. In addition, challenges and restrictions affecting CRNA practice are discussed, and studying the concept of CRNA organizational climate is introduced. The theoretical and empirical underpinnings guiding the dissertation are presented, and the three aims of the dissertation are stated. In **Chapter 2**, aim one of the dissertation is addressed. Aim one of the dissertation is achieved by systematically reviewing and synthesizing evidence regarding CRNA working conditions and outcomes. This evidence lays the foundation for studying CRNA organizational climate. In **Chapter 3**, aim two of the dissertation is addressed. This aim is achieved by selecting an instrument to adapt to measure CRNA organizational climate. In this chapter, the processes of content validity testing and reliability testing of the Certified Registered Nurse Anesthetist Organizational Climate Questionnaire (CRNA-OCQ), the adapted instrument to measure CRNA organizational climate, are presented. In **Chapter 4**, aim three of the dissertation is addressed.

This aim is achieved by the further psychometric testing of the CRNA-OCQ, which is presented in this chapter. In this chapter, the CRNA-OCQ is refined and finalized through conducting exploratory factor analysis. In addition, the internal consistency reliability of CRNA-OCQ subscales is assessed. In **Chapter 5**, results from the three included studies are discussed and synthesized. In addition, practice, policy, and research recommendations are presented. Lastly, the strengths and limitations of the dissertation are discussed before the conclusion.

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## **Chapter 1: Introduction**

In this chapter, the importance of certified registered nurse anesthetist care in the United States is discussed. CRNA contributions to the anesthesia workforce in providing safe, cost-effective care that improves access to anesthesia services are presented. Organizational influence on CRNA care provision is described, and the gap in organizational climate literature regarding CRNAs is presented. The chapter concludes with the conceptual and theoretical underpinnings guiding the three aims of the dissertation.

## **Background and Significance**

The demand for anesthesia services is increasing, as patients are living longer, experience acute and chronic conditions, and require diagnostic, procedural, and surgical interventions. Surgical volume in hospital operating room settings has not grown from 2001-2011 (Weiss & Elixhauser, 2014); whereas during the ten year period from 1996-2006, the national volume of ambulatory surgical cases increased by 300%, with nearly 15 million procedures performed in Ambulatory Surgical Centers (ASCs) in 2006 (Cullen, Hall, & Golosinskiy, 2009). In addition to this increase in demand for services, the Affordable Care Act's addition of eight million newly insured individuals who will likely require anesthesia at some point during their coverage period, further strain the health care system's ability to provide anesthesia care (Holst, 2014).

The anesthesia workforce has expanded in an attempt to meet increasing demands for services (Liu, Waxman, Main, & Mattke, 2012). Three groups of clinicians provide anesthesia care in the United States (U.S.): physician anesthesiologists, CRNAs, and anesthesiologist assistants (AAs). In 2015, about 29,000 anesthesiologists (Bureau of Labor Statistics, 2015a) delivered anesthesia services and participated in over 90% of anesthesia care provided in the U.S. (American Society of Anesthesiologists [ASA], 2014b). In the clinical setting, this participation ranges from independent, direct administration of anesthesia to supervision of up to seven CRNAs concurrently. Despite anesthesiologists' 16.2% increase in the U.S. workforce from 2003-2012 (Miller & Halzack, 2014) and projected 21% increase from 2014 – 2024 (Bureau of Labor Statistics, 2016b), demand for anesthesia services is expected to grow faster than the projected growth of the anesthesiologist workforce (Schubert, Eckhout, Ngo, Tremper, & Peterson, 2012).

The second group of anesthesia providers in the U.S. is the CRNA workforce. In 2015, about 40,000 CRNAs (Bureau of Labor Statistics, 2015b) administered approximately 65% of all anesthetic care, which was equivalent to 43 million cases (American Association of Nurse Anesthetists [AANA], 2016a). The CRNA workforce is expected to grow 19% from 2014 – 2024 (Bureau of Labor Statistics, 2016a) and is critical to providing access to anesthesia services, especially in rural and underserved areas of the country (Liao, Quraishi, & Jordan, 2015). Despite CRNAs delivering large volumes of anesthesia care to patients, forecasted needs for CRNAs may not be met, especially in facilities located in rural and underserved parts of the country, because surgical volume may be outgrowing the available CRNA workforce in these areas (Merwin, Stern, Jordan, & Bucci, 2009).

The third group of anesthesia providers in the U.S. is the AA; however, in 2014 only about 1,600 AAs were part of the anesthesia workforce (F.K. Boyles, personal communication, September 25, 2014). Due to the small number of practicing AAs, their collective contribution to anesthesia care delivery in the U.S. has not been established.

CRNAs have been delivering anesthesia for decades. In fact, shortly after the first successful general anesthetic was performed on a human in 1846 (Robinson & Toledo, 2012), nurses were successfully administering anesthesia by 1887 as documented by Sister Mary Bernard at St. Vincent's Hospital in Erie, Pennsylvania (Bankert, 1989). Since that time nurses have continued to administer anesthesia, and in current times, that care is provided by CRNAs. CRNAs are registered nurses (RNs) who have critical care nursing experience and have completed specialty education and training in anesthesia, many of whom hold advanced practice degrees including Masters and Doctoral degrees, and who have successfully passed the national

certification exam (National Board of Certification and Recertification for Nurse Anesthetists [NBCRNA], 2016).

The nearly 40,000 CRNAs practicing across the U.S. are essential to meeting demands for anesthesia services. CRNAs administer anesthesia, either independently or in collaboration with other healthcare providers, to patients in any location where anesthesia is provided, to patients across the care continuum, and for any surgical, procedural, or pain management procedures (AANA, 2016a). Research has shown that CRNA care is safe and yields positive outcomes for patients regardless if CRNAs practice independently or in collaboration with other providers (Dulisse & Cromwell, 2010; Hoffmann, Thompson, Burke, & Derkay, 2002; Needleman & Minnick, 2009; Pine, Holt, & Lou, 2003; Simonson, Ahem, & Hendryx, 2007). For example, Pine, Holt, & Lou (2003) studied the effect of anesthesia provider type on patient mortality for a wide range of surgical cases including orthopedic, general surgery, and vascular cases in twenty-two U.S. states. They found that mortality rates were no different for CRNAs practicing independently or in collaboration with anesthesiologists compared to anesthesiologists practicing independently (Pine et al., 2003). Similarly, CRNA safety has been demonstrated in obstetrical anesthesia. In 2007, Simonson, Ahen, & Hendryx compared rates of anesthesia complications for patients undergoing cesarean sections in 73 hospitals across Washington State. Results showed no difference in anesthesia complications or mortality for CRNAs practicing independently compared to anesthesiologists practicing independently (Simonson et al., 2007).

Evidence is clear that CRNAs provide not only safe but also cost-effective care, which benefits patients, organizations where they practice, and the overall health care system, particularly when CRNAs are able to practice to their full potential without physician oversight (Cromwell & Snyder, 2000; Hogan, Seifert, Moore, & Simonson, 2010). Hogan, Seifert, Moore,

& Simonson (2010) compared the cost of anesthesia care for three groups: CRNAs practicing independently, anesthesiologists medically directing the care of CRNAs, and anesthesiologists practicing independently. Results showed that the CRNAs practicing independently provided the most cost-effective anesthesia care compared to the other two groups. Furthermore, independently practicing CRNAs were likely to generate revenue even in low-demand facilities in rural areas of the country (Hogan et al., 2010), which is where CRNAs tend to predominate when compared to anesthesiologists.

In addition to demonstrating safe, cost-effective anesthesia care, CRNA care increases access to anesthesia care in rural and underserved areas of the U.S. and helps patients living in these areas to receive services in a timely manner. For example, Liao, Qurashi & Jordan (2015) investigated the geographical imbalance in the distribution of anesthesia providers across the U.S. and how it impacted on the uninsured and vulnerable populations. Results showed that the distribution of CRNA residence was correlated with lower income patients, the unemployed, and the uninsured, while the distribution of anesthesiologist residence was correlated with higher income patients, the employed, and the insured. These results suggest that vulnerable populations may have disproportionate access to anesthesia care based on provider type, but when they do have access to anesthesia care, it is more likely to be provided by a CRNA (Liao et al., 2015).

CRNAs have a long history of providing safe, cost-effective anesthesia care and this workforce has the potential to address the growing demand for anesthesia services. Yet, to date little is known about the organizations that employ CRNAs or the organizational structures in the employment settings of CRNAs that may promote or hinder their ability to deliver high-quality care.



## **Conceptualization of Organizational Climate**

Organizational structures of employment settings are often referred to as work context, work environment, organizational culture, or organizational climate. Although these terms have been used interchangeably in the literature, differences do exist, namely, between organizational culture and organizational climate. Some researchers defined organizational culture as a general state of an organization, comprised of an overarching set of norms, values, and tenets to which an organization subscribes (Alvesson, 2010; Gershon, Stone, Bakken, & Larson, 2004; Hemmelgarn, 2001). Organizational culture has been referred to as the glue that holds an organization together (Alvesson, 2002) and infers a broadly shared set of rules and unifying values to which members within an organization subscribe (Kunda, 2009). Because of its broad nature and defining characteristics, organizational culture tends to be difficult to measure and empirically study (Gershon et al., 2004). Traditionally, organizational culture has been studied qualitatively (Hemmelgarn, Glisson, & Dukes, 2001; Schein, 1990) and studies tend to focus on single institutions (Patterson et al., 2005).

Unlike elements of organizational culture, elements of organizational climate are more tangible and thus more readily studied and hence modified. Organizational climate inquiry effectively began in the 1960s, and it has been described as the employee's perception of and experience within organizational structures (Litwin & Stringer, 1968; Rousseau, 1988; Schneider, Brief, & Guzzo, 1996). Although a unified definition of organizational climate has not been agreed upon, it has been described as shared perceptions of psychologically important aspects of the work environment (Schneider, 1975), which affect individuals' behavior within organizations (Field, 1982; Jones & James, 1979; Schneider, 1975). In the health care literature, organizational climate is often referred to as work environment and has been described to include

leadership characteristics, group behaviors, communications, quality attributes of work life, and rewards (Gershon et al., 2004). Traditionally, organizational climate has been studied quantitatively (Hemmelgarn et al., 2001) with studies tending to aggregate data from the individual level to the group level across several institutions (Patterson et al., 2005). Early developments in organizational climate described it as a higher-level, global concept (James & Jones, 1974; Schneider, Ehrhart, & Macey, 2010). As organizational climate research developed, several key dimensions were identified that could be applied across industries and settings: the qualities of interpersonal relationships, the nature of work, and the focus of support and rewards (Schneider et al., 1996).

### **Organizational Climate and Healthcare Workforce**

More contemporary, domain-specific approaches to organizational climate such as patient safety or professional practice environments have emerged and been studied within health care settings (Lake, 2007). Within these settings, organizational climate has relevance to the wellbeing of organizations as well as the employees who work within them. RN organizational climate in hospital settings has been well studied (Fang, 2007; Keuter, Byrne, Voell, & Larson, 2000; Stone et al., 2006). In this literature, organizational climate is also referred to as work environment or practice environment and encompasses characteristics of organizations that enable nurses to function to their full potential. These include clinical care emphasizing quality, safety, collaboration, teamwork, and autonomy (American Association of Colleges of Nursing [AACN], 2002). Nurse practice environments that include staffing inadequacies, ineffective leadership, and poor nurse-physician relations are associated with burnout, lower levels of job satisfaction among nurses, high rates of turnover, and decreased quality of care (Aiken et al., 2011; Kelly, McHugh, & Aiken, 2011; Kutney-Lee, Wu, Sloane, & Aiken, 2013; Sawatzky &

Enns, 2012). On the other hand, when RN organizational climate is optimal and staffing is adequate, patients experience less falls (Patrician et al., 2011), are more often rescued from critical emergencies, (Needleman et al., 2011), and die less often (Aiken et al., 2011; McHugh et al., 2016). Thus, creating favorable RN organizational climate is important as studies demonstrate that favorable nurse practice environments are beneficial for patients, nurses, and health care organizations.

Unlike the robust body of research regarding RN organizational climate, less work has been done to study the organizational climate of advanced practice nurses, with the majority of the studies focusing on organizational climate of primary care nurse practitioners (NPs) (Abdallah, Fawcett, Kane, Dick, & Chen, 2005; Poghosyan, Nannini, & Clarke, 2013; Poghosyan, Nannini, Finkelstein, Mason, & Shaffer, 2013; Poghosyan, Nannini, Stone, & Smaldone, 2013). This growing field of research shows that dimensions of NP organizational climate include: Professional visibility, NP-administration relations, NP-physician relations, and Independent practice and support (Poghosyan et al., 2013; Poghosyan, Nannini, Finkelstein et al., 2013), and are important for optimal NP practice. Furthermore, practice environments with poor collegiality, poor intra-practice partnerships among NPs and physicians, and poor collaboration of NPs with physicians inversely affect NP job satisfaction (Faris, 2010) and are associated with NP job turnover (De Milt, 2011; Hall, Brazil, Wakefield, Lerer, & Tennen, 2010). Optimization of NP care and retention of these providers in their current clinical positions are critical for promoting quality patient outcomes, curtailing healthcare costs, and increasing access to primary care provided by NPs (Poghosyan & Aiken, 2015).

Whereas evidence is clear that organizational climate is important for patients, providers, and organizations, little evidence exists about CRNA organizational climate despite studies

demonstrating that CRNAs work in challenging work environments (Alves, 2005; Chipas & McKenna, 2011; Taylor, 2009). For example, CRNAs and anesthesiologists often experience role overlap, which creates conflict in clinical decision-making and a threat to respective professional identities within their work settings (Jameson, 2003). Such challenges are counter-productive to CRNAs' desire for autonomy and respect regarding their clinical decision-making (Jameson, 2003; Radzvin, 2011), and may challenge CRNA practice.

Variability in CRNA scope of practice, as determined by legislation, regulation, or organizational policy, further complicates CRNA work environments. For example, a CRNA may practice in a state with liberal laws regarding what roles CRNAs may fulfill, but be limited in those roles by either state-based regulations or by organizational rules that restrict their practice. CRNAs with fewer restrictions on their practice experience more occupational stress and role overload compared to CRNAs with more restrictions on their practice (Alves, 2005).

Additional poor CRNA outcomes are found among CRNA work environments that include incivility, which leads to burnout (Elmblad, Kodjebacheva, & Lebeck, 2014), and workplace aggression (Sakellaropoulos, Pires, Estes, & Jasinski, 2011). If CRNAs practice in poor working conditions it may prevent CRNAs from delivering high quality of care and lead to poor patient outcomes. An optimal organizational climate is important to help CRNAs exercise and expand their scope of practice where CRNAs could collaborate effectively, appreciate autonomy and respect in their clinical decision-making, and improve provider and patient outcomes. Yet to date, no systematic investigation of CRNA organizational climate has been conducted, and little is known about the domains of organizational climate that are important for CRNAs or how to investigate and measure them. CRNA organizational climate is the shared perception of CRNAs regarding the structures within their organizations that affect CRNA

behavior and outcomes. Assessment and measurement of CRNA organizational climate would not only help to better understand it, but also would promote future research to produce evidence about how CRNA organizational climate affects the quality of care delivered by CRNAs.

Evidence is needed to help policy makers and administrators to understand CRNA organizational climate and take actions to promote it, thus ensuring that CRNAs can deliver safe, high-quality care that benefits patients. This study fills this critical gap in evidence by synthesizing the existing evidence on CRNA organizational climate and developing and validating a CRNA-specific tool to measure their organizational climate.

This study is important as policy organizations across the country are searching for ways to optimize the utilization of clinicians to maximize efficiency and promote quality of care (Birk, 2014). This study supports policy recommendations by investigating and measuring organizational attributes that may support or curtail CRNA contributions to quality of care. Policy experts agree that improving quality of health care in the U.S. is necessary. For example, the National Academy of Medicine's (former Institute of Medicine) report *Crossing the quality chasm: A new health system for the 21<sup>st</sup> century* (2001) details the need to re-design health care to focus on safe, effective, patient-centered, timely, efficient, and equitable care. In part, they recommend a multi-disciplinary, collaborative, team approach to improve quality (Committee on Quality of Health Care in America, 2001). CRNA collaborative care fits this recommendation. In fact, the National Academy of Medicine's (former Institute of Medicine) seminal report *The future of nursing: Leading change, advancing health* (2010) calls for APRNs including CRNAs, to function as leaders in healthcare while practicing to their full potential as full partners with physicians (Institute of Medicine [IOM], 2010). In order to promote CRNA leadership and practice at full partnership with physicians, understanding and measuring organizational

structures that are present in their work environments, which either support or hinder CRNA practice, is necessary.

Research that leads to the optimization of CRNA organizational climate is relevant, as the research arm of the AANA, the AANA Foundation, set health services research as a national research priority for the fiscal year of 2016 (AANA Foundation, 2016). This study supports the AANA Foundation's research priorities by measuring organizational attributes that support effective CRNA practice, which may impact CRNA job satisfaction, prevent turnover, and promote quality patient outcomes. Furthermore, once CRNA organizational climate can be reliably measured, its deficient aspects can be identified, improved, and optimized through organizational interventions. Policy makers, administrators in institutions where CRNAs practice, other stakeholders, and the patients who are served by CRNA care will benefit from this research.

### **Purpose and Specific Aims**

The purpose of this dissertation is to investigate and measure CRNA organizational climate. Therefore, the dissertation has three aims:

Aim one: To conduct a systematic review of published literature regarding CRNA working conditions and outcomes.

Aim two: To select and adapt an instrument to measure CRNA organizational climate.

Aim three: To conduct psychometric testing of the adapted instrument and further validate it.

Each aim is fully addressed in subsequent chapters of this dissertation. Aim one is addressed in Chapter 2, aim two is addressed in Chapter 3, and aim three is addressed in Chapter 4.

Conceptual underpinnings from empirical and theoretical work on organizational climate guide this study (Denison, 1996; James & Jones, 1974). Because CRNA organizational climate is the shared perception of CRNAs regarding the structures within their organizations, a CRNA-specific tool should be capable of measuring specific organizational characteristics that are present within their employment settings and are consistent with their working conditions. In order to garner a full understanding of CRNA shared perceptions of their working conditions, conducting a thorough synthesis of existing evidence is necessary. This evidence is important to identifying the domains of CRNA organizational climate. Once these domains are identified, an instrument must be selected and adapted to be capable of measuring CRNA organizational climate. Psychometric testing would provide further evidence of the instrument's construct validity for measuring CRNA organizational climate.

## **Chapter 2: Certified Registered Nurse Anesthetist Working Conditions and Outcomes**

The following chapter presents a study that systematically reviews evidence regarding CRNA working conditions and outcomes. In this chapter, aim one of the dissertation is addressed. Evidence regarding CRNA working conditions and outcomes is important to the foundational underpinnings for studying organizational climate as perceived by CRNAs, since little evidence has been published that fits conceptually with this concept. This review was guided by the Preferred Reporting Items for Systematic reviews and Meta-Analyses (Liberati et al., 2009), and it includes relevant peer-reviewed, published articles that provide background information and demonstrate gaps in published literature on CRNA organizational climate.

Note 1: The full search strategy and article selection can be found in Appendix A.

