

Cricoid Pressure: Standardizing Clinical Technique

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Abstract

Objective: Development of an education model that provides a universal method for all anesthesia providers to practice administration of cricoid pressure (CP) during airway management and continue education for clinical practice.

Background: Currently, anesthesia providers are educated on CP during their didactic training and clinical experiences. However, neither realm has a standardized method of measuring the knowledge or proficiency as there is with other emergency medicine techniques.

Study Design/Methods: A simulation mannequin was used to assess anesthesia provider knowledge and application of CP. Data sources included pre-simulation surveys gauging the participant's knowledge of CP technique, recording participant application site and force on the model, and post-simulation surveys gauging the effectiveness and quality of the active simulation model. A CP technique video was uploaded onto the Rutgers University Nurse Anesthesia *Total Recall* YouTube site as a method continued standard education.

Conclusion: Of the 53 anesthesia providers that participated in the simulation portion of the study, only 15% could correctly identify CP landmarks and apply appropriate force. The mean force applied was 5.34 kg. A chi-squared analysis yielding a p value of 0.001 showed strong statistically significant evidence that formalized training is associated with correct CP anatomical knowledge. 94% of participants advocated for further use of the study's CP model as a standardized method of education.

Key Words: Cricoid Pressure, Technique, Anesthesia, Simulation, Standardized

Introduction

The application of cricoid pressure (CP) has been a mainstay of emergency medical and anesthetic practice since its inception in Sellick's (1961) monumental case series. Initially instituted as a protective strategy against aspiration during the induction of anesthesia, it has additionally become a common maneuver utilized in anesthetic practice for improved glottic view during intubation. The original description of CP involves a one-handed technique of unspecified pressure applied to the midline of the cricoid cartilage to occlude the esophagus against the fifth cervical vertebrae preventing passive regurgitation of gastric contents (Sellick, 1961). Due to the ill-defined nature of Sellick's initial description of CP, investigations for the appropriate technique and force of application have been conducted in an effort to establish a standardized clinical practice methodology. To date, Vanner and Asai's (1999) recommendations for effective CP, quantified as a force of 10 Newtons (N) prior to induction of anesthesia followed by an increase of 30 N to 40 N for anesthetized patients, has become the clinically accepted standard recommendation. However, a lack of uniformity in application technique and an accurate means to calibrate appropriate force has lead to the inappropriate and potentially hazardous use of CP within clinical practice.

The absence of a standard method for administration of CP can result in an array of potentially detrimental effects, specifically the amount of force administered. Inadequate force provides unreliable protection against regurgitation of gastric contents leading to aspiration. Conversely, applying too great a force can result in obstruction of ventilation during induction of anesthesia, poor glottic view during tracheal intubation and, in rare occurrences, esophageal rupture (Johnson, Cannon, Mantilla, & Cook, 2013).

These complications place the patient at an unprecedented level of risk. Considering CP is a technique designed with the main intent of providing further airway protection for patients at risk of aspiration, it is imperative a standardized method of education and application be developed for healthcare practitioners utilizing this airway management skill. To address this, an education simulation model of the larynx was developed to assess practitioner's current knowledge and technique of applying cricoid pressure including: airway anatomy, identifying correct airway landmarks, proper application technique, and appropriate force. This served as a guide for the development of an education program for standardization.

Background & Significance

Although the verdict on the true effectiveness of CP remains to be determined, it continues to be a skill required of clinicians involved in advanced airway management, most notably anesthesia personnel. The risk of aspiration in special patient populations such as trauma, obstetrics, and obese during the perioperative period outweighs the potential hazards that transpire utilizing CP (Holmes, Martin, & Begley, 2011). For this reason, despite controversial beliefs, CP has persevered as a hallmark element of rapid sequence induction (RSI). Therefore, the concern at the forefront for the continued use of CP in the clinical setting is not its validity, but rather the deficiency of a protocol for standard delivery to ensure patient safety (Johnson, Cannon, Mantilla, & Cook, 2013).

The significant gap in knowledge and technique of CP is a longstanding issue receiving increased recognition over the last decade within the anesthesia community (Brisson & Brisson, 2010). Lefave, Harrell, & Wright (2016) surveyed various

anesthesia providers and assistants on their airway management skill and knowledge of producing an effective Sellick's maneuver. Only twelve of sixty-one were able to correctly identify the cricoid cartilage with a mean force of CP a mere 2.47 kg. Neither of these findings is reassuring due to over 80% of providers showing ineffective placement and level of force for aspiration protection (Lefave, Harrell, & Wright, 2016). Research has shown results such as these countless times, however, no prominent advances have been made in an effort to develop a solution for this troubling matter (Yahana, Teo, Izaham, Tang, Mohamad, & Abdul, 2016). Since CP is still common practice in anesthetic practice and other airway management specialties, a standard method of delivering care needs to be instilled during personnel training to ensure proper application.

Healthcare Providers Administering Cricoid Pressure

Currently, anesthesiologists and certified registered nurse anesthetists (CRNAs) are the primary providers using CP on a regular basis as an airway management tool. However, there are many occasions where delegation or assistance performing CP is required from non-anesthesia trained healthcare staff members. Common scenarios include unanticipated difficult airways within the operating room (OR) and emergency intubations outside of the OR. Black, Carson, & Doughty (2012), determined seven different scopes of practice encountered the necessity for knowledge and skill of implementing CP at one point in their professional career. The list of practitioners included paramedics, respiratory therapists, emergency department (ED) registered nurses (RNs), OR RNs, intensive care unit (ICU) RNs, post anesthesia care unit (PACU) RNs, and ED physicians. Although this sample was surveyed within a single healthcare

system, it accurately illustrates the fact that CP is utilized outside of anesthetic practice too often to overlook. When questioned on their modes of training, over half of the entire 172-person sample had never received any type of formal training prior to using CP on a patient (Black, Carson, & Doughty, 2012). This discovery cannot be generalized to all facilities, but it does raise root for concern. Healthcare professionals using cricoid pressure in emergency airway situations in the absence of an anesthesia provider has the potential for disastrous patient outcomes, especially if the majority has inadequate or complete lack of training.

Cricoid Pressure Education for Anesthesia Providers

CP is still used as a protective airway strategy during life threatening situations where the individual is at risk for aspiration. Other skill sets used in times of crises, such as advanced cardiac life support (ACLS), basic life support (BLS), and the Heimlich maneuver, are all certified classroom based programs where skills are tested on a routine basis. Currently, anesthesia providers are educated on CP during their didactic training and clinical experiences. However, neither realm has a standardized method of measuring the knowledge or proficiency in performing the skill as there is with the other emergency medicine skills, such as ACLS. The repercussion is a gap in knowledge that exists within the anesthesia community, as well as other emergency and critical cares medicine areas.

Simulation and Media Based Learning.

The use of simulation and media based learning in education has set the tone for the expectation of contemporary scholarship not only in the collegiate setting, but the

professional as well (Fatimah, 2010). Professional certifications, such as ACLS, have made media based simulation for recertification available to medical professionals. Teaching healthcare facilities are utilizing simulation scenarios for both novice and seasoned staff to practice life saving skills such as mock codes, rapid response strategies, and trauma admissions. The benefit visual and kinesthetic learning have for the majority of student's acquisition and maintenance of knowledge exponentially outweighs other modes of education (Busan, 2014). For this reason, simulation and media based learning models were chosen as the preferred method of disseminating the project's standardized education tool for CP technique.

A useful media tool for the visual dependent learner is YouTube, a social media platform that disseminates a wide variety of videos ranging from entertainment to healthcare information. In recent years, YouTube has become an innovative learning tool for healthcare provider education in the classroom setting and for self-study. It is the third most frequently visited webpage in the world with an average of 2 billion views in a single day (Madathil, Rivera-Rodriguez, Greenstein, & Gramopadhye, 2015). With relative ease of accessibility in today's technologically driven society and a high volume of users on a consistent basis, YouTube presents an incredible arena for educators to distribute knowledge. However, the validity of YouTube as an educational medium has been repeatedly challenged and has shown evidence of providing false information to users (Ventolla, 2014). This creates a significant hurdle for any healthcare professional or organization that wishes to use this platform for educational purposes. Conversely, it is promising that many credible healthcare institutions, such as the World Health Organization (WHO) and American Cancer Society, are readily adapting YouTube to

educate the public in recent years. Additionally, a previous Rutgers University DNP project created a nurse anesthesia education channel to establish a reliable resource for nurse anesthesia students. The YouTube channel gained the support of the AANA and the organization additionally approved guidelines to facilitate the publication of credible videos. This provided sound reassurance that a social media platform is an asset in promoting credible information and education (Ventolla, 2014). YouTube was therefore instrumental in the study's task of effectively educating anesthesia professionals on correct CP technique.