Note 2: The content presented in this chapter, with permission from the AANA Journal, is a manuscript accepted for publication in the AANA Journal. The citation for this manuscript is:

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Certified Registered Nurse Anesthetist Working Conditions and  
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### **Abstract**

CRNAs deliver anesthesia to over 34 million patients per year in the United States in both in- and outpatient settings. Yet CRNA working conditions and workforce outcomes have not been well investigated in the literature. In order to get a deeper understanding of both, a review of the literature was conducted. Following specific inclusion criteria, peer-reviewed, research articles published from 2001-2015 were included. Data were abstracted from thirteen studies and were synthesized. Four themes emerged. Results showed that communication and collaboration, professional identity and autonomy, and work relations issues were experienced by CRNAs who practice in a variety of health care settings. Further, job dissatisfaction, occupational stress, incivility, burnout, workplace aggression, and intent to leave were prevalent CRNA outcomes. Future rigorous research should focus on CRNA working conditions that could be changed in order to diminish negative CRNA outcomes. Positive CRNA workforce outcomes in turn could have financial, access to care, and quality of care implications for organizations where CRNAs practice. Policy makers, organizations, CRNAs, and the patients and families CRNAs serve would benefit from such research.

## Introduction

The demand for anesthesia services is increasing, as individuals live longer, experience more acute and chronic conditions, and require diagnostic, procedural, and surgical interventions. During a ten-year period from 1996-2006, the national volume of ambulatory surgical cases increased by 300%, with nearly 15 million procedures performed in Ambulatory Surgical Centers in 2006 (Cullen et al., 2009). In addition to this increase in demand for services, the Affordable Care Act's addition of eight million newly insured individuals will further strain the health care system's ability to provide anesthesia care (Holst, 2014) as many of these previously uninsured individuals will seek surgical procedures (Ellimoottil, Miller, Ayanian, & Miller, 2014). Currently, 42,000 nurse anesthetists across the United States (U.S.) participate in 65% of all anesthetic cases per year (AANA, 2016a). Despite that CRNA workforce is projected to increase by 25% from 2012-2022 (Bureau of Labor Statistics, 2014), there is concern that the supply of CRNAs may still be inadequate, especially in ambulatory surgical centers (Merwin et al., 2009), potentially thwarting the ability of this growing workforce to deliver high quality services to patients.

While increasing the number of CRNAs will help meet care demands, it is only one strategy to address the challenges. Another strategy is retaining CRNAs in their current positions and promoting their practices through creating productive working conditions of these clinicians. The attributes of work context in health care organizations are referred to in the literature as organizational climate (Poghosyan, Nannini, & Clarke, 2013), practice environment (Erickson, 2009), or work environment (Aiken et al., 2011), among other terms. Organizational climate is one of the most commonly used terms to describe the work setting of employees and has been described as shared perceptions of important aspects of the work environment that

affect individuals' behavior within organizations (Schneider, 1975). A robust literature exist on the work context of RNs in which organizational climate has been described to include aspects of quality, safety, collaboration, teamwork, and autonomy (Fang, 2007; Stone et al., 2006). A growing body of literature exists describing the organizational climate of NPs to include professional visibility, NP-physician relations, NP-administration relations, and independent practice and support (Poghosyan et al., 2013; Poghosyan, Nannini, Finkelstein et al., 2013). However, little work has been done to explore the organizational climate of CRNAs with most work focusing on general working conditions of CRNAs. Therefore, the aim of this literature review is to investigate the existing evidence regarding working conditions of CRNAs and their relationships with CRNA outcomes.

### **Description of Project**

A comprehensive search of the literature was conducted using the following search engines: Ovid/MEDLINE, PubMed, SCOPUS, and EBSCO Cumulative Index to Nursing and Allied Health Literature. Google Scholar was used to search for additional articles. Using the RN and NP literature regarding organizational climate as a guide for our search strategy, the search was conducted using these keywords in various combinations: nurse anesthetists, job satisfaction, physician-nurse relations, interpersonal relations, organizational culture, professional autonomy, practice environment, professional practice, care environment, work environment, and stress. Full search strategy for all databases is available upon request.

Following the Preferred Reporting Items for Systematic and Meta-Analyses guidelines (Liberati et al., 2009), studies were eligible for inclusion if they were conducted in the U.S., published in English from January, 2001 – May, 2015, and were original research. Years of inclusion were selected based on the 2001 Federal Code of Regulations for the Center for

Medicare and Medicaid Services' Hospital Conditions of Participation: Anesthesia Services (Center for Medicare & Medicaid Services [CMS], 2001) which stated that no evidence existed that should require a federal mandate on CRNA supervision. Subsequent promulgation of state regulations regarding supervision of CRNAs resulted in state-by-state variability of physician supervision, which may have affected the working conditions of CRNAs beyond 2001.

Exclusion criteria were publications that were: non-research, opinions, or not relevant, namely, focused on student registered nurse anesthetists (SRNAs), or focused on patient outcomes.

Reference lists of included articles were scanned for additional titles.

## **Results**

A total of 1,352 studies were retrieved. Initially, the titles and abstracts of the articles were screened and after applying our inclusion and exclusion criteria, 113 articles were retained for further evaluation. Removal of duplicates left 19 articles for which full abstracts were read. Four articles were excluded: one was non-research, and three were not relevant, as one focused on students, one focused on patient outcomes, and one described anesthesia support personnel from the perspective of the CRNA, leaving 15 full-text articles for further review. Subsequently, two additional articles were excluded because they were not relevant: one described CRNA involvement in emergency airway management and trauma stabilization, and the other one measured relative deprivation in active duty CRNAs, leaving 13 studies selected for in-depth review and ultimate inclusion (see Figure 1). Eight studies included in this review were quantitative studies of cross-sectional design with data collection via surveys (Alves, 2005; Chipas & McKenna, 2011; Hyman et al., 2011; Jenkins, Elliott, & Harris, 2006; Kaplan, Brown, Andrilla, & Hart, 2007; Makary et al., 2006; Radzvin, 2011; Taylor, 2009). Three studies utilized mixed-methodology (Elmblad et al., 2014; Jones & Fitzpatrick, 2009; Sakellaropoulos et

al., 2011), while two were qualitative studies utilizing in-person interviews (Jameson, 2003; Perry, 2005). Data regarding the characteristics of each study were abstracted and tabulated in Table 1.

Reviewed quantitative and mixed-methods studies used a variety of sampling strategies. In two of them, a national sample of participants was recruited from the CRNA membership roster of the AANA. One invited participation of all AANA members (Chipas & McKenna, 2011) while the other utilized a random sample of AANA members (Sakellaropoulos et al., 2011). Two studies utilized a sample from multiple states. Of these, one invited participation of all AANA members from six New England states (Alves, 2005) and the other invited participation of all operating room caregivers in a health system encompassing 16 states (Makary et al., 2006). Six studies utilized AANA members from single states. Of these, two invited participation of all AANA members (Elmblad et al., 2014; Kaplan et al., 2007), one utilized a random sample of AANA members (Radzvin, 2011), while three utilized a convenience sample of AANA members (Hyman et al., 2011; Jones & Fitzpatrick, 2009; Taylor, 2009). Response rates of individual studies ranged from just under 27% (Chipas & McKenna, 2011) to 77% (Makary et al., 2006) with sample sizes ranging from 145 (Hyman et al., 2011) to 7,537 (Chipas & McKenna, 2011). All studies had clearly defined foci, aims, and outcomes. The majority of the studies incorporated a sample that was representative of its target population, utilized appropriate statistical methods, considered important outcomes, and confirm that results can be applied to the local situation. Less than half of the studies state that all survey questions had been validated (Elmblad et al., 2014; Kaplan et al., 2007; Makary et al., 2006; Sakellaropoulos et al., 2011), while only two clearly addressed bias and confounding (Elmblad et al., 2014; Hyman et al., 2011).

## Themes from the Reviewed Studies

Four themes emerged from reviewed studies: communication and collaboration, professional identity and autonomy, work relations of CRNAs, and CRNA outcomes. Each theme is discussed below.

**Collaboration and communication.** Synthesized results showed that effective communication between anesthesiologists and CRNAs was important for professional exchange of ideas and effective collaboration. Within the perioperative setting, CRNAs have described themselves as collaborators who promote patient safety (Jones & Fitzpatrick, 2009; Perry, 2005). Makary et al. (2006) studied collaboration and communication of perioperative clinicians and results showed that the quality of collaboration and communication was rated higher among clinician groups than between clinician groups. Specifically, anesthesiologists rated the quality of their collaboration and communication with each other at 96% while surgeons rated it at 84%, CRNAs rated it at 75%, and OR nurses rated it at 63%. Similar findings were observed with CRNAs rating the quality of their collaboration and communication with each other at 93%, while anesthesiologists rated it at 92%, surgeons rated it at 87%, and OR nurses rated it at 68% (Makary et al., 2006). Jones & Fitzpatrick (2009) studied collaboration between anesthesia provider groups and results showed that CRNA attitudes toward collaboration were significantly more positive than those of anesthesiologists. Furthermore, qualitative findings suggested that collaboration, teamwork, and mutual respect between CRNAs and anesthesiologists were important to providing safe care (Jones & Fitzpatrick, 2009).

In addition to variable perceptions of collaboration between providers, studies also demonstrated variability in the amount of collaboration reported by CRNAs and anesthesiologists. One study, conducted in a state that did not require physician supervision of

CRNAs, reported that 36% of CRNAs never collaborated with anesthesiologists while 20% of CRNAs collaborated with an anesthesiologist on every patient (Kaplan et al., 2007). Although anesthesiologist supervision of CRNAs has not been shown to improve patient outcomes (Dulisse & Cromwell, 2010), it seemed to affect CRNA outcomes. For example, CRNA attitudes on collaboration decreased as the percentage of anesthesiologists in the workplace increased (Taylor, 2009). In cases where an anesthesiologist supervises anesthesiology residents or fellows in training, anesthesiologist assistants, or CRNAs, the American Society of Anesthesiologists defines this arrangement as the anesthesia care team (ASA, 2014a). When the percentage of anesthesia care team practice exceeded 50%, CRNA attitudes on collaboration decreased, role conflict increased, and was associated with CRNA stress and job dissatisfaction (Jones & Fitzpatrick, 2009). In general, 93% of clinically practicing CRNAs were satisfied or extremely satisfied with their career choice, but only 73% were satisfied or extremely satisfied with their jobs (Chipas & McKenna, 2011). What is unclear is what are the etiological bases for job dissatisfaction among CRNAs and are they related to professional identity and autonomy or other complex work relations?

**Professional identity and autonomy.** Professional identity included overlap in professional roles of anesthesiologists and CRNAs, as well as CRNAs feeling that their professional autonomy was compromised because of it. Conflict in the work context of CRNAs and anesthesiologists may stem from the overlap in clinical responsibilities between these providers. When conflict incorporates a threat of identity, reinforcement of ongoing beliefs, and perpetuation of conflict, it has been described to be intractable (Northrup, 1989). Jameson (2003) described the conflict between anesthesiologists and CRNAs as intractable and encompassing a continuum of feelings among CRNAs and between CRNAs and



anesthesiologists. Furthermore, this study's results showed that CRNAs are well trained, competent, and autonomous, and expressed the desire for respect in their independent clinical decision-making. However, because of overlap in their professional roles, both CRNAs and anesthesiologists felt a threat to their professional identities. In this study, positive assertions regarding anesthesia providers were evident within provider groups, but between provider groups, ambivalence was reported and it may have been perpetuated from respective national organizations. This created conflict between providers; however, effective communication had the ability to de-escalate conflict as it occurred (Jameson, 2003). In another study, when conflict arose only 15% of CRNAs resolved conflict through collaboration with anesthesiologists, while nearly 38% of CRNAs resolved conflict through compromise and 23% resolved it through avoidance (Alves, 2005).

APRN autonomy has been described to involve self-determined, controlled actions not requiring authorization by another provider (Lyon), and has been promoted by collegial rather than adversarial relationships (Dempster, 1990). Results from one reviewed study showed that CRNA autonomy was important for CRNA job satisfaction (Jones & Fitzpatrick, 2009), while another research team reported that hierarchal supervision existed in CRNA practice settings where autonomy of CRNAs was restricted by anesthesiologists, with nearly 23% of CRNAs being required to accept the clinical decisions being made by the anesthesiologist (Kaplan et al., 2007). Being placed in such conflicting situations where CRNAs felt that their decisions were in the best interest of the patient for whom they were providing care, however had to accept the decisions of other providers led to CRNAs experiencing moral distress. Radzvin (2011) determined that 38% of CRNAs felt powerless in dealing with physicians with 17% of CRNAs compromising on their ethical values and 30% fearing termination as a result of ethical decision-

making. As a result of ethical issues, 9% considered leaving the nurse anesthesia specialty and 10% of CRNAs considered leaving the nursing profession overall (Radzvin, 2011).

**Work relations of CRNAs.** Work relations of CRNAs included anesthesia care team dynamics and occupational stress experienced by CRNAs with coping strategies for managing stress. Alves (2005) examined how scope of practice (SOP) and collaboration were related to occupational stress of CRNAs practicing in anesthesia care teams. The AANA defines unrestricted CRNA SOP as provision of all aspects of anesthesia care to any aged individual for any medical, pain management, or surgical procedure in any location where anesthesia services are provided (AANA, 2016b). Occupational stress has been defined in terms of work strain when job requirements do not match the capabilities or resources of the worker (World Health Organization, 2015), which can evoke harmful physical and emotional responses within them (Lu et al., 2015). Alves' study results showed that more than 88% of CRNAs practiced in anesthesia care teams. SOP restrictions were most evident in the pre-operative period in requesting consultations or ordering diagnostic tests, and in the post-operative period in discharging patients from post-anesthesia care units or managing chronic pain. In addition to SOP restrictions on CRNA practice, few CRNAs perceived their practice with anesthesiologists as collaborative, with CRNAs using compromise or avoidance in conflict resolution. Furthermore, CRNAs who were employed by hospitals scored higher on SOP compared to CRNAs who were employed by private physician groups. In regards to SOP and occupational stress, CRNAs with a less restrictive SOP experienced more occupational stress and role overload when compared to CRNAs with a more restrictive SOP (Alves, 2005).

One study of CRNAs from across the U.S. reported average daily stress of 4.3 on a 10-point Likert scale (zero meaning no stress to ten meaning maximum stress), with 50% of it being

attributed to occupational stress. The self-reported stress of CRNAs was slightly less than that of administrators or military CRNAs whose mean stress scores were 5.1 and 4.9 respectively. Results also showed that the highest-ranking personal stressors among CRNAs were changing jobs (28%), followed by the stress of relocating (23%), (Chipas & McKenna, 2011). Perry (2005) investigated the perceived stress, coping strategies, and work relationships of CRNAs. The study found that CRNAs experience high levels of stress due to the nature of their clinical work, which was characterized by high workload and pressures from administrators to meet patient quotas. This pushed CRNAs to finish cases as quickly as possible, creating concern among them regarding their ability to provide safe care. Results also showed that interpersonal work relations between CRNAs and anesthesiologists or other professionals contribute to CRNA stress more so than any other job stressors (Perry, 2005).

Interpersonal work relations were concerning not only to civilian CRNAs but also to active-duty CRNAs. Jenkins, Elliott, and Harris' (2006) study of Army Civilian and Army Nurse Corps CRNAs identified that conflicts in the nurse-physician (or other professional) relationship were the most commonly experienced ethical issue among all CRNAs in the study. Civilian CRNAs ranked conflicts in this relationship as the third most frequently experienced ethical issue, while the military CRNAs ranked it as the most frequently experienced ethical issue. In addition, interpersonal work relation conflicts were also deemed one of the most personally disturbing ethical issues for both groups of CRNAs (Jenkins et al., 2006).

**CRNA outcomes.** CRNA workforce outcomes including incivility, burnout, and workplace aggression were described in the reviewed studies. Incivility in health care has been defined as deviant, disrespectful behavior intended to harm its target and has the potential to escalate to workplace aggression (Hutton & Gates, 2008). Professional burnout has been described as the state of emotional and physical exhaustion experienced as a result of chronic, demanding work situations (Chipas & McKenna, 2011). Elmblad and colleagues (2014) studied CRNA workplace incivility and its relationship with CRNA professional burnout. Results showed that CRNAs experienced incivility from several sources including physicians, nurses, and other hospital personnel as well as from non-employee sources including patients and visitors. Furthermore, CRNA workplace incivility and burnout were positively correlated and this relationship was statistically significant (Elmblad et al., 2014). Hyman et al. (2011) studied professional burnout among CRNAs, experienced physicians (physicians with five or more years of post-medical school experience), and resident physicians (physicians with less than 5 years of post-medical school experience). Burnout was higher among both groups of physicians compared to CRNAs; however, CRNAs were the least satisfied with their work. CRNAs reported that personal support reduced burnout (Hyman et al., 2011).

Workplace aggression, which has been defined as physical or verbal abuse, bullying, conflict, or threatening behaviors (Neuman & Keashley, 2004) was another outcome investigated among CRNAs. Sakellaropoulos, Pires, Estes, & Jasinshi (2011) studied aggression towards CRNAs to determine its prevalence in the workplace. Among CRNAs, 92% experienced active aggression, 90% experienced verbal aggression, and 83% experienced physical aggression from supervising physicians, which included surgeons and anesthesiologists, with female CRNAs experiencing all forms of aggression more than males. Further, the study showed a statistically

significant positive correlation with workplace aggression increasing workplace stress, while qualitative results revealed that workplace aggression may lead to CRNA job dissatisfaction and turnover while having a negative effect on patient safety (Sakellaropoulos et al., 2011).

### **Discussion**

This review synthesized the findings from the existing studies on CRNA working conditions and workforce outcomes. The following four themes emerged from the review of the studies: collaboration and communication, professional identity and autonomy, work relations of CRNAs, and CRNA outcomes. These themes, which are consistent with findings from other studies conducted with nurses (Stone, Du, & Gershon, 2007), nurses practitioners (Maylone, Ranieri, Quinn Griffin, McNulty, & Fitzpatrick, 2011), or physicians (Ajeigbe, McNeese-Smith, Searle Leach, & Phillips, 2013) on their working conditions and outcomes, are important to take into consideration by policy makers and administrators to promote CRNA practice.

This review found that CRNAs make use of a variety of communication techniques such as collaboration, compromise, and avoidance in order to navigate work relationships with anesthesiologists and other providers. Despite varying communication techniques, as the percentage of anesthesia care team practice increases, role conflict between CRNAs and anesthesiologists increases, occupational stress of CRNAs increases, and CRNA job satisfaction decreases. These findings suggest that there may be an optimal percentage of anesthesia care team practice utilizing a variety of communication techniques that would maximize CRNA contributions to care, promote patient safety, and improve CRNA outcomes. CRNAs are not the only advanced practice registered nurse group that face similar work challenges. Similar findings have been reported in studies conducted with NPs. For example, when NP care is maximized, the overall health of patients improves (Stanik-Hutt et al., 2013), while the addition

of NPs to physician practices with effective collaboration between providers improves patient outcomes (Collins et al., 2014). Furthermore, when practice environments support NP autonomy as well as NP-physician relationships, NP job satisfaction increases and turnover intent decreases (Poghosyan, Liu, Shang, & D'Aunno, 2015). These findings are important for policy makers and administrators in organizations where CRNAs practice in determining the right mix of autonomy, collaboration, and teamwork that maximizes CRNA contributions to care while promoting job satisfaction and decreasing attrition. More research is needed to explore these complex relationships and how they might impact CRNA outcomes in order to benefit organizations where CRNAs practice and patients for whom CRNAs care.