Significance of Cricoid Pressure within Healthcare

The driving force behind modern medicine's premise for CP incorporation in airway management is the prevention of aspiration. The manifestation of aspiration occurs when either liquid or solid contents enter into the pulmonary tract. Induction of both general anesthesia (GA) and monitored anesthesia care (MAC) places the recipient at a high risk of aspiration independent of their co-morbid conditions. Many anesthetic agents decrease level of consciousness, lower esophageal sphincter tone, and the patient's natural protective airway reflexes such as coughing (Holmes, Martin, & Begley, 2011). Commonly used anesthetic substances that are known to produce these conditions are intravenous amnestics, volatile inhalation agents, anticholinergics, opioids, and β -agonists. All of these effects create a scenario where the airway is more vulnerable to both passive and active regurgitation of gastric contents.

The incidence of aspiration during the perioperative period is roughly 1 in every 2–3,000 operations requiring anesthesia resulting in nearly half of these patients developing an acute related lung injury (Nason, 2015). Acute lung injuries subject the

patient to an array of complications ranging in severity from hypoxia, aspiration pneumonitis, acute respiratory distress syndrome (ARDS), respiratory failure, and even cardiopulmonary collapse. Although mortality occurs in approximately 1 in 45,000 of aspiration cases, the healthcare costs related to the higher patient morbidity rates can be astronomical (Turnbull, Patel, Athanassoglou, & Pandit, 2016). The impact these complications have on a health system's budget are devastating stemming from the average length of a patient's hospital stay being prolonged 7-10 days with a steep price of \$40,000 per day (Nason, 2015). The anesthesia provider can play an integral role in protecting against aspiration if the correct application of CP is provided making this skill not only a potential life saving maneuver, but a way to decrease expensive, preventable healthcare costs.

In addition to the elevated healthcare costs aspiration can produce, the legal ramifications perioperative aspiration may have on an anesthesia provider are equally detrimental. In 1984, the American Society of Anesthesiologists (ASA) created the closed claims project in an effort to produce a database keeping track of all malpractice suits filed against anesthesia providers. Although there is no concise current data on aspiration claims, in the finalized 1991 closed claims analysis, 762 of the 2046 cases were attributable to respiratory complications. Of the 762, fifty-six were directly related to aspiration with payouts ranging as high as 20 million dollars and duration of malpractice suit lasting upwards of 5 years (Cheney, Posner, & Caplan, 1991). As this information was in its infancy and many institutions were not vested within the program, the amount of claims, monetary payouts, and length of legal suits in the present day can only be speculated to have drastically increased. That project continues to collect data on

current claims information with hopes of publishing an updated airway complications closed claims analysis.

Needs Assessment

There is a lack of quality evidence to support or desert the use of CP, which somewhat explains its continued widespread use. A few authors have suggested the reason why CP has not been removed from practice if it has been deemed potentially unsafe is that it has become a standard of care for RSI (Stewart, Bhananker, & Ramaiah, 2014). There are no other active measures for the clinician to apply to help protect the patient in those situations, and practitioners refuse to stand by idly. However, there is ample evidence to show that there are inconsistencies in the application and force when applying CP. Some of these differences in technique can result in serious complications. Therefore, upon waiting for more randomized control trials to be conducted to officially disprove or completely recommend CP, the question at this time cannot be focused on whether or not CP is an effective exercise, but can creating a more standardized method of education allow practitioners to apply it correctly on a consistent basis. Once a uniform educational strategy is constructed, a true measure of how effective CP can be determined.

Stewart et al. (2014) suggest that due to the minimal evidence that discourages the use of CP if accurately applied, carrying out an randomized control trial may be a wasted effort. Furthermore, it would require an incredibly large sample size of approximately 25,000 patients in each group in order to demonstrate a reduction in aspiration by one half. These obstacles make randomized control trials unrealistic. Therefore, Stewart et al (2014) advocate that the inception for amending the regulation and technique of CP is to

refine our teaching and simulation methods. Vanner and Asia (1999) provided valuable input that anyone providing CP should be trained on weighing scales and also practice the technique frequently in order to maintain its integrity.

The literature reviewed all trend toward a similar theme, that although CP is used across the board, there are vast inequalities in technique. These variations stem from a lack of a regulated training model. In an observational study by Brisson and Brisson (2010), the authors scoured five national training courses and found that none offered detailed CP training. A regimented and monitored educational training program would enable clinicians to furnish a safer and more efficient environment for high-risk aspiration patients.