In designing more optimal practice arrangements, steps should be taken by organizations and administrations to decrease conflict between anesthesiologists and CRNAs, promote professional identities of both providers, and encourage collaboration in clinical decision-making. The reviewed literature shows the intractable conflict between anesthesiologists and CRNAs, which may be perpetuated by the overlap in clinical roles among them as reported by both civilian and military CRNAs. Understanding how to best resolve conflict between providers, promote effective communication, and support CRNA decision-making may help to improve CRNA-anesthesiologist relations and help value CRNA contributions. Furthermore, other researchers suggest that in order to foster optimal care delivery, hospitals must correct deficient interpersonal communication among providers (Lyndon et al., 2014). In optimizing CRNA care delivery, promoting independent decision-making ability may be one such contribution that may empower CRNAs. The literature suggests that empowering CRNAs to act autonomously may decrease their ethical decision-making dilemmas and allay fear of termination while maximizing their contributions to safe care provision. More research is

needed in these areas so that policy makers will better understand how to foster conflict resolution between providers and design clinical practices with the right mix of autonomy and respectful collaboration that will minimize ethical decision-making dilemmas among CRNAs.

One attempt at mixing autonomy with collaborative practice is the anesthesia care team. The reviewed literature shows that CRNA SOP restrictions within anesthesia care team settings were most evident in the pre-and post-operative period suggesting that CRNA care may be underutilized in these areas. Instituting a less restrictive SOP of CRNAs seems like a reasonable option in maximizing CRNA care; however, the literature also tells us that a less restrictive SOP is associated with increased occupational stress and role overload among CRNAs. Creating a balance within anesthesia care teams may promote a sense of accomplishment and increase job satisfaction. Similar findings have been reported by researchers in a study conducted among NPs practicing in nurse managed health centers, reporting that sense of accomplishment and challenge in clinical work improved job satisfaction among NPs (Pron, 2013). This information has important implications for CRNAs, namely, care must be taken by administration to utilize CRNAs to their full capacity with considerations that will minimize occupational stress, while providing opportunities that prevent role overload, promote productivity, and increase job satisfaction.

The reviewed literature also tells us some about additional CRNA outcomes including incivility, professional burnout, and workplace aggression that involve dysfunctional behaviors and inter-professional work relations involving a variety of providers. Incivility experienced by CRNAs is mainly attributed to employee, non-employee, and physician sources. Furthermore, workplace incivility contributes to the development of professional burnout among CRNAs and other healthcare providers. When professional burnout is experienced by CRNAs, it can be

reduced through factors of good health, work satisfaction, and personal support. This suggests that positive organizational influences could potentially reduce professional burnout through promotion of similar factors. Similar effects have been reported among hospital nurses, where positive care environments have been shown to decrease professional burnout and intent to leave a job, while increasing job satisfaction (Kutney-Lee et al., 2013). Therefore, more robust research in this area could help organizations to better understand where to focus their attention to mitigate negative provider outcomes, including those of CRNAs.

This review is not without its limitations. Several are that the search was limited to literature published in the U.S. in peer-reviewed journals, focused on U.S. CRNAs, and included studies published after 2001. As such, studies may have been missed as a result of the search strategy utilized. Because study samples ranged from CRNAs in single states to national samples of CRNAs, external validity of synthesized findings may be limited. Also, bias was not addressed in eight of the included studies (Alves, 2005; Chipas & McKenna, 2011; Jones & Fitzpatrick, 2009; Kaplan et al., 2007; Makary et al., 2006; Radzvin, 2011; Sakellaropoulos et al., 2011; Taylor, 2009); however, recruitment bias was possible in four (Jones & Fitzpatrick, 2009; Makary et al., 2006; Radzvin, 2011; Taylor, 2009), and response bias was possible in three (Makary et al., 2006; Radzvin, 2011; Sakellaropoulos et al., 2011), possibly skewing results. In addition, quantitative data collected in two of the 11 mixed-methods or quantitative studies utilized instruments for which validation could not be determined (Chipas & McKenna, 2011; Hyman et al., 2011) perhaps invalidating conclusions made.

Despite these limitations, this review offers important information regarding CRNA working conditions and related outcomes. More rigorous research is needed to understand the full spectrum of working conditions of CRNAs, their complex inter-related nature, and how they



collectively impact CRNA outcomes and quality of care. Future research should focus on describing and measuring CRNA organizational climate and its impact on provider outcomes, which our research team is undertaking. Once established, intervention studies could be designed and implemented that would optimize CRNA outcomes and maximize CRNA contributions to care. Collectively, this research would be critical to improving work relationships between CRNAs and other providers, promoting work conditions that benefit CRNAs, patients, and organizations where they practice, and demonstrating high-quality provider and patient outcomes. Policy makers, organizations, CRNAs, and the patients and families they serve would benefit from such research.

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)  
flow diagram

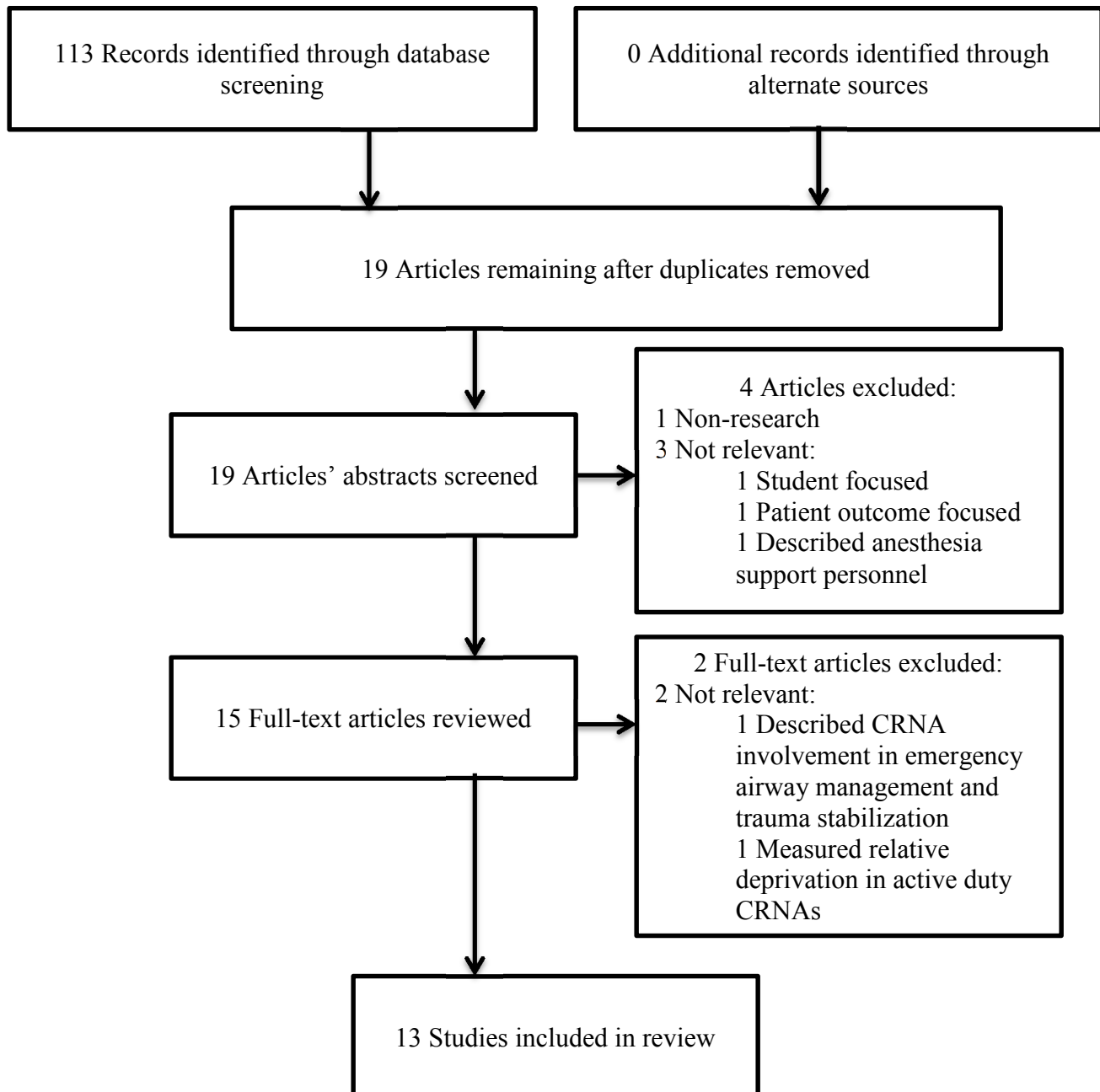


Table 1

*Data Abstraction for Included Studies*

<b>Author (year)</b>	<b>n</b>	<b>Sample</b>	<b>Study Design</b>	<b>Findings</b>
Alves (2005)	347	AANA Member CRNAs from 6 New England States	Quantitative	1) Hospital- employed CRNAs had higher SOP scores than anesthesiologist group-employed CRNAs. Higher educated were more likely to have broader SOP in ACTs. 2) Higher SOP translated to higher stress levels. 3) CRNAs with increased SOP or those who experienced work overload utilized appropriate coping resources
Chipas & McKenna (2011)	7537	AANA Member CRNAs in all 50 states	Quantitative	1) Changing jobs was the highest rated personal stressor by 27.8% of CRNAs, followed by relocating (23.2%). 2) Student anesthetists experience the most stress, followed by nurse anesthesia program faculty, followed by staff anesthetists. 3) Gastrointestinal, orthopedic, and miscellaneous illnesses were experienced 35.2%, 27.8%, and 24.3% of the time. 4) Interaction/support from others was the most commonly reported coping mechanism, while 31% sought professional help
Elmblad et al. (2014)	385	AANA Member CRNAs from MI	Mixed-methods	1) CRNAs experienced moderately high levels of incivility from employee, non-employees, and physician sources, moderate levels of incivility from CRNA colleagues, and low levels of incivility from supervisors. 2) Workplace incivility and professional burnout were statistically significant
Hyman et al. (2011)	145	Staff from one perioperative suite	Quantitative	CRNA's had lower burnout scores (as measured by MBI-HHS scores) than residents or experienced physicians, and CRNAs experienced the least amount of work satisfaction. Personal support contributed to decreased professional burnout among CRNAs
Jameson (2003)	16	Convenience sample of anesthesiologists and CRNAs from one state	Qualitative	1) Threat to identity: communication between members combines positive assertions of in-group legitimacy with ambivalence toward the other group. 2) Distortion with revivification: CRNAs perceive a threat to their identity, while anesthesiologists distort the difference in training between groups. Collusion: Members of each provider group emphasize differences between them. Dominance is present in anesthesiologist perceptions. Conflict can be either fueled or de-escalated
Jenkins et al. (2006)	96	Department of Army Civilian (DAC) and Army Nurse Corps (ANC) CRNAs	Quantitative	1) The most frequently encountered ethical issue among DAC and ANC CRNAs was conflicts in the nurse-physician (or other professional) relationship with 23.7% reporting this occurring frequently, and 41.2% reporting this occurring sometimes. 2) The second-most disturbing ethical issue among DAC and ANC CRNAs was conflicts in the nurse-physician (or other professional) relationship with 23.7 reporting this occurring frequently, and 37.1% reporting this occurring sometimes

Author (year)	n	Sample	Study Design	Findings
Jones & Fitzpatrick (2009)	270	Convenience sample of CRNAs and anesthesiologists from TX	Mixed-methods	1) Mean scores on attitudes towards collaboration were higher for CRNAs than for anesthesiologists. 2) Significant difference existed in attitudes by the interaction of gender and discipline on collaboration. 3) Key themes: Limited communication skills regarding teamwork created strained relationships between anesthesiologists and CRNAs, collaboration of anesthesiologists and CRNAs was best for patient safety, and CRNA autonomy was important for CRNA SOP and job satisfaction
Kaplan, et al. (2007)	283	CRNAs licensed in Washington	Quantitative	Respondents tended to be: equally likely to be male or female, >50 y.o., Caucasian, have on average 19 years of experience, majority practice in urban settings, many work in multiple settings, consultation with an anesthesiologist ranged from 36.3% never consulting with an anesthesiologist to 20% consulting on every pt. with an anesthesiologist, physicians were generally present and available for consultation
Makary et al. (2006)	2135	All OR caregivers in a Catholic health system in 16 states	Quantitative	% reporting high or very high level of collaboration: Anesthesiologists with each other: 96%, CRNAs with each other: 93%. % reporting high or very high level of collaboration between provider groups: 92% of anesthesiologists rated their collaboration with CRNAs as high or very high, while 75% of CRNAs rated their collaboration with anesthesiologists as high or very high
Perry (2005)	35	Convenience sample of TN and NC CRNAs and peers	Qualitative	1) CRNA roles: Typical anesthesia duties, offering assistance or being a reliable co-worker, collaborator. Responsibilities: pt. care and safety, continuing education, administrative duties. 2) Care-related stressors (newborn cases, deaths, pt. complications), administrative stressors (workload, production pressure, CRNA shortage, and not enough appreciation by anesthesiologists). 3) Remain calm, internalization, spiritual beliefs or prayer, humor. Thematic analysis: Being an attentive, reliable co-worker alleviates antagonism in the OR, open communication is effective in addressing concerns and preventing conflict, occupation-related stressors create concern for pt. safety, interpersonal work relations cause more stress than any other perceived stressors
Radzvin (2011)	300	Random sample of AANA Member CRNAs from PA	Quantitative	1) CRNAs aged 24-30 had higher levels of moral distress than any other age group. 2) CRNAs experience moderate levels of moral distress. 3) Thirty-eight % of CRNAs felt powerless in dealing with physicians most of the time. 10% of CRNAs considered leaving the nursing profession because of ethical issues, while 9% had thought of leaving their nursing specialty/work setting in response to ethical problems. 30% of CRNAs feared job loss as a result of their ethical decision-making. 17% of CRNAs reported compromising their ethical values in their work setting

<b>Author (year)</b>	<b>n</b>	<b>Sample</b>	<b>Study Design</b>	<b>Findings</b>
Sakellaropoulos et al. (2011)	205	Random national sample of AANA Member CRNAs	Mixed-methods	1) 92% of CRNAs experienced aggression in the workplace, with the most common age between 21-39 years old, then decreases with age. 2) Female CRNAs experience all forms of aggression more often than male CRNAs. 3) A significant correlation existed between workplace aggression to workplace stress. 4) Key qualitative findings were that workplace aggression may have an effect on patient safety, and that oppression may contribute to workplace aggression
Taylor (2009)	351	Convenience sample of anesthesiologists and CRNAs from one southwestern state	Quantitative	No difference on gender scores. Attitudes on collaboration of CRNAs in this sample were significantly more positive than those of the anesthesiologists. Attitude toward collaboration decreased as percentage of practice with anesthesiologists increased. Correlation between attitude toward collaboration and years of experience was positive and significant for anesthesiologists, while it was negative and significant for CRNAs

### **Chapter 3: Measuring Certified Registered Nurse Anesthetist Organizational Climate**

This chapter presents a study regarding instrument selection for adaptation and instrument adaptation to measure organizational climate among CRNAs. In this chapter, aim two of the dissertation is addressed. Adaptation steps presented are content validity testing and reliability testing of the adapted instrument. This study is important as it demonstrates that the adapted instrument is content-valid, as was determined by a panel of six expert CRNAs, and has strong internal consistency reliability, as was determined by 30 clinically practicing CRNAs in New York State.

Note 1: The email to participate in content validity testing, the consent to participate, and the Certified Registered Nurse Anesthetist Organizational Climate Questionnaire (CRNA-OCQ) for content validity testing can be found in Appendix B.

Note 2: The email to participate in pilot testing, the email consent to participate, the reminder email to participate, and the CRNA-OCQ for pilot testing can be found in Appendix C.

Note 3: The content presented in this chapter, with permission from the Journal of Nursing Measurement, is a manuscript accepted for publication. The citation for this manuscript is:

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Measuring Certified Registered Nurse Anesthetist Organizational Climate:

Instrument Adaptation

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Key Words: CRNA organizational climate, instrument adaptation, content validity, reliability

### **Abstract**

Background and Purpose: No tool exists measuring CRNA organizational climate. The study's purpose is to adapt a validated tool to measure CRNA organizational climate.

Methods: Content validity of the CRNA Organizational Climate Questionnaire (CRNA-OCQ) was established. Pilot testing was conducted to determine internal reliability consistency of the subscales.

Results: Experts rated the tool as content valid. The subscales had high internal consistency reliability (with respective Cronbach's alphas): CRNA-anesthesiologist relations (.753), CRNA-physician relations (.833), CRNA-administration relations (.895), Independent practice (.830), Support for CRNA practice (.683), and Professional visibility (.772).

Conclusions: Further refinement of the CRNA-OCQ is necessary. Measurement and assessment of CRNA organizational climate may produce evidence needed to improve provider and patient outcomes.



## **Introduction**

Organizational climate, employees' perceptions regarding working conditions of their employment system (Denison, 1996; Litwin & Stringer Jr., 1968), has been widely studied by researchers in business management (Castro & Martins, 2010), organizational psychology (Tucker, Ogunfowora, & Ehr, 2016), and health services research (Benzer et al., 2011) as an important factor affecting both employees (Carr, Schmidt, Ford, & DeShon, 2003) as well as their customers (Rogg, Schmidt, Shull, & Schmitt, 2001). Conditions of organizational systems that are important for employees in their work settings include interpersonal relationships, the nature of work, and the availability of support and rewards among other characteristics (Schneider et al., 1996). These conditions contribute to a shared sense of belonging for new and experienced employees within organizations (Denison, 1996). As such, a positive organizational climate is germane to the wellbeing of organizations as well as the employees who work within them. Further, when organizational climate is optimal, employees are happy, retention is high, cost of attrition is low, and customers benefit.

Within healthcare settings, organizational climate refers to employees' shared perceptions of and experiences with organizational features such as decision-making, leadership, and workplace norms (Stone et al., 2005). RNs' perceptions of organizational climate have been thoroughly investigated by researchers who found that organizational climate affects nurses' ability to deliver high quality care to patients (Aiken et al., 2011; Stone et al., 2007). Important aspects of organizational climate perceived by RNs include autonomy, control over their practice (Ajeigbe et al., 2013), teamwork, and collaborative relationships with physicians and staff (Aiken & Patrician, 2000; MacDavitt, Chou, & Stone, 2007). When organizational climate is optimal and nursing staffing is adequate, patient mortality decreases (Aiken, Cimiotti et al.,

2011; McHugh et al., 2016). Furthermore, when organizational climate is perceived by nurses to be positive, it improves their job satisfaction (Kutney-Lee et al., 2013), decreases professional burnout (Aiken, Sloane et al., 2011) and turnover (Aiken, Sloane et al., 2011; Hall et al., 2010; Kelly et al., 2011). When nurses are happy and remain in their current positions, patients benefit from high-quality care they provide (Aiken, Sloane, et al., 2011) while organizations benefit from decreased turnover costs (Li & Jones, 2013).

Organizational climate as perceived by NPs is a growing field of research, especially among NPs practicing in primary care. Important aspects of primary care NP organizational climate include NP relations with physicians and administration, autonomy, support for practice, and professional visibility within organizations (Poghosyan, Shang et al., 2015). Further, when these aspects are favorable within NP organizational climate, NP job satisfaction increases and intent to leave decreases (Poghosyan, Liu et al., 2015). Optimization of NP care and retention of these providers in their current clinical positions are critical in promoting quality patient outcomes, curtailing healthcare costs, and increasing access to care provided by NPs (Poghosyan, Liu et al., 2015). Thus, organizational climate has been shown to be an important factor of study within health care organizations.

Whereas evidence is clear that organizational climate is important for patients, providers, and organizations, little evidence exists about CRNA organizational climate despite studies demonstrating that CRNAs work in challenging work environments (Boyd & Poghosyan, 2015). For example, CRNAs and anesthesiologists often experience role overlap, which creates conflict in clinical decision-making and a threat to respective professional identities (Jameson, 2003). Conflict and professional identity threat are counter-productive to CRNAs' desire for autonomy and respect regarding their clinical decision-making (Jameson, 2003; Radzvin, 2011). Further

complicating CRNA working conditions are varied scopes of practice that exist among these providers. Although CRNAs may desire a broad scope of practice, which includes autonomy and ability to practice to their full legal authority, as CRNA scope of practice increases occupational stress and role overload also increase (Alves, 2005). These findings suggest that an optimal climate could exist where CRNAs collaborate effectively, experience autonomy and respect in clinical decision-making, and have a broad scope of practice without experiencing role overload. Yet to date, no systematic investigation of CRNA organizational climate has been conducted, and little is known about the domains of CRNA organizational climate or how to measure it. Measuring CRNA organizational climate would not only help to better understand it, but also would promote future research to produce evidence about how CRNA organizational climate affects the quality of care delivered by CRNAs. This evidence can help administrators and policy makers to create a climate for CRNA that optimizes their job satisfaction, improves retention, and decreases costs.

Conceptual underpinnings from empirical and theoretical work on organizational climate guide this study (Denison, 1996; James & Jones, 1974). Accordingly, organizational climate is the shared perception of CRNAs regarding the structures within their organizations that affect CRNA behavior and outcomes. Thus, a tool for measuring CRNA organizational climate would need to ask CRNAs to report on specific organizational characteristics that are present within their employment settings and are consistent with their working conditions.

### **Purpose**

The purpose of this study is to adapt an existing, validated, survey tool to measure CRNA organizational climate. This manuscript presents the steps of instrument adaptation: instrument selection, content validity testing, reliability testing, and scale refinement.

## **Instrument Selection**

Lack of evidence regarding CRNA organizational climate can be explained by the lack of psychometrically valid and reliable tools that measure the concept. Many instruments exist that measure organizational climate (or similar concepts) of nursing, or advanced practice nursing, but none is CRNA specific. Therefore, consideration of instruments for adaptation to CRNAs is necessary. One of the most widely used tools to measure nurse work environment is the Nursing Work Index (NWI), (Kramer & Hafner, 1989). The NWI measures nurses' job satisfaction and perceived productivity according to the following subscales: Work values related to staff nurse job satisfaction, Work values related to staff nurse perceived productivity, Staff nurse job satisfaction, and Staff nurse perception of an environment conducive to quality nursing care. Subscale alphas range from .894 - .928 (Kramer & Hafner, 1989); however, constructs like autonomy, which was found to be important for CRNA organizational climate (Boyd & Poghosyan, 2015) is not measured by this tool. In addition, the scope of practice of CRNAs varies significantly from that of RNs, and the tool might not be capable of measuring important CRNA organizational climate domains.

Subsequent revisions of the NWI demonstrate strong psychometric properties, but also lack relevance for adaptation. For example, the Nursing Work Index Revised (NWI-R), (Aiken & Patrician, 2000) subscales measure Staff nurse autonomy, Control over practice setting, Nurse-physician relationship, and Organizational support. Aggregated subscale alphas demonstrate evidence of internal consistency reliability of each subscale range from .84 - .91 (Aiken & Patrician, 2000). However, the NWI-R is focused on staff nurse issues including floating to other hospital units, nurse staffing, and nursing care being guided by nursing diagnoses, making it not relevant for adaptation for CRNAs. Another revision of the NWI, the

Nursing Work Index Practice Environment Scale (NWI-PES), (Lake, 2002), was developed to link nurse practice environment to patient and provider outcomes. The NWI-PES subscales are Nurse participation in hospital affairs, Nursing foundations for quality of care, Nurse manager ability, leadership, and support of nurses, Staffing and resource adequacy, and Collegial nurse-physician relations. Subscale alphas range from .71 - .84 (Lake, 2002). Although the NWI-PES addresses nurse-physician relations, it does not address autonomy making it not relevant for adaptation. While these tools are reliable and valid and have been widely used by researchers to measure nurse work environment, they are not relevant for advanced practice nurses, including CRNAs, as the relationship between RNs and physicians and autonomy of RNs significantly vary from that of APRNs.

Other instruments measure organizational climate among intensive care nurses or advanced practice nurses and were considered for adaptation. For example, the Perceived Nurse Work Environment of critical care nurses (PNWE), (Choi, Bakken, Larson, Du, & Stone, 2004) measures the work environment of critical care nurses through seven subscales: Professional practice, Staffing and resource adequacy, Nursing management, Nursing process, Nurse-physician collaboration, Nursing competence, and Scheduling. Overall scale Cronbach's alpha is .91 while subscale alphas range from .56 - .91 (Choi et al., 2004). The PNWE measures some aspects of organizational climate relevant to CRNAs including professional practice and nurse-physician collaboration. However, it does not include measures for autonomy, making it not suitable for adaptation.

Two instruments were found that measure advance practice nursing roles, or organizational climate. The EverCare Nurse Practitioner Role and Activity Scale (Abdallah et al., 2005) measures NP roles at long-term stay nursing homes via six subscales: Collaborator,

Clinician, Care coordinator, Coach/educator, Counselor, and Communicator/cheerleader. The tool has acceptable internal reliability consistency with overall scale Cronbach's alpha of .97, with subscale alphas ranging from .78 - .96 (Abdallah et al., 2005). However, its focus is on long-term care and it does not address NP-physician collaboration or autonomy in clinical decision-making, rendering it not relevant for adaptation. The Nurse Practitioner Primary Care Organizational Climate Questionnaire (NP-PCOCQ), (Poghosyan, Nannini, Finkelstein et al., 2013) measures the organizational climate of primary care NPs with four subscales: Professional visibility, NP-administration relations, NP-physician relations, and Independent practice and support. The NP-PCOCQ subscales demonstrate strong reliability properties with subscale alphas of .87 - .95 (Poghosyan, Nannini, Finkelstein et al., 2013) and seemed to capture necessary elements of organizational climate that are shared among CRNAs. Therefore, it was selected as the most relevant for adaptation.

## **Content Validity Testing**

### **Method**

The 34-item NP-PCOCQ originally had five subscales, which later researchers reduced to four. We used the original 34 items to see if those five items that were not relevant for NPs are important for CRNAs. The 34-item NP-PCOCQ first went through technical and grammatical assessment and changes to reflect CRNAs rather than NPs. Then, one meeting of expert CRNAs was held in order to establish the tool's content validity. Eligibility criteria for experts were membership in the New York State Association of Nurse Anesthetists (NYSANA), and full-time clinically practicing CRNAs who had five or more years of work experience. Participants were asked to evaluate each item, participate in a group discussion, and make additional item recommendations. Participants individually evaluated items for their relevance to CRNA

organizational climate according to the following 4-point Likert scale: 1 = Not relevant, 2 = Unable to assess without significant revision, 3 = Item is relevant and succinct, and 4 = Item is very relevant and succinct (Lynn, 1986). Once the items were individually evaluated, the experts participated in a group discussion and made suggestions to improve any item's intent or clarity. The experts suggested new items to capture aspects of CRNA organizational climate not represented by the existing items.

Expert ratings were used to compute the content validity index (CVI) for individual items by dividing the number of experts rating an item a three or a four divided by the total number of experts participating. The CVI for the overall instrument was calculated by dividing the number of items judged to be content-valid by the experts by the total number of items considered.

### **Results of Content Validity Testing**

Six experts participated in the meeting. The majority of participants were female (83%), four (67%) had ten to 19 years of experience, four (67%) were employed by a hospital, and all were clinically practicing CRNAs (see Table 1). The experts rated all items. One item, "During visits, I have enough scheduled time with each patient," demonstrated a CVI of .67, which is less than the accepted CVI of .83 (Lynn, 1986). Resulting from group discussion, it was revised to: "In my organization, enough time is allotted to perform patient care" and achieved a CVI of 1.00. Of the remaining items, all achieved a CVI of .83 or above (content valid). Resulting from the group discussion, minor revisions were made to items in order to further increase intent or clarity. For example, the item "Physicians ask CRNAs for suggestions" was revised to "Physicians ask CRNAs for patient care suggestions." In addition, five new items were added to capture aspects of CRNA-anesthesiologist relations, teamwork between CRNAs and other

healthcare providers, CRNA innovation, and rewards for CRNA performance (see Table 2). This resulted in a 39-item instrument with a CVI of 1.00.

### **Discussion of Content Validity Testing**

Content validity testing was an iterative process that allowed for individual evaluation of items as well as group discussion to consensus that the 39-item instrument accurately represented CRNA organizational climate. Experts were in agreement that the content of all final items were valid. Further, they were in agreement that the instrument measured CRNA organizational climate and nothing else. Subsequently, it was prepared to undergo pilot testing for item analysis and reliability testing.

### **Pilot Testing**

#### **Methods**

A purposive sample of 30 NYSANA CRNAs was chosen for pilot testing of the content-valid instrument. Thirty participants are sufficient to conduct pilot testing for survey development (Johanson & Brooks, 2010). Eligibility criteria included being a clinically practicing CRNA in New York State and being a NYSANA member. Exclusion criteria were being CRNA retirees or student registered nurse anesthetists. An email invitation for participation was sent through the NYSANA management company. Recruitment continued until 30 NYSANA CRNAs completed the survey. The email invitation for participation contained an anonymous survey link developed in Qualtrics (Qualtrics, 2015). Participants were instructed to click on the link and complete the 39-item instrument by rating the extent to which they agreed that each item was present in their primary practice site. Participants indicated their degree of agreement on a 4-point Likert scale with 1 = Strongly Disagree, 2 = Disagree, 3 =



Agree, and 4 = Strongly Agree. All responses captured by Qualtrics were imported into SPSS (SPSS Incorporated, 2015) for analysis.

Data were evaluated for missing responses and outliers through frequency statistics and bar charts. Item mean scores with standard deviations were calculated. Subscales were determined based on the structure of the original instrument selected for adaptation, whose dimensions of organizational climate were consistent with CRNA work environment literature (Boyd & Poghosyan, 2015a), and the subscales from the 34-item NP-PCOCQ. Accordingly, items were grouped into five subscales: CRNA-anesthesiologist Relations, CRNA-physician relations, CRNA-administration relations, Independent practice and support, and Professional visibility. The CRNA-anesthesiologist relations subscale was added to capture intra-professional dynamics between these providers, while the subscale CRNA-physician relations would capture intra-professional dynamics between CRNAs and any physician other than an anesthesiologist. The Independent practice and support subscale included autonomy, or making clinical decisions without the input or direction from physician providers, and included broader elements of independent practice such as practicing within the full extent of the state's regulatory scope of practice and applying all of one's skills and knowledge to provide care. One item, "I have to discuss every patient detail with an anesthesiologist," was reverse-coded for analysis, as item response of "4," or strongly agree, was unfavorable for CRNA organizational climate and was contrary to other items' positive intent.

Cronbach's alphas, inter-item correlation matrices, corrected item-total correlations, and Cronbach's alphas if item deleted were calculated for each subscale. Inter-item correlations were examined for low correlations of items in respective subscales and were considered for removal (Nunnally & Bernstein, 1994). Items for which corrected item-total correlations were outside the

range of .30 - .70 or that were not contributing to subscale internal consistency reliability were also considered for removal.

### **Results of Pilot Testing**

Participants were largely female (63%), more than half were less than 40 years old, more than 80% were Caucasian, more than half (53%) were practicing less than ten years, and two thirds (67%) were employed at hospital settings (see Table 1). All participants answered 37 of the 39 items on the CRNA-OCQ, while two participants did not answer the items “Anesthesiologists support my patient care decisions,” and “In my organization, there is a system in place to evaluate the care that I provide.”

The CRNA-anesthesiologist relations subscale achieved a Cronbach’s alpha of .673 with five items initially selected. The item “I have to discuss every patient care detail with an anesthesiologist” was recoded to 1 = Strongly Agree, 2 = Agree, 3 = Disagree, and 4 = Strongly Disagree for analysis. Item means (with standard deviations in parentheses) ranged from 2.4 (0.7) to 3.6 (0.5). Inter-item correlations ranged from .084 - .583 while corrected item-total correlations ranged from .204 - .641. The item “I have to discuss every patient care detail with an anesthesiologist” correlated at  $\leq .184$  with all items on this subscale; therefore, it was removed and Cronbach’s alpha increased to .753. Inter-item correlations ranged from .284 - .583 while corrected item-total correlations ranged from .501 to .697. Removal of additional items did not improve the Cronbach’s alpha of the subscale; thus all four items were retained (see Table 3).

The CRNA-physician relations subscale achieved a Cronbach’s alpha of .833 with eight items initially selected. Item means ranged from 2.4 (0.8) to 3.0 (0.7). Inter-item correlations ranged from .136 - .780. Several inter-item correlations were  $< .200$ , while corrected item-total

correlations ranged from .341 - .736. The only potential for improvement in subscale Cronbach's alpha from .833 to .840 was by removing the item "Physician colleagues support my patient care decisions." This item was retained at this point in the instrument adaptation, leaving eight items in this subscale (see Table 3).

The CRNA-administration relations subscale achieved a Cronbach's alpha of .886 with nine items in the subscale. Item means ranged from 1.7 (0.7) to 2.9 (0.8). Inter-item correlations ranged from -.051 - .812, while corrected item-total correlations ranged from .375 - .773. The item "Administration informs CRNAs about changes taking place in the organization" correlated with "Administration is open to CRNA ideas to improve patient care" at -.051 while correlating with "Administration takes CRNA concerns seriously" at .020. When this item was removed from the subscale, Cronbach's alpha increased to .895. Inter-item correlations ranged from .323 - .812, while corrected item-total correlations ranged from .553 - .769. Eight items were retained for this subscale (see Table 3).

The Independent practice and support subscale achieved a Cronbach's alpha of .765 with eleven items initially selected. Item means ranged from 2.2 (1.1) to 3.5 (0.6). Inter-item correlations ranged from -.126 - .682, while corrected item-total correlations ranged from .260 - .656. Three items had low correlations with other items in the subscale: "Anesthesiologists and CRNAs have similar support for daily functions (e.g. help with patient follow-up, referrals, labs, clerical support, or office space, etc.)," "In my practice setting, I have enough resources to provide patient care," and "In my organization, enough time is allotted to perform patient care." Two items "CRNAs are an integral part of the organization," and "There are enough ancillary staff to help with patient care" had marginally low correlations with other items in the subscale. Subsequently, the Independent practice and support subscale was split into two subscales:

Independent practice, and Support for CRNA practice, increasing the number of subscales from five to six.

The Independent practice subscale achieved a Cronbach's alpha of .805 with six items. Item means ranged from 2.2 (1.1) to 3.0 (0.7). Inter-item correlations ranged from .079 - .682, while corrected item-total correlations ranged from .248 - .733. The item "In my organization, staff members practice as a team" correlated with two items in the subscale: "In my organization, I can provide patient care to the full extent of my state's regulatory scope of practice" at .079, and "I independently make patient care decisions within my area of competency without input from a physician" at .107. When this item was removed from the subscale, Cronbach's alpha increased to .830. Inter-item correlations ranged from .206 - .682, while corrected item-total correlations ranged from .469 - .732. Five items were retained for this subscale (see Table 3).

The Support for CRNA practice subscale achieved a Cronbach's alpha of .590 with five items in the subscale. Item means ranged from 2.3 (1.0) to 3.5 (0.6). Inter-item correlations ranged from -.082 - .569 while corrected item-total correlations ranged from .126 - .600. Cronbach's alpha improved to .683 without the item "Anesthesiologists and CRNAs have similar support for daily functions (e.g. help with patient follow-up, referrals, labs, clerical support, or office space, etc.)" and so it was removed. Inter-item correlations without this item ranged from .112 - .569, while corrected item-total correlations ranged from .373 - .692. If the item "CRNAs are an integral part of the organization" were removed, Cronbach's alpha would increase to .711. However, at this point in the instrument adaptation this item was retained, leaving four items in this subscale (see Table 3).

The Professional visibility subscale achieved a Cronbach's alpha of .772 with six items in the subscale. Item means ranged from 2.0 (0.8) to 3.2 (0.7). Inter-item correlations ranged from

.119 - .614, while corrected item-total correlations ranged from .323 - .634. Cronbach's alpha would improve to .791 by removal of item "In my organization there is a system in place to reward my performance." However, this item was retained at this phase of instrument adaptation leaving six items in this subscale (see Table 3).

### **Discussion of Pilot Testing**

Pilot testing provided evidence about the tool's items and internal consistency reliability. We found that the 35 items are capable of measuring CRNA organizational climate. These items have a wide range as evidenced by the means and standard deviations. Certain subscales were modified to improve their ability to describe the construct, while others did not require modification. Modifications included removal of items that did not contribute to subscales as was done in the CRNA-anesthesiologist relations and CRNA-administration relations subscales. Another modification was the splitting of the subscale Independent practice and support into two subscales: Independent practice, and Support for CRNA practice, as items seemed to be describing two separate constructs. Two subscales required no modification: CRNA-physician relations and Professional visibility, as respective items adequately described the constructs.

Subscale inter-item correlations demonstrate that respective items are capable of measuring various levels of each construct as perceived by CRNAs. Corrected item-total correlations demonstrate that within each subscale items are well related, providing evidence that they measure the same construct and nothing else. Items with corrected item-total correlations  $> .700$  were retained since their removal did not improve respective subscale alphas, and their inclusion provided a more robust description of the construct. Moreover, at this stage of instrument adaptation as many items as possible were retained while still contributing to internal

reliability consistency and its six subscales. The instrument was named the Certified Registered Nurse Anesthetist Organizational Climate Questionnaire (CRNA-OCQ).

### **Relevance to Nursing Practice and Research**

In this paper, we present the findings of content validity testing and pilot testing of the CRNA-OCQ. The CRNA-OCQ is the first instrument capable of measuring organizational climate for CRNAs. Our preliminary findings demonstrate however, that more work is needed to further validate the CRNA-OCQ to assure its utility for use by researchers, administrators, and clinicians to measure and assess CRNA organizational climate. In this study we focus on assessing whether each item on the tool is relevant for CRNA practice, clear, and adequately worded to be understood by individual CRNAs, which is the first step in scale development. As organizational climate represents the shared perceptions of employees, future work should focus on assessing CRNA-OCQ's ability to capture the concept at the organizational level. Future research should also focus on refinement of the CRNA-OCQ, including factor analyses with larger samples of CRNAs. For example, exploratory factor analysis will allow researchers to determine if the CRNA-OCQ subscales will emerge as separate factors or should be modified in order to more accurately represent the tool and measure CRNA organizational climate. Confirmation of the factorial structure of the CRNA-OCQ should be accomplished through confirmatory factor analysis utilizing a different, sufficiently large sample of CRNAs to provide evidence about the construct validity of the tool. Combined, this evidence will assure the tool's validity to adequately measure CRNA organizational climate.