On a local level, at Rutgers University, CP is briefly and theoretically mentioned in the course Introduction to Anesthetic Management. A simulation lab is held for students prior to entering clinical, where CP is also spoken of, but not practiced as a technique in its entirety. As Black, Carson, and Doughty (2012) have mentioned, in emergent situations non-anesthesia providers such as ICU nurses are often asked to assist with applying CP. The primary researchers attended Drexel University in Philadelphia, Pennsylvania, where the undergraduate BSN program does not cover CP even in theory, let alone offer any formal training. Several studies including one by Ashhurst, Rout, Rocke, and Gouws (1996) have suggested that incorporating a hands-on approach to teaching the application of CP and maintaining the skill through intermittent reassessment may have a direct correlation with better patient outcomes. A convenience sample was collected in which the authors were attempting to discern the level of knowledge that the emergency department staff held regarding CP (Nafiu, Bradin, &

Tremper, 2009). These researchers found that of the 83 participants, who included residents, attending physicians, and nurses, the overall theoretical knowledge was very weak. Most of the respondents also described their training as either “poor or nonexistent.” These findings further solidify the crucial need for a nation-wide curriculum including manual training and guidance on CP mastery.

Problem Statement

Application of CP is a vital component of RSI and airway management during tracheal intubation in conventional anesthetic practice. However, there is no consistent means of training anesthesia clinicians the technical skills and appropriate pressure required for safe use of this maneuver (Brisson & Brisson, 2010). To facilitate the formation of a uniform method of education, a focused assessment of currently practicing certified registered nurse anesthetists (CRNA) and student registered nurse anesthetists (SRNA) concerning their baseline knowledge and skill of CP technique, indications, and current use in clinical practice was required. Additionally, evaluation of training received during both graduate studies and professional careers brought insight to the study’s endeavors. The motivation behind this project sought to resolve the inquiry: “Would the creation of an education simulation model and media outlet (I) depicting the correct application and force of CP improve CRNA/SRNA’s (P) knowledge and competence of the appropriate technique (O) needed for sustainable, efficient clinical practice of Sellick’s maneuver?”

Aims & Objectives

The ideal outcome of this project was the development of an educational design

that provided a medium for all anesthesia providers to utilize during airway management training that would permit a universal method of administering CP. The underlying aim invariably being improved patient safety and perioperative outcomes during RSI and traditional tracheal intubation. The four focused objectives of this venture included: 1.) assessment of the level of current New Jersey (NJ) CRNA/SRNA's knowledge of correct CP application and anatomic landmarks via utilization of a simulation model; 2.) construction of a survey to gauge knowledge and frequency of CP use including most common indications over the last year of clinical practice; 3.) development, implementation and evaluation of an educational video uploaded to a SRNA driven social media platform on YouTube named, *Total Recall*, depicting correct recognition of anatomical landmarks, technique and force of cricoid pressure; 4.) incorporation of active simulation of correct CP using the anatomical model in the yearly RNAP airway workshop for sustainability.

Review of Literature

The literature was reviewed and critiqued based on its relevance to the project's main objectives. The primary topics of consideration included: 1.) clinical relevance of CP; 2.) current healthcare provider knowledge and skill of CP; and 3.) modes of education utilized by healthcare professionals. Four databases including PubMed, UpToDate, Cinahl, and Ovid were accessed using Rutgers University library. The search contained key terms: *cricoid pressure, effectiveness, cricoid pressure technique, risks and benefits, rapid sequence intubation, aspiration, knowledge, video assisted, and current teaching with YouTube*. The search for literature included articles written within the last decade, from 2008 to present, written in English, peer reviewed, and relating to the topic

of CP training techniques/applications. Details of each data search may be found in Appendix B. The most limited search conducted in the Ovid database, produced a total of 20 articles. Two studies were found to be applicable to the randomized control trial limitation, and only one article was able to be included due to date of publication. Several articles including systematic reviews, expert reviews, experimental, observational, and prospective studies had relevance to the objectives and were of sufficient merit to support the project. Appendix A exhibits each article chosen for the literature review.

Clinical Relevance of Cricoid Pressure

The use of CP was born and remains alive due to a common sense concept that has not been able to be substantiated by high quality research. To this point, Algie et al. (2015) coordinated a systematic review, searching several databases for randomized control trials involving CP. Only one article was even mildly applicable out of 493 records. The authors concluded that there is an extreme shortage of high caliber information accessible regarding CP application during RSI.