Having a psychometrically sound instrument to measure CRNA organizational climate would allow organizations to assess CRNA climate, determine suboptimal aspects of it, and implement changes that would positively affect provider outcomes like job satisfaction and intent

to leave. Additional inquiry should focus on how organizations could improve the organizational climate of CRNAs and maximize their contributions to care, which may have cost, quality, and access implications similar to those found in the RN and NP literature. Healthcare systems, CRNAs, and patients and families they serve would benefit from such research.

Table 1

*Pilot Study Participant Demographics*

Characteristic	Content Validity	Pilot Testing
	Testing	
	n (%)	n (%)
<b>Sex</b>		
Female	5 (83.3)	19 (63.3)
Male	1 (16.7)	11 (36.7)
<b>Age</b>		
30 - 39	1 (16.7)	16 (53.3)
40 - 49	5 (83.3)	8 (26.7)
50 - 59		5 (16.7)
60 and older		1 (3.3)
<b>Race</b>		
White	6 (100)	25 (83.3)
Asian or Pacific Islander		5 (16.7)
<b>Years of CRNA experience</b>		
< 5	1 (16.7)	8 (26.7)
five to nine	1 (16.7)	9 (30.0)
ten to nineteen	4 (66.6)	8 (26.7)
29 - 39		3 (10.0)
30 - 39		1 (3.3)
Forty or more		1 (3.3)
<b>Employed by</b>		
Hospital	4 (66.7)	20 (66.7)
Group		8 (26.7)
Independent contractor		1 (3.3)



Characteristic	Content Validity	
	Testing	Pilot Testing
	n (%)	n (%)
Other setting	2 (33.3)	1 (3.3)
Average number of hours worked per week		
21 - 35		2 (6.7)
36 - 40	3 (50.0)	10 (33.3)
> 40	3 (50.0)	18 (60.0)
Highest education level		
Diploma/Certificate in anesthesia		1 (3.3)
BS in nursing or other field		1 (3.3)
MS in nursing or other field	3 (50.0)	25 (83.3)
DNP, PhD, JD or other doctorate	3 (50.0)	3 (10.0)

Table 2

*Items Added on the Tool During Content Validity Testing*

Newly created items

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Anesthesiologists support my patient care decisions

In my organization, anesthesiologists and CRNAs practice as a team

My organization is open to CRNA suggestions regarding new ideas about patient care

In my organization, staff members and CRNAs practice as a team

In my organization there is a system in place to reward my performance

---

Table 3

*CRNA-OCQ with Preliminary Subscales*

Subscales with respective items	M	SD	r	Cronbach's alpha if deleted
<b>CRNA-anesthesiologist relations (Cronbach's alpha .753)</b>				
Anesthesiologists support my patient care decisions	3.1	0.52	.563	.692
In my organization, anesthesiologists and CRNAs practice as a team	3.1	0.53	.501	.722
In my practice setting, I have colleagues who I can ask for help	3.6	0.49	.697	.630
My organization is open to CRNA suggestions regarding new ideas about patient care	2.4	0.74	.512	.748
<b>CRNA-physician relations (Cronbach's alpha .833)</b>				
Physician colleagues support my patient care decisions	3.0	0.67	.341	.840
Physicians ask CRNAs for patient care suggestions	2.5	0.73	.628	.796
I am valued by my physician colleagues	3.0	0.59	.679	.800
In my organization, CRNAs and physicians collaborate to provide patient care	3.0	0.46	.460	.827
In my organization, physician colleagues and CRNAs practice as a team	2.7	0.79	.459	.826
Physicians in my practice setting value my patient care decisions	3.0	0.49	.502	.827
Physicians ask CRNAs for their advice when providing patient care	2.5	0.68	.736	.789
Physicians seek CRNAs' input when providing patient care	2.4	0.77	.676	.797
<b>CRNA-administration relations (Cronbach's alpha .895)</b>				
I feel valued by my organization	2.9	0.82	.747	.875
Administration is open to CRNA ideas to improve patient care	2.2	0.90	.728	.877

Subscales with respective items	M	SD	r	Cronbach's alpha if deleted
Administration takes CRNA concerns seriously	2.4	0.81	.740	.876
Administration shares information equally with CRNAs and physicians	1.8	0.80	.687	.881
Administration is well informed of the skills and competencies of CRNAs	2.4	0.81	.559	.893
Administration treats CRNAs and physicians equally	1.7	0.71	.553	.893
Administration makes efforts to improve working conditions for CRNAs	2.3	0.75	.619	.887
In my organization, there is ongoing communication between CRNAs and administration	2.3	0.89	.769	.873
Independent practice (Cronbach's alpha .830)				
In my organization, I apply all my knowledge and skills to provide patient care.	3.0	0.74	.561	.815
My organization does not restrict my abilities to practice to the full extent of my state's regulatory scope of practice	2.3	0.91	.728	.766
In my organization, I can provide patient care to the full extent of my state's regulatory scope of practice	2.3	0.83	.681	.782
My organization fosters an environment where I can practice autonomously	2.2	1.10	.732	.765
I independently make patient care decisions within my area of competency without input from a physician	2.9	0.90	.469	.830
Support for CRNA practice (Cronbach's alpha .683)				
CRNAs are an integral part of the organization	2.9	1.00	.410	.711
In my practice setting, I have enough resources to provide patient care	3.5	0.57	.373	.673
There are enough ancillary staff to help with patient care	3.0	0.74	.692	.458

Subscales with respective items	M	SD	r	Cronbach's alpha if deleted
In my organization, enough time is allotted to perform patient care	3.0	0.56	.509	.611
Professional visibility (Cronbach's alpha .772)				
In my organization the CRNA role is understood	3.2	0.71	.536	.733
CRNAs are represented on important committees in my organization	2.0	0.91	.559	.728
Staff members have an understanding about CRNA roles in the organization	2.7	0.65	.572	.727
In my organization, there is a system in place to evaluate the care that I provide	2.9	0.75	.634	.707
I regularly get feedback about my performance from my organization	2.4	0.68	.536	.734
In my organization there is a system in place to reward my performance	2.0	0.85	.323	.791

M = mean

SD = standard deviation

r = corrected item-total correlation

## **Chapter 4: Psychometric Assessment and Validation of the Certified Registered Nurse Anesthetist Organizational Climate Questionnaire**

This chapter presents the study in which the psychometric properties of the CRNA-OCQ were further tested to determine its factorial structure, the respective items on each factor, and refine and finalize the subscales on the CRNA-OCQ. It addresses aim three of the dissertation. This study was important, since determining the factorial structure and respective items on the CRNA-OCQ is necessary before large-scale surveys of CRNAs across institutions can be conducted. Two hundred seventy-nine CRNAs from Texas were included in the study. Exploratory factor analysis was conducted using data from this sample of CRNAs to determine the factorial structure and respective items of the CRNA-OCQ.

Note 1: The email invitation to participate in the study, the email consent to participate in the study, the email reminder to participate in the study, and the CRNA-OCQ for psychometric testing can be found in Appendix D.

Note 2: The content presented in this chapter is a manuscript that is being prepared for submission in consideration for publication in Nursing Research. The citation for this manuscript is:

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Psychometric assessment and validation of the  
Certified Registered Nurse Anesthetist Organizational Climate Questionnaire

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### **Abstract**

Background: Organizational climate has been extensively studied among registered nurses and primary care nurse practitioners. To date, it has not been studied among CRNAs because of lack of CRNA-specific tools to measure it.

Objective: To conduct psychometric testing on the CRNA-OCQ, an adapted instrument, to identify its factorial structure and refine its subscales.

Method: A cross sectional survey of CRNAs practicing in Texas was conducted. Participants responded to items on the CRNA-OCQ through an online survey. Exploratory factor analysis (EFA) was conducted to determine the factorial structure and finalize the subscales on the CRNA-OCQ. Cronbach's alphas on each subscale were computed.

Results: Two hundred seventy-nine CRNAs participated in the study. EFA revealed 29 items loading on four subscale factors. Kaiser-Meyer-Olkin measure of sampling adequacy was .939. The goodness-of-fit test was non-significant: Chi-Square 941.46, DF 461, Sig .000. Percent total cumulative variance explained by the 4-factor solution was 60.04. The four factors (with respective Cronbach's alphas) were: CRNA-administration relations (.925), CRNA-physician relations (.882), Independent practice and support (.875), and Professional visibility (.760).

Discussion: The CRNA-OCQ is the first validated tool capable of measuring CRNA organizational climate and could be used in future research to provide valuable insight into organizational influence on CRNA care provision. Confirmation of the CRNA-OCQ factorial structure should be determined in future research. Future research using the CRNA OCQ should assess CRNA organizational climate and its impact on provider and patient outcomes.

## **Background**

The needs for anesthesia related care across the U.S. are increasing, in large part, because surgical case volumes are growing in ambulatory surgical centers as well as in hospital operating room settings. For example, during the ten-year period from 1996-2006, the U.S. national volume of ambulatory surgical cases requiring anesthesia increased by 300%, with nearly 15 million procedures performed in non-hospital owned ambulatory surgical centers in 2006 (Cullen et al., 2009). Smaller growth was documented in hospital owned ambulatory surgical centers with surgical case volume increases from 26.1 million in 2000 to 26.4 million in 2014 (Weir, Steiner, & Owens, 2015). Similar growth was demonstrated in hospital operating room settings of 15.3 million cases in 2001 to 15.6 million cases in 2011 (Weiss & Elixhauser, 2014). In addition to existing demand, many of the 20 million newly insured Americans who have entered the healthcare system since June of 2015 (U.S. Department of Health and Human Services, 2016), inevitably will require anesthesia services for procedural or surgical interventions.

CRNAs are advanced practice registered nurses (APRN) who have graduated from nursing school and most hold master's degrees and beyond, and are specifically educated and trained to administer anesthesia. In the U.S., nearly 40,000 CRNAs (Bureau of Labor Statistics, 2015b) provide anesthesia for nearly 43 million cases per year, often in rural and underserved areas across the U.S. (AANA, 2016a). In an effort to meet growing demand for anesthesia services, the CRNA workforce is growing and is expected to increase by 19% from 38,200 in 2014 to 45,600 in 2024 (Bureau of Labor Statistics, 2015c). CRNA care could be a solution to meeting the demand for anesthesia services; however, in many states CRNAs are required to be supervised by an anesthesiologist, surgeon, or other type of physician, thus limiting their ability to meet care demands.



As the number of CRNA providers is increasing, so are policy recommendations supporting their functioning to the full capacity of their education and training, which does not require supervision of their care. These decisions are based on the fact that CRNA care is safe regardless if the care is provided by a CRNA independently or in collaboration with physicians (Dulisse & Cromwell, 2010; Negrusa, Hogan, Warner, Schroeder, & Pang, 2016). In 2001 the Center for Medicare and Medicaid Services published a final rule in the federal register stating that no evidence existed supporting the requirement of CRNA supervision (CMS, 2001). This rule became the impetus for seventeen states to not require supervision of CRNA care (AANA State Government Affairs Division, 2012). In 2010, the National Academy of Medicine (former Institute of Medicine) report *The future of nursing: Leading change, advancing health* recommended full practice authority for APRNs, including CRNAs (IOM, 2010). Most recently, the Department of Veterans Affairs proposed a rule that would allow APRNs, including CRNAs, to practice without a supervision requirement regardless of their state of practice (Department of Veterans Affairs, 2016).

Whereas considerable attention has been given to policy recommendations for CRNAs to practice to their full capacity, limited attention has been given to organizational influence on their care provision. We know that CRNAs work in challenging work environments (Boyd & Poghosyan, (in press)-a) characterized with conflict and professional identity threat (Jameson, 2003), inconsistent collaboration between CRNAs and anesthesiologists (Jones & Fitzpatrick, 2009; Taylor, 2008), and inability to practice to one's full legal authority (Alves, 2005). However, little is known about organizational structures in the employment settings of CRNAs or how they might be optimized and promoted to benefit providers or patients.

The organizational structures of health care settings or other organizations are collectively referred to as organizational climate (Gershon et al., 2004; Lake, 2007; Litwin & Stringer, 1968; Schneider et al., 2010). Organizational climate is defined as employee perception of and experience with organizational structures (Litwin & Stringer Jr., 1968) and affect employees (Field, 1982) as well as their customers (Schneider, Parkington, & Buxton, 1980).

Organizational climate has been extensively studied among RNs. Important aspects of RN organizational climate include teamwork and collaboration with physicians (Aiken & Patrician, 2000; MacDavitt et al., 2007), autonomy in decision-making, and control over their practice (Ajeigbe et al., 2013). When RN organizational climate is favorable, job satisfaction and employee retention increase, and occupational safety improves (Aiken et al., 2012; Kutney-Lee et al., 2015). Furthermore, optimal RN organizational climate has been associated with better quality of patient care and patient outcomes (Aiken, Sloane et al., 2011; Needleman et al., 2011; Patrician et al., 2011).

Organizational climate has also been studied among primary care NPs and encompasses intra-professional relations between NPs and physicians, NP visibility within organizations, and NP autonomy and support for their practice (Poghosyan, Nannini, Finkelstein et al., 2013). When NP organizational climate is optimal, job satisfaction increases and intent to leave decreases, while quality patient outcomes are promoted, healthcare costs decrease, and access to care increases (Poghosyan & Aiken, 2015; Poghosyan et al., 2015).

Whereas organizational climate has been an important concept of study among RNs and primary care NPs because it impacts providers and patients, to date no study has investigated CRNA organizational climate or how it may affect CRNA practice or patient outcomes. One of

the contributing issues to this lack of evidence is the absence of reliable and valid tools to measure CRNA organizational climate.

### **Preliminary Work**

In past work, we have adapted a survey tool to measure CRNA organizational climate. The details of the adaptations are summarized next and can be found in Chapter 3 (Boyd & Poghosyan, (in press)-b). The NP-PCOCQ, which is a valid instrument capable of measuring organizational climate for primary care NPs (Poghosyan, Nannini, Finkelstein et al., 2013), was selected as the best available survey tool to fit for adaptation to CRNAs. The NP-PCOCQ went through technical and grammatical evaluation in addition to content validity testing and was named the CRNA-OCQ (Boyd & Poghosyan, (in press)-b). The CRNA-OCQ's content validity was established with six CRNA experts who agreed that the CRNA-OCQ is content-valid and is capable of measuring CRNA organizational climate and nothing else. Also, the tool was pilot tested with 30 CRNAs from New York State and results demonstrated acceptable internal consistency reliability of its subscales (with respective Cronbach's alphas): CRNA-anesthesiologist relations (.753), CRNA-physician relations (.833), CRNA-administration relations (.895), Independent practice (.830), Support for CRNA practice (.683), and Professional visibility (.772) (Boyd & Poghosyan, (in press)-b). While our prior work demonstrates that CRNA organizational climate can be measured with six subscales and the CRNA-OCQ has content validity and internal consistency reliability, further testing of the 35-item tool is necessary before using it in large-scale surveys of CRNAs.

## **Objectives**

This study's objective is to conduct psychometric testing of the CRNA-OCQ to determine its factorial structure, the respective items on each factor, and the internal consistency reliability of its subscales.

## **Method**

The Columbia University Medical Center's institutional review board approved the study prior to data collection. An email was sent to all CRNA members of a single state's professional association through their professional management company inviting participation in the study. The email invitation contained a description of the study including the purpose of the study, consent for participation, and an anonymous link to the web-based survey developed in Qualtrics research suite (Qualtrics, 2015). A modified Dillman technique was used to recruit participants, with email reminders to participate being sent at weeks two, three, and four (Dillman, 1978). No personally identifying information was collected, including Internet Provider addresses, ensuring complete anonymity of responses.

## **Sample**

The 3266 active CRNA members of the Texas Association of Nurse Anesthetists (TxANA) were recruited to participate and were emailed the invitation to participate in the study. Eligible CRNAs included being TxANA members, and being clinically practicing CRNAs in Texas. Only eligible CRNAs could proceed to the full survey by answering "yes" to the question "Are you a clinically practicing CRNA?"

## **Procedures**

Participants were asked to respond to the 35-item CRNA-OCQ by indicating the extent to which they agreed that the items were present in their primary practice setting. They were to indicate their degree of agreement on a four point Likert scale with 1 = Strongly disagree, 2 = Disagree, 3 = Agree, or 4 = Strongly agree. Participants also completed demographic questions regarding sex, age, race, employment structure, and education level. Participants were encouraged to answer all questions on the survey. All data were exported from the web-based survey and were imported into IBM SPSS version 23 (IBM Corp., 2015) for analysis.

The accuracy of data was checked through conducting univariate analysis on all variables. Descriptive statistics were run on collected data. Data were screened for missing values, errors, and outliers. Where missing data were identified, patterns of missing data were analyzed. Respondents were dropped from the analysis if they had more than 10% of data missing (DeVellis, 2003). Normality and kurtosis of CRNA-OCQ data were assessed through inspection of histograms, normality plots, and Kolmogorov-Smirnov tests of normality.

## **Factor Analysis**

Exploratory factor analysis (EFA) was conducted using Tabachnick & Fidell recommendations (Tabachnick & Fidell, 2013). For all EFA runs, we used maximum likelihood extraction to estimate population values for factor loadings and promax rotation to allow correlation among the factors (Tabachnick & Fidell, 2013). Missing data were excluded pairwise in analyses. We experimented with four approaches in running the EFA. First, we allowed factors to emerge based on Eigenvalues  $> 1$ . Next, we pre-selected the number of factors to be extracted at six factors, corresponding to each conceptual domain of organizational climate identified in the pilot testing of the CRNA-OCQ (Boyd & Poghosyan, (in press)-b).

Then, we pre-selected the number of factors to be extracted at five factors, since five factors were identified in the pilot testing of the original instrument selected for adaptation. Finally, we pre-selected the number of factors to be extracted at four factors, since four factors were identified in the final version of the original instrument selected for adaptation.

For the best factor solution, items were considered for removal if inter-item correlations were out of the .3 - .7 range. In addition, low-loading items ( $< .35$  as a highest factor loading) or cross-loading items ( $< .2$  between highest and lowest factor loadings on two or more factors) were considered for removal. Following the removal of an item, the EFA was re-run. Once a clearly interpretable factor structure was identified, adequacy of the EFA was assessed, factors were named, and internal consistency reliabilities were computed.

## **Results**

Two hundred eighty-one clinically practicing CRNAs from Texas participated in the study. Our sample was satisfactory, as it meets recommendations of ten subjects per item (Nunnally & Bernstein, 1994). Response rate was not possible to determine because CRNA members may not have had an active email address on file, or the email could have been filtered by spam software. Of those that participated, almost half were female (52%), more than half were  $\geq 50$  years old (51.6%), and just over 40% had 20 or more years experience as a CRNA. A large majority of the participants worked in a hospital setting (77.4%), more than 94% were supervised by an anesthesiologist, and nearly 85% were educated at the master's degree or beyond (see Table 1).

Univariate statistics for CRNA-OCQ items showed that all responses were within range (1 – 4). One respondent had  $> 10\%$  missing data and was dropped from the analysis. One respondent did not answer the question “Are you a clinically practicing CRNA?” so this

respondent's data were dropped from the analysis, leaving 279 respondents. No patterns were identified for missing data and no outliers were found on the CRNA-OCQ items. Skewness and kurtosis were found on most CRNA-OCQ items, with  $-0.77 > \text{Skewness} < 0.77$ , and  $-1.57 > \text{kurtosis} < 1.57$  (see Table 2). However, because neither skewness nor kurtosis were extreme ( $> 2$ ) and due to our sample size ( $> 200$ ), neither impacted our analysis (Tabachnick & Fidell, 2013; Waternaux, 1976).

Three of our four approaches in EFA using maximum likelihood extraction and promax rotation produced uninterpretable factor structures. The first approach used Eigenvalues  $> 1$  which produced a three-factor structure. The second approach pre-specified six factors to be extracted. The third approach pre-specified five factors to be extracted. However, when we pre-specified the number of factors to be extracted at four, the four-factor solution was interpretable and was determined to be the best factor solution. Rationale included that most of the item loadings on respective factors were acceptable ( $> .35$ ), few items cross-loaded on two or more factors, and the four-factor solution was conceptually consistent with the number of factors on the adapted instrument. The four factors were named: CRNA-administration relations, CRNA-physician relations, Independent practice and support, and Professional visibility, which closely align with subscale names of the adapted instrument.

Of the original 35 items on the CRNA-OCQ, three items were removed for lack of adequate correlation with other items. Additionally, three items were removed because they cross-loaded on two or more factors. The resulting 29-item, four-factor solution's Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .939, showing that the data were well suited for EFA. Bartlett's test of sphericity was significant: approximate Chi-Square 4836.05, DF 406, Sig .000, which we expected based upon our sample size. Initial communalities for all items

were  $> .3$ , while extraction communalities were  $< .3$  for only two items. Percent total cumulative variance explained by the 4-factor solution was 60.04. The factor matrix goodness-of-fit test was non-significant: Chi-Square 537.02, DF 296, Sig .000, supporting the four-factor solution.

Factor 1 (CRNA-Administration Relations) had a Cronbach's alpha of .925. Factor loadings (with average factor loading) ranged from .321 - .972 (.638). Corrected item-total correlations ranged from .388 - .816. Removing two items could make slight improvements in Cronbach's alpha. Removal of item "There are enough ancillary staff to help with patient care" would improve Cronbach's alpha to .929. Alternatively, removal of item "In my organization, enough time is allotted to perform patient care" would improve Cronbach's alpha to .926. However, both items were retained since both contribute positively to the factor, leaving thirteen items in the subscale (see Table 3).

Factor 2, CRNA- physician relations, had a Cronbach's alpha of .882. Factor loadings ranged from .472 - .873 (.659). Corrected item-total correlations ranged from .531 - .776. Removal of items did not improve Cronbach's alpha of the subscale; thus, all items were retained, leaving seven items in the final subscale (see Table 3).

Factor 3, Independent practice and support, had a Cronbach's alpha of .875. Factor loadings ranged from .363 - .977 (.707). Corrected item-total correlations ranged from .550 - .808. Removal of two items could make slight improvements to Cronbach's alpha. Removal of item "I independently make patient care decisions within my area of competency without input from a physician" would improve Cronbach's alpha to .881. Alternatively, removal of item "In my organization, I apply all of my skill and knowledge to provide care" would improve Cronbach's alpha to .878. Removal of these items would result in a loss of essence of subscale



descriptors; therefore, both items were retained at this point in the adaptation, leaving five items in the subscale (see Table 3).

Factor 4, Professional visibility, had a Cronbach's alpha of .760. Factor loadings ranged from .346 - .662 (.551). Corrected item-total correlations ranged from .477 - .645. Removal of items did not improve Cronbach's alpha; thus, all items were retained, leaving four items in the subscale (see Table 3).

### **Discussion**

In this study, we investigated the factorial structure of a newly developed survey tool, the CRNA-OCQ, to measure organizational climate for CRNAs. We used various approaches in EFA to assess the factorial structure of the tool. We both allowed factors to emerge from the data as well we specified several factor structures based upon theory and preliminary work. Our iterative EFA process allowed us to select the CRNA-OCQ's four-factor structure that best represents CRNA organizational climate.

The CRNA-OCQ's four-factor structure was clearly interpretable, with nearly all items loading on only one factor. One exception was the cross-loading item "CRNAs are represented on important committees in my organization." Despite the lesser factor loading on Factor 4 (Professional visibility) than on Factor 1 (CRNA-administration relations), the item was retained on Factor 4 because it conceptually fit with the items on this subscale. However, it is possible that in organizations where CRNAs have favorable working relationships with administrators, they are more likely to be involved in organizational committees. This finding should be studied in future work.

Marginal improvements to the CRNA-OCQ could be made by removal of additional items that diminish average factor loadings below the recommended .7 (Tabachnick & Fidell,

2013). For example, the item “There are enough ancillary staff to help with patient care” was retained in Factor 1, CRNA-administration relations, despite its relatively low factor loading. Nevertheless, its retention provides a more robust description of relations between CRNAs and administrations and presents interesting opportunity for future investigation. Namely, in organizations where CRNA-administration relations are optimal there may not be enough ancillary staff to help with patient care. Inadequate ancillary staff could potentially negatively impact quality of care, which is important to healthcare systems and patients.

Removing items that would slightly improve internal consistency reliability in two of its four subscales could also make negligible improvements to the CRNA-OCQ. However, by removing items that narrowly improve Cronbach’s alphas, we lose some subscale descriptors and hence conclusions that might be drawn from them. This information could be valuable to healthcare systems that wish to identify sub-optimal areas of CRNA climate where improvements could be made.

The 29-item CRNA-OCQ is the first validated tool capable of measuring CRNA organizational climate that can be used in future research to provide valuable insight into organizational influence on CRNA care provision. Additional research should be conducted to confirm the factorial structure of the CRNA-OCQ utilizing a different, sufficiently large sample of CRNAs to provide further evidence about its construct validity. Once established, the CRNA-OCQ could be used in future research to measure CRNA climate at the organizational level, and across institutions, to identify areas where improved climate would contribute to improved provider and patient outcomes. This information is important since provider outcomes like job dissatisfaction and attrition may decrease quality of care, increase healthcare costs, and decrease

access to anesthesia care for patients. Patients, providers, and healthcare systems where CRNAs practice would benefit from such research.

The study had several limitations. First, only CRNA members from the TxANA, a state-based advocacy organization, participated in the study. Exclusion of non-members from participation may have limited the range of perceptions regarding CRNA organizational climate, since non-member perceptions may have differed from member perceptions. Second, all responses were self-reported, so we have no way to know if respondents were being truthful in answering items on the CRNA-OCQ. Third, our iterative EFA process and process of item removal may have missed a sequence of item deletions that could have resulted in a more psychometrically sound solution.

Table 1

*Field Testing Participant Demographics*

Demographics	n (%)
Sex	
Female	145 (52.0)
Male	134 (48.0)
Age	
< 30	8 (2.9)
30 - 39	46 (16.5)
40 - 49	81 (29.0)
50 - 59	81 (29.0)
60 and older	63 (22.6)
Race	
White	231 (83.1)
Asian or Pacific Islander	12 (4.3)
Black or African American	12 (4.3)
Hispanic	20 (7.2)
American Indian or Alaska Native	2 (0.7)
Other	1 (0.4)
Years of CRNA experience	
< 5	34 (12.2)
5 - 9	57 (20.4)
10 - 19	75 (26.9)
20 - 29	52 (18.6)
30 - 39	52 (18.6)
40 or more	9 (3.2)
Current employment structure	
Employee of a hospital	54 (19.4)
Employee of a group	121 (43.4)
Independent contractor	72 (25.8)
Owner/Partner	9 (3.2)
Military/Government/VA	6 (2.2)
Employee in other setting	11 (3.9)
Other employment arrangement	6 (2.2)
Current practice setting	
Hospital	217 (77.8)
Ambulatory surgical center	54 (19.4)
Other	8 (2.9)
Physician supervision of CRNA practice	
Yes	198 (71.0)
No	81 (29.0)

Demographics	n (%)
Type of physician supervising CRNA practice	
Anesthesiologist	187 (94.4)
Surgeon	8 (4.0)
Other	3 (1.5)
Highest education level	
Diploma/Certificate in anesthesia	25 (9.0)
BS in nursing or other field	17 (6.1)
MS in nursing or other field	182 (65.2)
DNP, PhD, JD or other doctorate	55 (19.7)

Table 2

*Descriptive Statistics for CRNA-OCQ Items*

Question number on survey	CRNA-OCQ items	Mean (SD)	Skewness (SD)	Kurtosis (SD)
1	Anesthesiologists support my patient care decisions	3.03 (0.69)	-0.81 (0.15)	1.57 (0.30)
2	In my organization, anesthesiologists and CRNAs practice as a team	2.88 (0.85)	-0.77 (0.15)	0.25 (0.30)
3	In my practice setting, I have colleagues who I can ask for help	3.39 (0.65)	-1.06 (0.15)	2.05 (0.29)
4	My organization is open to CRNA suggestions regarding new ideas about patient care	2.71 (0.79)	-0.40 (0.15)	-0.14 (0.29)
5	Physician colleagues support my patient care decisions	3.10 (0.58)	-0.34 (0.15)	1.33 (0.29)
6	Physicians ask CRNAs for patient care suggestions	2.65 (0.78)	-0.33 (0.15)	-0.19 (0.29)
7	I am valued by my physician colleagues	3.00 (0.69)	-0.52 (0.15)	0.63 (0.29)
8	In my organization, CRNAs and physicians collaborate to provide patient care	3.05 (0.65)	-0.69 (0.15)	1.59 (0.29)
9	In my organization, physician colleagues and CRNAs practice as a team	2.97 (0.68)	-0.58 (0.15)	0.88 (0.29)
10	Physicians in my practice setting value my patient care decisions	3.10 (0.64)	-0.68 (0.15)	1.76 (0.29)
11	Physicians ask CRNAs for their advice when providing patient care	2.59 (0.79)	-0.27 (0.15)	-0.32 (0.29)
12	Physicians seek CRNAs' input when providing patient care	2.67 (0.76)	-0.27 (0.15)	-0.17 (.29)
13	I feel valued by my organization	2.76 (0.85)	-0.42 (0.15)	-0.32 (0.29)
14	Administration is open to CRNA ideas to improve patient care	2.57 (0.83)	-0.23 (0.15)	-0.47 (0.29)
15	Administration takes CRNA concerns seriously	2.52 (0.85)	-0.23 (0.15)	-0.57 (0.29)
16	Administration shares information equally with CRNAs and physicians	2.11 (0.86)	0.42 (0.15)	-0.45 (0.29)

Question number on survey	CRNA-OCQ items	Mean (SD)	Skewness (SD)	Kurtosis (SD)
17	Administration is well informed of the skills and competencies of CRNAs	2.61 (0.87)	-0.20 (0.15)	-0.59 (0.29)
18	Administration treats CRNAs and physicians equally	1.85 (0.77)	0.64 (0.15)	0.02 (0.29)
19	Administration makes efforts to improve working conditions for CRNAs	2.37 (0.79)	-0.16 (0.15)	-0.57 (0.29)
20	In my organization, there is ongoing communication between CRNAs and administration	2.30 (0.79)	-0.01 (0.15)	-0.56 (0.29)
21	In my organization, I apply all my knowledge and skills to provide patient care	3.09 (0.87)	-0.67 (0.15)	-0.31 (0.29)
22	My organization does not restrict my abilities to practice to the full extent of my state's regulatory scope of practice	2.61 (1.03)	-0.12 (0.15)	-1.12 (0.29)
23	In my organization, I can provide patient care to the full extent of my state's regulatory scope of practice	2.67 (1.04)	-0.15 (0.15)	-1.16 (0.29)
24	My organization fosters an environment where I can practice autonomously	2.74 (1.01)	-0.34 (0.15)	-0.95 (0.29)
25	I independently make patient care decisions within my area of competency without input from a physician	3.14 (0.78)	-0.76 (0.15)	0.40 (0.29)
26	CRNAs are an integral part of the organization	3.25 (0.78)	-0.97 (0.15)	0.72 (0.29)
27	In my practice setting, I have enough resources to provide patient care	3.20 (0.59)	-0.29 (0.15)	0.65 (0.29)
28	There are enough ancillary staff to help with patient care	2.82 (0.74)	-0.51 (0.15)	0.31 (0.29)
29	In my organization, enough time is allotted to perform patient care	2.91 (0.69)	-0.47 (0.15)	0.50 (0.29)
30	In my organization the CRNA role is well understood	2.75 (0.82)	-0.41 (0.15)	-0.24 (0.29)
31	CRNAs are represented on important committees in my organization	2.07 (0.86)	0.34 (0.15)	-0.69 (.029)
32	Staff members have an understanding about CRNA roles in the organization	2.84 (0.76)	-0.54 (0.15)	0.24 (0.29)

Question number on survey	CRNA-OCQ items	Mean (SD)	Skewness (SD)	Kurtosis (SD)
33	In my organization, there is a system in place to evaluate the care that I provide	2.52 (0.80)	-0.20 (0.15)	-0.45 (0.29)
34	I regularly get feedback about my performance from my organization	2.25 (0.82)	0.14 (0.15)	-0.54 (0.29)
35	In my organization there is a system in place to reward my performance	2.05 (0.81)	0.30 (0.15)	-0.59 (0.29)



Table 3

*29-Item CRNA-OCQ*

CRNA-OCQ factors (with Cronbach's alphas) and respective items			Factor loading	Corrected item-total correlation	Cronbach's alpha if item deleted
Factor 1: CRNA-administration relations (.925)					
1	15 <sup>a</sup>	Administration takes CRNA concerns seriously	.972	.816	.914
2	14	Administration is open to CRNA ideas to improve patient care	.882	.749	.917
3	13	I feel valued by my organization	.795	.729	.917
4	19	Administration makes efforts to improve working conditions for CRNAs	.746	.705	.918
5	4	My organization is open to CRNA suggestions regarding new ideas about patient care	.700	.710	.918
6	17	Administration is well informed of the skills and competencies of CRNAs	.673	.698	.919
7	20	In my organization, there is ongoing communication between CRNAs and administration	.668	.724	.918
8	30	In my organization the CRNA role is well understood	.603	.674	.919
9	16	Administration shares information equally with CRNAs and physicians	.565	.704	.918
10	18	Administration treats CRNAs and physicians equally	.549	.668	.920
11	32	Staff members have an understanding about CRNA roles in the organization	.483	.638	.921
12	28	There are enough ancillary staff to help with patient care	.333	.388	.929
13	29	In my organization, enough time is allotted to perform patient care	.321	.482	.926

CRNA-OCQ factors (with Cronbach's alphas) and respective items			Factor loading	Corrected item-total correlation	Cronbach's alpha if item deleted
Factor 2: CRNA-physician relations (.882)					
1	11	Physicians ask CRNAs for their advice when providing patient care	.873	.745	.854
2	6	Physicians ask CRNAs for patient care suggestions	.853	.746	.854
3	12	Physicians seek CRNAs' input when providing patient care	.829	.776	.850
4	10	Physicians in my practice setting value my patient care decisions	.569	.662	.866
5	9	In my organization, physician colleagues and CRNAs practice as a team	.510	.540	.880
6	7	I am valued by my physician colleagues	.508	.681	.863
7	8	In my organization, CRNAs and physicians collaborate to provide patient care	.472	.531	.881
Factor 3: Independent practice and support (.875)					
1	22	My organization does not restrict my abilities to practice to the full extent of my state's regulatory scope of practice	.977	.802	.823
2	23	In my organization, I can provide patient care to the full extent of my state's regulatory scope of practice	.947	.808	.821
3	24	My organization fosters an environment where I can practice autonomously	.713	.801	.823
4	21	In my organization, I apply all my knowledge and skills to provide patient care	.536	.571	.878
5	25	I independently make patient care decisions within my area of competency without input from a physician	.363	.550	.881
Factor 4: Professional visibility (.760)					
1	33	In my organization, there is a system in place to evaluate the care that I provide	.662	.545	.710

CRNA-OCQ factors (with Cronbach's alphas) and respective items			Factor loading	Corrected item-total correlation	Cronbach's alpha if item deleted
2	34	I regularly get feedback about my performance from my organization	.625	.645	.655
3	35	In my organization there is a system in place to reward my performance	.572	.571	.696
4	31	CRNAs are represented on important committees in my organization	.346	.477	.748

## **Chapter 5: Conclusion**

In this chapter, results from the three studies are discussed and synthesized to address the dissertation aims. In addition, policy, practice, and research recommendations are presented. Lastly, the strengths and limitations of the dissertation are discussed before the conclusion.

## **Discussion of Findings**

This dissertation consists of three unique studies in which CRNA organizational climate was investigated and measured. Aim one of the dissertation was achieved by conducting a systematic review of evidence to investigate CRNA working conditions and outcomes. Data were abstracted from 13 studies and were synthesized. Results uncovered valuable evidence about CRNA working conditions and outcomes and identified significant challenges that CRNAs face within their employment settings. The review found poor working conditions for CRNAs in areas of intra-professional work relationships, overlap in professional roles leading to conflict, restrictions on their practice, and inability of CRNAs to practice autonomously. In addition, the review found poor CRNA outcomes that included incivility, burnout, and workplace aggression. Results of the systematic review, together with theoretical and empirical underpinnings regarding organizational climate, served as the foundation upon which CRNA organizational climate domains were identified.

Aim two of the dissertation was achieved by selecting and adapting an instrument to measure CRNA organizational climate. A review of valid tools was assessed, and the most relevant tool was selected for adaptation to CRNAs. A panel of six expert CRNAs from New York State participated in content validity testing and determined that the CRNA-OCQ, was content-valid. The experts agreed that the CRNA-OCQ measured CRNA organizational climate and nothing else. The newly developed CRNA-OCQ was pilot-tested with 30 clinically practicing CRNAs from New York State to determine internal consistency reliability. Results from pilot testing determined that the newly developed CRNA-OCQ reliably measured CRNA organizational climate with six subscales: CRNA-anesthesiologists relations, CRNA-physician

relations, CRNA-administration relations, Independent practice, Support for CRNA practice, and Professional visibility.

Aim three of the dissertation was achieved by conducting further psychometric testing of the newly developed CRNA-OCQ. The study findings provided additional evidence of the tool's factorial structure and respective items, and helped to refine and finalize the CRNA-OCQ. A sample of 279 TxANA CRNAs participated in the study. Through psychometric testing, the tool's 29-item four-factor structure was determined and internal consistency reliability of its subscales was verified. The CRNA-OCQ measures CRNA organizational climate with four subscales: CRNA-administration relations, CRNA-physician relations, Independent practice and support, and Professional visibility. The CRNA-OCQ is the first instrument that can reliably measure CRNA organizational climate.