What are available for reference are non-RCT studies. One hundred seven patients participated in a study in which CP was measured using a weighing scale. In order to assess an occluded esophageal entrance, the conductors attempted to insert 2 different sized gastric tubes. The authors found the esophagus to be occluded with a 95% success rate with the use of adequate CP (Zeidan, Salem, Mazoit, Abdullah, & Crystal, 2014).

Another motivation for implementing CP is to improve the glottic view. Researchers compared the use of CP with patients who did not receive it in a study involving 50 patients by Kumar, Behera, Dali, Arya, and Gupta (2011). Kumar et al. determined that a more efficient view was achieved using CP versus without. The use of

CP for improved glottic view has been altered slightly and renamed as backwards, upwards, rightward pressure (BURP). As mentioned previously, no matter the motivation, improvement of view or prevention of aspiration, practitioners continue to apply the CP maneuver in order to implement some active form of protection.

Even in early practice as SRNAs, the use of CP has been observed frequently for both the reasons mentioned previously. CP continues to be implemented despite the lack of gold standard research to support its use. The literature reviewed points to several major deficiencies; the quality of research in support or abandonment of the use of CP, and lack of a formalized and widely accepted training for CP technique. Many authors suggested that the starting point to fix these deficiencies lies in our approach to education, considering how challenging it would be to carry out randomized control trials. Instead of becoming complacent, it is the duty of the practitioner to do what they can in order to provide the highest level of safety and efficiency. The priority for best practice includes revamping the approach to education and simulation of CP.

Healthcare Provider Knowledge and Skill of Cricoid Pressure

CP efficacy is a subject of great debate, which conversely has an extreme deficit in current research to support or debunk its use. However, much of recent clinical discussion and evidence-based research has focused on the level of knowledge and skill clinical providers have using CP. After thorough review, the literature failed to produce a current, universal method used for the training of all healthcare professionals, including anesthesia providers. The chief form of education anesthesia staff received concerning correct CP technique stemmed from the didactic portion of their scholarly training. Acquisition of current skill level came from individual experience obtained in the clinical

setting (Salem, Khorasani, Zeidan, & Crystal, 2017). Both phases of learning present the opportunity for the provider to develop proficient CP application. The predicament that ensues is the shortcoming in the guarantee that every anesthesia provider has received the same baseline training.

When anesthesia providers were sampled in a private clinical setting, the majority was unable to correctly identify airway anatomy and apply appropriate force to a simulation model (Lefave Harrell, & Wright, 2016). Additionally, multiple studies have shown an array of techniques used in current practice with no traditional means of providing standardized education to providers practicing CP (Brisson & Brisson, 2010). The most notable commonality within the evidence was the inability of healthcare providers to consistently apply the appropriate amount of force, 30-40 N, to the cricoid cartilage. Without the proper force during CP, the maneuver is essentially useless and potentially harmful to the patient (Taylor, Smurthwaite, Mehmood, Kitchen, & Baker, 2014).

In the presence of formal provider training, immediate improvements in force of application were seen. In conjunction with improved force, correct recognition of airway landmarks was enhanced in both formal training and simulation sessions (Ellis, Harris, & Zideman, 2007). Sustainability was the significant downfall for most CP education models reflected within poor follow up results of cricoid pressure skill retention found when participants were surveyed between 1- 12 weeks (Johnson, Cannon, Mantilla, & Cook, 2013). To achieve sustainability for this project's goals, it was imperative to incorporate a recurrent active CP simulation model within the yearly RNAP airway

workshop to provide continued education along with follow up of current knowledge and skill level.

Modes of Education Utilized by Healthcare Professionals

Modern day practice includes simulations that can be utilized to mimic real-life scenarios. In doing so, clinicians are enabled to augment their professional skills and knowledge. In addition, rehearsing correct CP technique can help to protect patients from unneeded risks. Lateef (2010) supports the use of simulation-based learning and suggests that if incorporated into orthodox instruction, could help to decrease errors in practice.

Ashurst, Rout, Rocke, and Gouws (1996) created an airway-training model to evaluate anesthesia provider's ability to correctly identify placement and force of CP. The device operated using hydraulics and participants included forty-nine anesthesia assistants and anesthesiologists. These volunteer anesthesiologists were assessed initially, completed further training for three days consecutively, and finally were evaluated on their ability to retain this skill after 14-21 days. The research showed that after the first training session CP application performances improved immensely and 72% of the participants were able to retain the skill after 2-3 weeks (Ashurst et al., 1996).