### **Policy, Practice, and Research Implications**

The findings of this dissertation have important policy, practice, and research implications. Results from the systematic review demonstrate that CRNAs work in challenging work environments that include the inability of CRNAs to practice autonomously. Additional challenges in their work environments include poor intra-professional collaboration and teamwork between CRNAs, physicians, and staff, and administrative issues including role overlap of CRNAs and anesthesiologists, and role confusion regarding CRNAs. When CRNAs are unable to practice autonomously and are required to implement other providers' decisions regarding patient care, CRNA job satisfaction decreases, and the quality and safety of patient care may suffer. Additional results from the systematic review suggest that when CRNAs are unable to provide care at their fullest capacity, patient access to anesthesia care may be compromised. The newly developed CRNA-OCQ is the first reliable tool that measures CRNA

organizational climate, which includes measurement of CRNA autonomy and scope of practice. Use of the CRNA-OCQ by organizations where CRNAs practice can produce valuable evidence regarding underutilization of CRNAs in institutions where their scope is restricted. Once underutilization of CRNAs can be identified, institutional policies should change to maximize CRNA contributions to care to improve provider and patient outcomes. Provider outcomes may include increased job satisfaction or decreased intent to leave, and patient outcomes may include improved patient safety or increased access to anesthesia care provided by CRNAs. The CRNA-OCQ should be used in future research to determine specific impacts of maximization of CRNA contributions to care on access to anesthesia services. Similar research among primary care NPs demonstrates that when primary care NPs function at their full capacity, mobility of providers is promoted, and access to NP primary care services among vulnerable, underserved patients in the U.S. is increased (Esperat, Hanson-Thurton, Richardson, Debisette, & Rupinta, 2012).

Results from the systematic review also show that CRNAs experience challenges in their work environments regarding intra-professional collaboration and teamwork between CRNAs and physicians. These challenges include conflict, ineffective collaboration, and role overload. Whereas systematic review results also show that beneficial collaboration, effective teamwork, and mutual respect between CRNAs and physicians were found to be important in providing safe care. Use of the CRNA-OCQ by organizations where CRNAs practice can produce evidence regarding problematic aspects of intra-professional collaboration and teamwork between CRNAs and physicians. Once identified, institutional policies should be developed and implemented to create favorable CRNA practice environments, which include supportive intra-professional relations between CRNAs and physicians, to positively impact providers, healthcare systems, and patients. The CRNA-OCQ should be used in future research to measure CRNA-physician

relations, which include intra-professional collaboration and teamwork, after policy implementation that optimizes intra-professional relations to determine the specific benefits to providers and patients. This research is important since similar research conducted in primary care settings demonstrates that when practice environments are favorable, NP job satisfaction increases and intent to leave decreases, maintaining critical access to primary care provided by NPs (Poghosyan et al., 2015).

Additionally, results of the systematic review show that CRNAs work in challenging work environments that include administrative workload pressures, role overlap, and role confusion. The CRNA-OCQ measures these aspects through its CRNA-administration relations subscale. Use of the CRNA-OCQ by organizations where CRNAs practice can produce valuable evidence regarding sub-optimal CRNA-administration relations, which include a lack of administrative commitment to improving working conditions of CRNAs, a lack of CRNA role clarity throughout the institution, or unequal administrative sharing of information with CRNAs and physicians. Once suboptimal aspects of CRNA-administration relations can be identified and measured, policies should be created and implemented to improve CRNA-administration relations to positively impact CRNAs, institutions where CRNAs practice, and patients who receive care. The CRNA-OCQ should be used in future research to demonstrate how optimization of CRNA-administration relations would specifically impact CRNAs and patients for whom they provide care. This information is important, since similar research by Aiken et al. (2012) demonstrates that improved RN work environments, which include improved administrative support for RN practice, positively influence RN job satisfaction and RN job retention. Results also show that improved RN work environments positively impact quality of care and patient satisfaction (Aiken et al., 2012).



Because CRNAs represent a significant portion of the anesthesia workforce in the U.S., and research demonstrates that CRNAs provide safe, cost-effective care that increases access to anesthesia services, state-level scope of practice for CRNAs should mirror their education and training. Furthermore, organizational influence on CRNA care provision should allow for CRNAs to practice to their full capacity. Use of the CRNA-OCQ provides a systematic way for understanding and measuring organizational influence on CRNA care provision.

### **Planned Future Research**

Although the CRNA-OCQ is the first CRNA-specific survey tool that reliably measures CRNA organizational climate, more research is needed to confirm its factorial structure and produce evidence about its construct validity before widespread use of the tool is recommended. Therefore, a study is planned that will utilize a large sample (n=361) of NYSANA CRNAs to confirm the factorial structure of the CRNA-OCQ using confirmatory factor analysis. The data is collected, and the research is ongoing. Results from this study will confirm if the CRNA-OCQ is able to measure CRNA organizational climate among a different sample of CRNAs. In addition, results will determine the relationship between CRNA organizational climate, CRNA job satisfaction, and CRNA intent to leave a job. A second planned study, which is underway, will use the CRNA-OCQ to compare aspects of CRNA-administration relations of 279 TxANA CRNAs to aspects of CRNA-administration relations of 361 NYSANA CRNAs. Results of this study will demonstrate the similarities and differences of CRNA-administration relations between the two provider populations. In addition, results will produce evidence about challenging administrative aspects of Texas and New York State CRNA work environments where organizations may focus improvement efforts.

## **Strengths and Limitations**

The dissertation study has several strengths. First, the dissertation contributes new knowledge regarding CRNA organizational climate to nursing science, as this is the first study that investigates and reliably measures CRNA organizational climate. Second, the several methodological approaches used in the three studies were guided by empirical evidence and were implemented to ensure academic rigor. Third, a valid tool with strong psychometric properties was adapted to measure CRNA organizational climate. Fourth, data from a large sample were collected to finalize and refine the CRNA-OCQ and determine subscale reliability. Fifth, this work is timely, as policy organizations like the Academy of Medicine (former Institute of Medicine) and the Veteran's Affairs Medical Center are recommending full practice authority for CRNAs.

This dissertation has several limitations. First, the review of evidence regarding CRNA working conditions and outcomes was limited to peer reviewed, published research in the U.S. from 2001 and beyond. Published research prior to 2001 was missed by our search strategy, but could have aided in CRNA organizational climate domain identification. Similarly, published research from other countries regarding CRNA working conditions was also missed by our search strategy, but could have aided in climate domain identification. In addition, studies may have been missed because of our key word usage or process of article elimination, which could have influenced subsequent work. Second, only CRNA members from state-based advocacy organizations participated in studies two and three. Exclusion of non-members may have limited the range of perceptions regarding CRNA organizational climate, since non-member perceptions may have differed from member perceptions. A third limitation may have occurred with item removal during psychometric testing. Despite attempts to utilize best science to make

elimination decisions, a different order of item elimination could exist that would have produced a more parsimonious tool with stronger psychometric properties.

### **Conclusion**

This dissertation's three aims were achieved through conducting three studies. Results from the studies identified salient CRNA working conditions, which served as the underpinnings in identifying the domains of CRNA organizational climate. The four subscales on the finalized CRNA-OCQ, which can reliably measure CRNA organizational climate, represent those domains. The CRNA-OCQ is the first tool that is capable of measuring CRNA organizational climate. However, before using the CRNA-OCQ in large-scale studies to measure CRNA organizational climate, further confirmation of the tool's factorial structure is warranted. Once confirmed, widespread use of the CRNA-OCQ by organizations that employ CRNAs has the potential to identify deficient CRNA climates within and across institutions, healthcare systems, and geographical regions. If deficient CRNA climates can be identified, policies could be designed and implemented that would optimize CRNA climate. Optimization of CRNA climate, which includes maximization of CRNA contributions to anesthesia care, would benefit providers, organizations, health care systems, other stakeholders, and patients. These benefits may include decreasing CRNA attrition, decreasing costs, improving quality, improving access to care, and potentially in ways that are unable to be conceived at this time. Furthermore, this dissertation is laying the foundation for future research regarding CRNA organizational climate. Future CRNA organizational climate research has the ability to positively impact the practice, policy, and research regarding CRNA care for years to come.

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## **Appendix A: Systematic Review Full Search Strategy and Article Selection**

Ovid/Medline:

- 1) Nurse anesthetists AND Job satisfaction
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 33, Selected: 3
  - c. Hyman, Pearson, Horton
- 2) Nurse anesthetists AND Physician-Nurse Relations
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 26, Selected: 6
  - c. Dulisse, Jones, Taylor, Jenkins, Alves, Jameson
- 3) Interpersonal relations AND (Nurse anesthetists AND Physicians)
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 1, Selected: 0
- 4) Organizational Culture AND nurse anesthetists
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 6, Selected: 1
  - c. Elmblad
- 5) Nurse anesthetists AND Professional autonomy
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 76, Selected: 5
  - c. Taylor, Pearson, Alves, Penn, Jameson
  - d. Exclusion: Legal cases, non-research

6) Practice environment [Nursing staff, Hospital/Attitude of personnel/Job satisfaction, U.S. Health facility environment/Workplace/Questionnaires] OR Professional practice AND Nurse anesthetists

- a. Inclusion criteria: US Studies, 2001-2015
- b. Scanned: 322, Selected: 8
- c. Elmlad, Sakellaropoulos, Radzvin, Chipas, Hyman, Jones, Taylor, Horton
- d. Excluded: Students, non-research

7) Care environment: “Delivery of Healthcare” AND Nurse Anesthetists

- a. Inclusion criteria: US Studies, 2001-2015
- b. Scanned: 17, Selected: 0

8) Work environment AND Nurse anesthetists

- a. Inclusion criteria: US Studies, 2001-2015
- b. Scanned: 12, Selected: 4
- c. Elmlad, Ford, Sakellaropoulos, Perry

9) Stress AND Nurse anesthetists

- a. Inclusion criteria: US Studies, 2001-2015
- b. Scanned: 15, Selected: 2
- c. Elmlad, Perry

PubMed:

1) Nurse anesthetists AND (Job satisfaction or Professional burnout)

- a. Inclusion criteria: US Studies, 2001-2015
- b. Scanned: 52, Selected: 6
- c. Elmlad, Chipas, Radzvin, Hyman, Jones, Alves

- 2) Nurse anesthetists AND Physician-nurse relations
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 42, Selected: 6
  - c. Dulisse, Jones, Taylor, Jenkins, Makaray, Alves
- 3) (Nurse anesthetists AND Physicians) AND Interprofessional relations
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 23, Selected: 4
  - c. Elmblad, Dulisse, Taylor, Makaray
- 4) Nurse anesthetists AND Organizational culture
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 18, Selected: 2
  - c. Elmblad, Makaray
- 5) Nurse anesthetists AND Professional autonomy
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 83, Selected: 4
  - c. Pearson, Taylor, Alves, Jameson
- 6) Nurse anesthetists AND Practice environment
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 43, Selected: 4
  - c. Ford, Taylor, Alves, Jameson
- 7) Nurse anesthetists AND Care environment
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 73, Selected: 3



- c. Ford, Sakellaropoulos, Perry
- 8) Nurse anesthetists AND Work environment
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 40, Selected: 4
  - c. Elmblad, Ford, Sakellaropoulos, Perry
- 9) Nurse anesthetists AND Stress
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 62, Selected: 7
  - c. Elmblad, Sakellaropoulos, Chipas, Radzvin, Jones, Alves, Perry

SCOPUS:

- 1) “Nurse anesthetists” AND “Job satisfaction”
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 42, Selected: 4
  - c. Chipas (2011), Hyman, Jones, Horton
- 2) “Nurse anesthetists” AND “Physician-nurse relations”
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 9, Selected: 8
  - c. Dulisse, Jones, Taylor, Jenkins, Makaray, Alves, Jameson
- 3) (“Nurse anesthetists” AND “Physicians”) AND “Interprofessional relations”
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 20, Selected: 1
  - c. Elmblad

- 4) “Organizational culture” AND “Nurse anesthetist”
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 10, Selected: 2
  - c. Elmblad, Makaray
- 5) “Professional autonomy” AND “Nurse anesthetists”
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 84, Selected: 2
  - c. Taylor, Pearson
- 6) “Nurse anesthetists” AND “Practice environment”
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 3, Selected: 0
- 7) “Nurse anesthetists” AND “Care environment”
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 8, Selected: 0
- 8) “Nurse anesthetists” AND “Work environment”
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 25, Selected: 2
  - c. Ford, Sakellaropoulos
- 9) “Stress” AND “Nurse anesthetists”
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 67, Selected: 6
  - c. Elmblad, Sakellaropoulos, Chipas (2011), Jones, Alves, Perry

EBSCO/CINAHL:

- 1) Nurse anesthetist\* AND Job satisfaction
  - a. Inclusion criteria: US Studies, 2001-2015
  - b. Scanned: 28, Selected: 4
  - c. Chipas (2011), Pearson, Hyman
- 2) Physician AND Nurse relations AND Nurse anesthetist\*
  - a. Inclusion criteria: US Studies, 2001-2015, English, peer reviewed
  - b. Scanned: 27, Selected: 5
  - c. Taylor, Jones, Alves, Jenkins, Kaplan
- 3) Nurse anesthetist\* AND Physician\* AND Interprofessional relation\*
  - a. Inclusion criteria: US Studies, 2001-2015, English, peer reviewed
  - b. Scanned: 7, Selected: 0
- 4) Nurse anesthetist\* AND Organizational culture
  - a. Inclusion criteria: US Studies, 2001-2015, English, peer reviewed
  - b. Scanned: 6, Selected: 0
- 5) Nurse anesthetist\* AND Professional autonomy
  - a. Inclusion criteria: US Studies, 2001-2015, English, peer reviewed
  - b. Scanned: 11, Selected: 1
  - c. Pearson
- 6) Nurse anesthetist\* AND Practice environment
  - a. Inclusion criteria: US Studies, 2001-2015, English, peer reviewed
  - b. Scanned: 2, Selected: 0
- 7) Nurse anesthetist\* AND Care environment

- a. Inclusion criteria: US Studies, 2001-2015, English, peer reviewed
  - b. Scanned: 7, Selected: 0
- 8) Nurse anesthetist\* AND Work environment
- a. Inclusion criteria: US Studies, 2001-2015, English, peer reviewed
  - b. Scanned: 16, Selected: 3
  - c. Elmblad, Ford, Sakellaropoulos
- 9) Nurse anesthetist\* AND Stress
- a. Inclusion criteria: US Studies, 2001-2015, English, peer reviewed
  - b. Scanned: 36, Selected: 6
  - c. Radzvin, Chipas (2011), Alves, Perry, Sakellaropoulos, Jones

Total search results combined: 1352

Screened on basis of title and abstract: 113

Remained after duplicates removed: 19:

Alves

Chipas (2011)

Chipas (2012)

Dulisse

Elmblad

Ford

Horton

Hyman

Jameson

Jenkins

Jones

Kaplan

Makaray

Pearson

Penn

Perry

Radzvin

Sakellaropoulos

Taylor

Article abstracts screened: 19

4 excluded:

1 non-research (Horton)

3 Off topic:

1 Student focused (Chipas 2012)

1 Patient outcome focused (Dulisse)

1 Non-CRNA focused (Ford)- Description of anesthesia support personnel  
from the perspective of the CRNA

Full text review: 15

1 Excluded: Off-topic (Penn)- Assessed the degree of involvement of CRNAs in airway management and trauma stabilization in rural hospitals

1 Excluded: Not relevant (Pearson)- Measured relative deprivation in active duty CRNAs

Included in systematic review: 13:

Alves

Chipas (2011)

Elmblad

Hyman

Jameson

Jenkins

Jones

Kaplan

Makary

Perry

Radzvin

Sakellaropoulos

Taylor

## **Appendix B: Content Validity Testing**

### **Appendix B1: Email Invitation to Participate in Content Validity Testing**

The following is the email invitation to participants requesting their participation in an in-person meeting of experts to determine the content validity of CRNA-OCQ items:

Title: Investigating Certified Registered Nurse Anesthetist Organizational Climate and Its Influence on Job Satisfaction and Turnover  
IRB #AAAP8854

Dear CRNA Colleague:

You have been purposively selected as an expert in your field to participate in an important research study. The purpose of the study is to investigate the organizational climate (OC) of certified registered nurse anesthetists (CRNAs) and its impact on CRNA job satisfaction and CRNA turnover. This study is being conducted by Don Boyd, MPhil, MS, CRNA as a part of a PhD dissertation for the Columbia University School of Nursing.

OC has been described as the employee's perception of and experience within an organization's culture. OC includes the nature of interpersonal relationships, the nature of hierarchy, the nature of work, and the focus of support and rewards. You are being asked to participate in the validation of the CRNA Organizational Climate Questionnaire (CRNA-OCQ). Your participation would involve your rating the relevance of items on the CRNA-OCQ, and participating in consensus decisions that will either improve item relevance or remove items that are not relevant. Lastly, you will be asked to individually rate all questions a second time to be certain that the CRNA-OCQ contains all that it should to best represent the organizational climate of CRNAs and nothing that it should not.

Should you agree to participate, we will convene an in-person meeting at a mutually agreeable date, time, and private location. Validation of the CRNA-OCQ is expected to take 90 minutes. Response burden could occur related to the expected duration of participation. No compensation will be provided. Participation in this research is completely voluntary, and you are free to withdraw at any time without penalty. No personally identifiable information will be collected. All collected data will be securely housed on a password-protected research computer with limited access by only the researchers and authorities from Columbia University Institutional Review Board (IRB).

Please respond as immediately as possible with your intent to participate in this important research.

Thank you for your time and consideration,  
Don Boyd, MPhil, MS, CRNA  
PhD Candidate, Columbia University School of Nursing

## **Appendix B2: CRNA-OCQ for Content Validity Testing**

The following CRNA-OCQ was distributed to participants at the in-person meeting of experts to determine the content validity of CRNA-OCQ items:

Organizational climate (OC) has been described as the employee's perception of and experience within an organization's culture. OC includes the nature of interpersonal relationships, the nature of hierarchy, the nature of work, and the focus of support and rewards. You have been purposively selected to participate in the validation of the CRNA Organizational Climate Questionnaire (CRNA-OCQ). As such, you are being asked to individually judge each existing item's relevance to the OC of CRNAs. Please rate each item with:

**1 = Not relevant**

**2 = Unable to assess without significant revision**

**3 = Item is relevant and succinct (relevant but needs minor alterations)**

**4 = Item is very relevant and succinct.**

**Space is provided where you may offer revision requests that you believe will improve any item. Revision to items will be done to consensus. Items will be retained that achieve ratings of 3 or 4. Items with any rating of 1 or 2 will either be revised to consensus through a researcher-led discussion in order to achieve an item rating of 3 or 4, or be eliminated from further consideration. New items may be added based on participant discussion and consensus request for addition. These items must also achieve ratings of 3 or 4 for further consideration.**



Lastly, participants were asked to individually rate all questions a second time to be certain that the CRNA-OCQ contains all that it should to best represent the organizational climate of CRNAs and nothing that it should not.

**1) In my organization the CRNA role is well understood.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**2) I feel valued by my organization.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**3) Physicians support my patient care decisions.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**4) CRNAs are represented on important committees in my organization.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**5) CRNAs are an integral part of the organization.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**6) Physicians ask CRNAs for suggestions.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**7) In my practice setting, staff members have a good understanding about CRNA roles in the organization.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**8) In my organization, there is a system in place to evaluate my care.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**9) I feel valued by my physician colleagues.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**10) In my organization, CRNAs and physicians collaborate to provide patient care.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**11) In my organization, physicians and CRNAs practice as a team.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**12) I regularly get feedback about my performance from my organization.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**13) Physicians in my practice setting trust my patient care decisions.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**14) Physicians may ask CRNAs for their advice to provide patient care.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**15) Administration is open to CRNA ideas to improve patient care.**

1 = Not relevant

- 2 = Unable to assess without significant revision
- 3 = Item is relevant and succinct (relevant but needs minor alterations)
- 4 = Item is very relevant and succinct.

**16) Administration takes CRNA concerns seriously.**

- 1 = Not relevant
- 2 = Unable to assess without significant revision
- 3 = Item is relevant and succinct (relevant but needs minor alterations)
- 4 = Item is very relevant and succinct.

**17) Physicians seek CRNAs' input when providing patient care.**

- 1 = Not relevant
- 2 = Unable to assess without significant revision
- 3 = Item is relevant and succinct (relevant but needs minor alterations)
- 4 = Item is very relevant and succinct.

**18) I do not have to discuss every patient care detail with a physician.**

- 1 = Not relevant
- 2 = Unable to assess without significant revision
- 3 = Item is relevant and succinct (relevant but needs minor alterations)
- 4 = Item is very relevant and succinct.

**19) Administration shares information equally with CRNAs and physicians.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**20) Administration is well informed of the skills and competencies of CRNAs.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**21) In my organization, I freely apply all my knowledge and skills to provide patient care.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**22) Administration treats CRNAs and physicians equally.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**23) Administration informs CRNAs about changes taking place in the organization.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**24) Administration makes efforts to improve working conditions for CRNAs.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**25) In my organization, there is constant communication between CRNAs and administration.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**26) My organization does not restrict my abilities to practice within my scope of practice.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**27) In my organization, I can provide all patient care within my scope of practice.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**28) Physicians and CRNAs have similar support for care management (e.g. help with patient follow-up, referrals, labs, etc.).**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**29) My organization creates an environment where I can practice independently.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**30) In my practice setting, I have colleagues who I can ask for help.**

1 = Not relevant



2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**31) I independently make patient care decisions within my area of competency without input from a physician.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**32) In my practice setting, I have enough resources to provide patient care.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**33) There are enough ancillary staff to prepare my patients (e.g. height, weight, bring patient to examining room) for their visit.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

**34) During visits, I have enough scheduled time with each patient.**

1 = Not relevant

2 = Unable to assess without significant revision

3 = Item is relevant and succinct (relevant but needs minor alterations)

4 = Item is very relevant and succinct.

## **Appendix C: Pilot Testing**

### **Appendix C1: Email Invitation to Participate in Pilot Testing**

Dear NYSANA colleague:

It's Don Boyd, here, Past President of the NYSANA and current PhD Candidate at the Columbia University School of Nursing. This email serves as an invitation for you to participate in my dissertation research that will investigate our practice environment and workforce outcomes. Your participation is critical to the success of this research. Further, this research will help to inform policy and advocacy work in which the NYSANA is continuously participating.

Please help by participating today. Respondents have taken on average around 10 minutes to complete the survey. This is your anonymous link to the survey:

(Insert active link here)

Attached to this email is the formal consent form for your review.

Thank you for your time and participation.  
Don Boyd, MPhil, MS, CRNA  
PhD Candidate, Columbia University School of Nursing

## **Appendix C2: Information Sheet/Consent for Participation in Pilot Testing**

The following was the emailed information sheet/consent form for participation in the pilot study to determine internal consistency reliability of the CRNA-OCQ:

Title: Investigating Certified Registered Nurse Anesthetist Organizational Climate and Its Influence on Job Satisfaction and Turnover  
IRB #AAAP8854

Dear CRNA colleague:

You are being asked to participate in a research study through a web-based survey with the purpose of investigating the organizational climate of CRNAs and its impact on CRNA job satisfaction and CRNA turnover. This study is being conducted by Don Boyd, MPhil, MS, CRNA as a part of a PhD dissertation at the Columbia University School of Nursing.

Organizational climate has been described as shared perceptions of psychologically important aspects of the work environment that affect individuals' behavior within organizations. Results from this study will help organizations where CRNAs practice to optimize aspects of the CRNA practice environment in order to improve CRNA job satisfaction and decrease CRNA intent to leave their jobs.

You are encouraged to complete the web-based survey in its entirety. It is expected to take 20 minutes to complete. You are encouraged to respond from a private location in order to minimize the risk of others' seeing your responses. No personally identifying information will be collected. You will not directly benefit from participating in this research; however, your participation may help to optimize the CRNA practice environment, which could influence job satisfaction and decrease turnover. In accordance with AANA Foundation policy, no compensation for participation will be provided. Participation is completely voluntary, and you are free to withdraw at any time without penalty. All collected data will be securely housed on a password-protected research computer with limited access by only the researchers and authorities from Columbia University Institutional Review Board (IRB).

Any questions or concerns regarding this study should be directed to:

Don Boyd, MPhil, MS, CRNA  
Drb2102@cumc.columbia.edu  
(212) 342-3664

I encourage you to participate in this important research, and I thank you for your time in doing so. Here is your unique link to the web-based survey (insert link here).

### **Appendix C3: Reminder Email to Participate in Pilot Testing**

Dear NYSANA colleague:

It's Don Boyd, here, Past President of the NYSANA and current PhD Candidate at the Columbia University School of Nursing. Last week I sent an invitation for you to participate in my dissertation research that will investigate our practice environment and workforce outcomes. Your participation is critical to the success of this research. Further, this research will help to inform policy and advocacy work in which the NYSANA is continuously participating.

Please help by participating today. Respondents have taken on average less than 10 minutes to complete the survey. This is your anonymous link to the survey:

(Insert active link here)

Thank you,  
Don Boyd, MPhil, MS, CRNA  
PhD Candidate, Columbia University School of Nursing

## Appendix C4: CRNA-OCQ for Pilot Testing

### CRNA Organizational Climate Questionnaire for Pilot Testing

Q1.1 Demographics. Please respond to the following demographic questions.

Q1.2 What is your sex?

- Female (1)
- Male (2)

Q1.3 What is your age (in years)?

- < 30 (1)
- 30 - 39 (2)
- 40-49 (3)
- 50-59 (4)
- 60 or older (5)

Q1.4 What is your race?

- White/Caucasian (1)
- Asian or Pacific Islander (2)
- Black or African American (3)
- Hispanic (4)
- American Indian or Alaska Native (5)
- Other (6)

Q1.5 How many years of experience do you have as a CRNA?

- < 5 (1)
- 5 - 9 (2)
- 10 - 19 (3)
- 20 - 29 (4)
- 30 - 39 (5)
- 40 or more (6)

Q1.6 What is your current employment structure?

- Employee of a Hospital (1)
- Employee of a Group (2)
- Independent Contractor (3)
- Owner/Partner (4)
- Military/Government/VA (5)
- Employee in Other Setting (6)
- Other Employment Arrangement (7)

Q1.7 In what type of geographic setting do you practice?

- Urban (1)
- Rural (2)
- Other (3)

Q1.8 Does a physician supervise your practice?

- Yes (1)
- No (2)

Answer If Does a physician supervise your practice? Yes Is Selected

Q1.9 What type of physician supervises your practice?

- Anesthesiologist (1)
- Surgeon (2)
- Podiatrist/Ophthalmologist/Dentist (3)
- Other (4)

Q1.10 On average, how many hours do you work per week over the last month?

- 1 - 20 hours per week (1)
- 21 - 35 hours per week (2)
- 36 - 40 hours per week (3)
- > 40 hours per week (4)

Q1.11 What is your highest educational degree attained?

- Diploma/Certificate in Anesthesia (1)
- Baccalaureate (In nursing, and/or another field) (2)
- Masters (In nursing, and/or another field) (3)
- DNP, PhD, JD, or other Doctorate (4)

Q1.12 All things considered, are you satisfied with your job?

- Yes (1)
- No (2)

Q1.13 Do you intend to leave your current position in the next year?

- Yes (1)
- No (2)

Q2.1 Organizational climate has been described as the employee's perception of and experience within an organization's culture. Organizational climate includes the nature of interpersonal relationships, the nature of hierarchy, the nature of work, and the focus of support and rewards. You have been purposively selected to participate in the pilot testing of the CRNA Organizational Climate Questionnaire (CRNA-OCQ). You are encouraged to respond to all items in this survey.

Directions: For each item, please indicate the extent to which you agree that the following items are present in your primary practice site. Indicate your degree of agreement by selecting one option that best applies to you: 1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree

Q2.2 In my organization the CRNA role is well understood.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.3 I feel valued by my organization.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.4 Anesthesiologists support my patient care decisions.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.5 Other physician colleagues support my patient care decisions.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.6 CRNAs are represented on important committees in my organization.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)



Q2.7 CRNAs are an integral part of the organization.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.8 Physicians ask CRNAs for patient care suggestions.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.9 Staff members have an understanding about CRNA roles in the organization.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.10 In my organization, there is a system in place to evaluate the care that I provide.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.11 I am valued by my physician colleagues.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.12 In my organization, CRNAs and physicians collaborate to provide patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.13 In my organization, anesthesiologists and CRNAs practice as a team.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.14 In my organization, other physician colleagues and CRNAs practice as a team.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.15 In my organization, staff members and CRNAs practice as a team

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.16 I regularly get feedback about my performance from my organization.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.17 Physicians in my practice setting value my patient care decisions.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.18 Physicians ask CRNAs for their advice when providing patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.19 Administration is open to CRNA ideas to improve patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.20 Administration takes CRNA concerns seriously.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.21 Physicians seek CRNAs' input when providing patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.22 I have to discuss every patient care detail with an anesthesiologist.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.23 Administration shares information equally with CRNAs and physicians.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.24 Administration is well informed of the skills and competencies of CRNAs.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.25 In my organization, I apply all my knowledge and skills to provide patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.26 Administration treats CRNAs and physicians equally.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.27 Administration informs CRNAs about changes taking place in the organization.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.28 Administration makes efforts to improve working conditions for CRNAs.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.29 In my organization, there is ongoing communication between CRNAs and administration.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.30 My organization does not restrict my abilities to practice to the full extent of my state's regulatory scope of practice.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.31 In my organization, I can provide patient care to the full extent of my state's regulatory scope of practice.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.32 Anesthesiologists and CRNAs have similar support for daily functions (e.g. help with patient follow-up, referrals, labs, clerical support, or office space, etc.).

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.33 My organization fosters an environment where I can practice autonomously.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.34 In my practice setting, I have colleagues who I can ask for help.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.35 I independently make patient care decisions within my area of competency without input from a physician.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.36 In my practice setting, I have enough resources to provide patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.37 There are enough ancillary staff to help with patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.38 In my organization, enough time is allotted to perform patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.39 My organization is open to CRNA suggestions regarding new ideas about patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q2.40 In my organization there is a system in place to reward my performance.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

## **Appendix D: Psychometric Testing**

### **Appendix D1: Email Invitation to Participate in Psychometric Testing**

Dear CRNA colleague:

My name is Don Boyd. I am a Past President of the NYSANA and current PhD Candidate at the Columbia University School of Nursing. Today I'm writing to ask you to please participate in my dissertation research that will explore our work environment and it's impact on job satisfaction and intent to leave a job. CRNAs, policy makers, organizations where we practice, and patients we care for may benefit from this research, but no one can without the help of CRNAs like yourself.

Please participate in this important web-based research today. It should take you only about 10 minutes to do so, and all responses are completely anonymous. Attached is the consent form that includes pertinent details of this Columbia University Medical Center IRB-approved research. Once you are comfortable, please...

(Anonymous link to survey will be embedded here as a "click here" active link)

Thank you for your participation and for all that you do as a CRNA!

Don Boyd, MPhil, MS, CRNA  
PhD Candidate, Columbia University School of Nursing

## **Appendix D2: Information Sheet/Consent to Participate in Psychometric Testing**

Title: Investigating Certified Registered Nurse Anesthetist Organizational Climate and Its Influence on Job Satisfaction and Turnover  
IRB #AAAP8854

Dear CRNA colleague:

You are being asked to participate in a research study through a web-based survey with the purpose of investigating the organizational climate of CRNAs and its impact on CRNA job satisfaction and CRNA turnover. This study is being conducted by Don Boyd, MPhil, MS, CRNA as a part of a PhD dissertation at the Columbia University School of Nursing.

Organizational climate has been described as shared perceptions of psychologically important aspects of the work environment that affect individuals' behavior within organizations. Results from this study will help organizations where CRNAs practice to optimize aspects of the CRNA practice environment in order to improve CRNA job satisfaction and decrease CRNA intent to leave their jobs.

You are encouraged to complete the web-based survey in its entirety. It is expected to take 10 minutes to complete. You are encouraged to respond from a private location in order to minimize the risk of others' seeing your responses. No personally identifying information will be collected. You will not directly benefit from participating in this research; however, your participation may help to optimize the CRNA practice environment, which could influence job satisfaction and decrease turnover. Participation is completely voluntary, no compensation for participation will be provided, and you are free to withdraw at any time without penalty. All collected data will be securely housed on a password-protected research computer with limited access by only the researchers and authorities from Columbia University Medical Center Institutional Review Board (IRB).

Any questions or concerns regarding this study should be directed to:

Don Boyd, MPhil, MS, CRNA

[Drb2102@cumc.columbia.edu](mailto:Drb2102@cumc.columbia.edu)

(212) 342-3664

I encourage you to participate in this important research, and I thank you in advance for your time in doing so.



### **Appendix D3: Reminder Email to Participate in Psychometric Testing**

Dear CRNA colleague:

My name is Don Boyd. I am a Past President of the NYSANA and current PhD Candidate at the Columbia University School of Nursing. Recently I sent you an email invitation asking you to please participate in my dissertation research that will explore our work environment and it's impact on job satisfaction and intent to leave a job. CRNAs, policy makers, organizations where we practice, and patients we care for may benefit from this research, but no one can without the help of CRNAs like yourself.

This is a reminder to please participate in this important web-based research today. It should take you only about 10 minutes to do so, and all responses are completely anonymous. Attached is the consent form that includes pertinent details of this Columbia University Medical Center IRB-approved research. Once you are comfortable, and if you haven't already done so, please...

("Click here to begin" active link embedded here)

Thank you for your participation and for all that you do as a CRNA!

Don Boyd, MPhil, MS, CRNA  
PhD Candidate, Columbia University School of Nursing

## Appendix D4: CRNA-OCQ for Psychometric Testing

Are you a clinically practicing CRNA?

- Yes (1)
- No (2)

If No Is Selected, Then Skip To End of Survey

Organizational climate has been described as the employee's perception of and experience within an organization's culture. Organizational climate includes the nature of interpersonal relationships, the nature of hierarchy, the nature of work, and the focus of support and rewards. You are being asked to participate in the field-testing of the CRNA Organizational Climate Questionnaire (CRNA-OCQ). You are encouraged to respond to all items in this survey.

### Directions:

For each item, please indicate the extent to which you agree that the following items are present in your primary practice site. Indicate your degree of agreement by selecting one option that best applies to you:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Agree
- 4 = Strongly Agree

Please note: "Physician" refers to any physician other than an anesthesiologist.

Anesthesiologists support my patient care decisions.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my organization, anesthesiologists and CRNAs practice as a team.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my practice setting, I have colleagues who I can ask for help.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

My organization is open to CRNA suggestions regarding new ideas about patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Physician colleagues support my patient care decisions.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Physicians ask CRNAs for patient care suggestions.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

I am valued by my physician colleagues.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my organization, CRNAs and physicians collaborate to provide patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my organization, physician colleagues and CRNAs practice as a team.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Physicians in my practice setting value my patient care decisions.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Physicians ask CRNAs for their advice when providing patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Physicians seek CRNAs' input when providing patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

I feel valued by my organization.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Administration is open to CRNA ideas to improve patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Administration takes CRNA concerns seriously.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Administration shares information equally with CRNAs and physicians.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Administration is well informed of the skills and competencies of CRNAs.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Administration treats CRNAs and physicians equally.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Administration makes efforts to improve working conditions for CRNAs.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my organization, there is ongoing communication between CRNAs and administration.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my organization, I apply all my knowledge and skills to provide patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

My organization does not restrict my abilities to practice to the full extent of my state's regulatory scope of practice.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my organization, I can provide patient care to the full extent of my state's regulatory scope of practice.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

My organization fosters an environment where I can practice autonomously.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

I independently make patient care decisions within my area of competency without input from a physician.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

CRNAs are an integral part of the organization.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my practice setting, I have enough resources to provide patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

There are enough ancillary staff to help with patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my organization, enough time is allotted to perform patient care.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my organization the CRNA role is well understood.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

CRNAs are represented on important committees in my organization.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Staff members have an understanding about CRNA roles in the organization.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my organization, there is a system in place to evaluate the care that I provide.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

I regularly get feedback about my performance from my organization.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

In my organization there is a system in place to reward my performance.

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

**Please respond to the following items asking about aspects of CRNA work:**

All things considered, how satisfied are you with your present job?

- Very dissatisfied (1)
- A little dissatisfied (2)
- Moderately satisfied (3)
- Very satisfied (4)

How likely do you think it is that you will lose your job or be laid off in the next 12 months?

- Very likely (1)
- Fairly likely (2)
- Not too likely (3)
- Not at all likely (4)

Do you intend to leave your current position in the coming year?

- Yes (1)
- No (2)

How would you describe the quality of CRNA care delivered in your work setting?

- Excellent (1)
- Good (2)
- Fair (3)
- Poor (4)

Please give your workplace an overall grade on the prevention of infections

- Excellent (1)
- Good (2)
- Fair (3)
- Poor (4)

How often do you provide care to patients who are:

	Always (1)	Often (2)	Rarely (3)	Never (4)
White/Caucasian (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asian or Pacific Islander (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Black or African American (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hispanic (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
American Indian or Alaska Native (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



## Demographics

Please respond to the following demographic questions:

What is your sex?

- Female (1)
- Male (2)

What is your age (in years)?

- < 30 (1)
- 30 - 39 (2)
- 40 - 49 (3)
- 50 - 59 (4)
- 60 or older (5)

What is your race?

- White/Caucasian (1)
- Asian or Pacific Islander (2)
- Black or African American (3)
- Hispanic (4)
- American Indian or Alaska Native (5)
- Other (6)

How many years of experience do you have as a CRNA?

- < 5 (1)
- 5 - 9 (2)
- 10 - 19 (3)
- 20 - 29 (4)
- 30 - 39 (5)
- 40 or more (6)

In which state do you practice as a CRNA?

- California (3)
- New York (1)
- Texas (2)
- Other (6)

What is your current employment structure?

- Employee of a Hospital (1)
- Employee of a Group (2)
- Independent Contractor (3)
- Owner/Partner (4)
- Military/Government/VA (5)
- Employee in Other Setting (6)
- Other Employment Arrangement (7)

What is your current practice setting?

- Hospital (1)
- Ambulatory Surgical Center (2)
- Other (3)

In what type of geographic setting do you practice?

- Urban (1)
- Rural (2)
- Other (3)

Does a physician supervise your practice?

- Yes (1)
- No (2)

Answer If Does a physician supervise your practice? Yes Is Selected

What type of physician supervises your practice?

- Anesthesiologist (1)
- Surgeon (2)
- Podiatrist/Ophthalmologist/Dentist (3)
- Other (4)

On average, how many hours did you work per week over the last month?

- 1 - 20 hours per week (1)
- 21 - 35 hours per week (2)
- 36 - 40 hours per week (3)
- > 40 hours per week (4)

What is your highest educational degree attained?

- Diploma/Certificate in Anesthesia (1)
- Baccalaureate (In nursing, and/or another field) (2)
- Masters (In nursing, and/or another field) (3)
- DNP, PhD, JD, or other Doctorate (4)