A narrative review by Salem, Khorasani, Zeidan, and Crystal (2017) discussed the benefits of training with a hands-on model approach. These authors claimed that CP can be accurately replicated within 2N when employing educational models such as floor-weighting scales or cricoid compression devices. Salem et al. (2017) strongly promoted an intermittent retraining to be included due to variability in retention of the maneuver. These researchers suggest placing the laryngotracheal model on a scale that is zeroed in order to measure force applied. This method allows for kilograms applied to be read in

Newtons. Another method mentioned by Salem et al. (2017) includes the use of a 50-60 mL Luer Lock syringe. The process of measurement is described as filling the syringe with 50 mL of air, capping it, and placing it vertically. Using Sellick's three-finger technique to apply pressure to the syringe, assessment is conducted by measuring how much air is pushed out. A reading at the 38 mL mark equated to 20 N of force used, and the 33 mL mark equated 30N of force.

The ability to receive instant feedback post simulation is extremely valuable. The student then has the opportunity to correct their mistake, and allow these errors to continue until they no longer occur. Another supplementary benefit to simulation included a higher chance of retention and accuracy to perform the skill. According to Abdulmohsen (2010), simulation-based learning also provided a reduction in inconvenient interference, exposure to rare situations, and an improvement in standards that can be used to evaluate performances and detect gaps in education needs.

The use of YouTube specifically as an educational resource is routinely employed. Credibility of YouTube is somewhat controversial, but can be beneficial if the user is deliberate and fastidious (Duncan, Yarwood-Ross, & Haigh, 2013). Fralinger and Owens (2009) conducted a study investigating YouTube as a learning tool. This study included 81 college, 61 graduate, and 20 undergraduate students. Classroom experiences and perceptions were then evaluated. Fralinger et al. (2009) advocated for the inclusion of YouTube as a learning platform due to the added benefit of conceptual understanding being fostered by visualization of information. The summary of responses concluded that YouTube was considered useful due to advancing technology. Lindstrom (1994) explained that people remember 20% of what they see, increasing to 40% retention if the

information is seen and heard, and an impressive 75% if the knowledge is translated by way of seeing, hearing, and doing. YouTube offers a multimedia experience in which the user can simulate a technique while receiving visual and auditory guidance.

In recent years, educational development has trended toward the incorporation of social media. Literature reviewed supports blending traditional didactic education with a visual and hands-on component. As part of a strategy to efficiently teach and obtain sustainability for accurate CP application, it was pivotal to share results through a web-based learning platform. In order to foster a robust and durable educational action plan, the CP application model was incorporated into the didactic curriculum and simulation lab at Rutgers University for practicing SRNAs.

Theoretical Framework

The Knowledge to Action (KTA) framework was used to support the implementation of the project's goals for the improvement of anesthetic clinical practice (Appendix C). This model provided unparalleled organization to allow for functional development of the project's objectives.

Knowledge to Action Framework

The KTA framework incorporates two major concepts that were crucial to this project's success, knowledge creation and application within the action cycle (White & Dudley-Brown, 2012). Initially developed to circumvent the confusion seen when conceptualizing the transfer of knowledge into action by Graham et al. (2006), the KTA framework has been readily adapted as an efficient tool to ease the translation of research

based knowledge into clinical practice. The KTA framework met the needs for this endeavor as it created a continuum for reassessment of CRNA/SRNA's knowledge and skill of correct CP technique via their performance using the simulation model and YouTube video adjunct.

To understand how the KTA infrastructure assisted with the translation of knowledge for CP application, deconstruction of each phase is outlined. In phase I of knowledge creation, development of the knowledge inquiry took place. There was an abundant amount of research pointing to a significant gap in knowledge of CP application and position. The knowledge inquiry consisted of raising the question, why is there large variability in CP technique and force used among anesthesia providers and does this pose and increased risk of injury to the patient? Additionally, phase 1 required knowledge synthesis. Synthesis included literature and systematic reviews, which are delineated in the review of literature section. The final step of knowledge creation involved developing an evidenced-based tool. The KTA schematic described some examples of these tools such as clinical guidelines or performance measures. Currently there are no tools or products for CP technique available for use, further solidifying the need to create a standardized teaching model for CP application. In response, a survey and simulation model to assess CRNA/SRNA's current knowledge and skill level applying CP was developed.

The second phase of the KTA framework included the application of knowledge. The action cycle involved in this phase focused on behavior and practice. Implementation planning was a crucial step in order to gain acceptance, adoption, and cohesion of the project. Phase 2 required the gaps in knowledge to be identified. This was accomplished

via the pre simulation survey and the active CP simulation model implemented at the fall NJANA meeting on October 13th, 2018. Delivering and analyzing the questionnaire targeted the identification of any breaches in understanding. The survey assisted in assessing knowledge of anatomy, indications, and frequency of use of CP. The simulation model assessed technique, correct identification of landmarks, and level of force applied. Management of potential barriers to knowledge translation was assessed prior to the implementation phase.

Following the identification of barriers to knowledge, the tailored interventions were implemented. For CP application, the use of education and training were pertinent to the success of the project. This was accomplished using the same hands-on educational model constructed for accurate CP technique that was utilizing at the NJANA meeting. It was subsequently adopted into the RNAP simulation lab for continued use by SRNAs. This step assisted in retention of information and skill due to the element of active participation in addition to theory. An educational video depicting correct identification of landmarks, application technique, and force was uploaded to the RNAP education-based YouTube platform for CRNA/SRNA use called *Total Recall*. The final stages of phase 2 worked synergistically to determine the reliability of the interventions. Monitoring knowledge acquisition and effectiveness was executed by way of feedback through post-simulation surveys following the implementation of the active CP simulation model and frequent surveillance of open communication links on the CP YouTube video. YouTube offered viewers the option to provide responses to the demonstration of CP technique through a YouTube analytics.

Gathered data from the CP simulation model, surveys, and YouTube video

feedback was analyzed. Evaluation took place to assess the validity of these tools and potential for further improvements. Optimistically, for future patients, the impact of incorporating a standardized CP education model for incoming clinicians would improve clinician satisfaction and decrease patient risk. The KTA model is accommodating to researchers by its ability to identify the gaps in knowledge and encourages awareness of these rifts. There is no standard method of measuring appropriate force of CP or technique within clinical practice. The end result was the development of a methodical and useful tool for all stakeholders (Appendix D).

Methodology

Project Design

Due to the complexity of creating a sustainable and standardized education tool for CP technique, a quasi-experimental study design was the most applicable. Multiple sources of quantitative data were collected over an extended period of time. Data sources included pre-simulation surveys gauging the participants current knowledge of CP technique, an active CP simulation model gauging participant CP technique and force, post-simulation surveys gauging the effectiveness and quality of the active CP simulation model, and a YouTube video providing a visual representation of correct CP technique that was evaluated based on *Total Recall* YouTube website analytics.

Setting

The setting varied throughout the course of the project. The CP simulation model was acquired and subsequently improved upon within the Rutgers University (Newark)

simulation lab. The pre-simulation surveys were distributed to CRNAs and SRNAs at the October 13th, 2018 NJANA meeting in Galloway, NJ. Post-simulation surveys were then distributed to all participants at the same October 13th, 2018 NJANA meeting after participants demonstrated their CP technique on the active simulation model. The video demonstrating correct CP technique was filmed at Rutgers University (Newark) simulation lab. It was uploaded to the Rutgers University SRNA driven YouTube channel, *Total Recall*, on January 15th, 2019. Advertisement for the video was released via email and social media outlets, Facebook and Instagram, for both the NJANA and RNAP on January 16th, 2019. Preliminary analytic data was gathered from *Total Recall's* administrators on January 27th, 2019 (Appendix Q).

Study Population

The target audience for the CP simulation model and pre/post simulation surveys was CRNAs and SRNAs at the NJANA fall 2018 meeting. The study population consisted of anesthesia providers attending the fall meeting, which included practicing or clinically educated AANA members from neighboring states. Exclusion criteria consisted of any non-anesthesia personnel, participants who were not an active member of the AANA, or nurse anesthesia students with less than 3 months of clinical experience. The CP simulation video uploaded to *Total Recall* targeted a study population of all current SRNAs and practicing CRNAs. On a larger scale, the study population included any YouTube viewer and/or subscriber. Exclusion criteria for the study population included lack of Internet access, non-English speaking viewers, and viewers that did not have a basic knowledge of airway anatomy. A disclosure statement explaining the intentions of the CP video was provided per the standard *Total Recall* sustainability endeavor. The CP

simulation model was also adopted into the annual RNAP airway workshop, which specifically targeted current SRNAs enrolled in the program as a continuous study population. Adoption of the CP simulation model was at the discretion of the RNAP faculty. The RNAP faculty will continue to assess the effectiveness of the CP simulation model through course evaluations completed by students. The primary investigators no longer collect data from students who participate in future simulation experiences within the RNAP curriculum.

Study Interventions

The first phase of the project required templates outlining the structural components of all study interventions. The CP simulation model was represented on a template depicting the exact methods for constructing the larynx and trachea including a scale for measuring CP during the active simulation (See Appendix E). The pre and post simulation survey outlines were drawn up for official approval by the Institutional Review board (IRB) (See Appendix F and G). Finally, the development of the official template for the content and credible sources used for the CP technique video was submitted to *Total Recall* for approval on January 6th, 2019 (Appendix K). The components and entire process for making the video followed the strict IRB approved guidelines outlined by *Total Recall* (Appendix L). It was approved and uploaded for public viewing on January 15th, 2019.

Phase two consisted of making the structural model of the larynx and trachea to authentically represent the landmarks required for correct CP application. A scale was adopted specifically for the model to facilitate real time measurement of CP in kilograms

during active simulation. IRB approved surveys were administered pre and post active simulation. The participant would begin by completing the pre-simulation survey, which evaluated knowledge and current use of CP. Upon completion of the pre-simulation survey, the participant was instructed to direct their attention to the CP model to complete the active simulation. The participant was asked to demonstrate on the CP model how they find the correct location for appropriate CP application. Once the participant had verbally confirmed they had found the correct location, they were asked to physically apply CP to the model. After the participant had confirmed they were administering what they believed to be effective CP, the primary investigator recorded the force applied in kilograms by utilizing the scale. The scale was not visible to the participant. The active simulation concluded when the participant was informed by the primary investigator of their accuracy administering CP technique. Afterwards, the participant was given the post-simulation survey, which evaluated the CP simulation model. The number of participants was projected between 50-100 subjects. The final count was 53 total participants.

The final intervention, the CP technique video for the *Total Recall* YouTube channel, was developed during the second phase of the project. The video commenced with a brief verbal description of CP in conjunction with its indications, contraindications, and potential complications. Following this was a detailed physical demonstration with voice directed instructions for accurate acquisition of CP landmarks, technique and application (Appendix K). The final edited CP video was 3 minutes and 47 seconds in length and was originally recorded at Rutgers University simulation lab. *Total Recall* administrators received the final CP video on January 6th, 2019 to determine

the validity of the recording in accordance with the channel's standards (Appendix L). Approval and official upload of the CP video took place on January 15th, 2019.

Outcome Measures

Outcome measures were contingent upon IRB and NJANA approval. Both parties approved all interventions including the pre and post simulation surveys, the CP simulation model, and the CP YouTube video. However, in order to implement the project's analytic tools, it was required that participants provide consent prior to completing any portion of the project. This granted the primary investigators permission to utilize participant results and feedback anonymously.

The quantitative data collected from pre and post simulation surveys were analyzed and interpreted to measure outcomes. In the post-simulation survey, participants determined whether they had learned from the CP simulation model and if they would refer this type of learning tool to other practitioners. The primary investigators gathered quantitative data from both the pre-simulation survey and CP model regarding participant knowledge and skill of CP. Once available on YouTube, viewers of the CP technique video were able to evaluate the video by liking, disliking, sharing, or commenting on the site. This feedback has continued to be used for further educational purposes within RNAP. The specific data that continues to be analyzed includes: number of likes, number of shares, number of views, and evaluation of comments to develop common themes.

Risks or Harms

No identifying information was revealed at any time during surveying, videotaping, or commentary feedback. The surveys provided were completely anonymous. Each participant was given a bundle that included a consent form and pre/post simulation surveys. Each bundle was assigned a unique ID number to keep information together without identifying the participant. Upon completion of the consent form by the participant, the pre-simulation survey was administered followed by the post-simulation survey after completion of the CP model simulation. The packet was not given as a whole to ensure the consent form had been signed prior to initiation of the research study.

The members of the research team, Jacquelyn Chestnut and Lauren Diskerud, performed the recording for CP technique YouTube video. Any feedback contributed by YouTube viewers was identifiable by username, which is already public information. The study team did not document usernames during any portion of the data collection process.

Due to the inadequate amount of research available to prove YouTube to be a credible educational resource, participants were required to review and acknowledge a disclaimer describing its use as a supplemental form of learning. Another potential risk included the spread of cyber viruses via links posted by viewers. If the viewers dispersed such viruses, site administrators blocked them from the channel.

Subject Recruitment, Cost and Compensation

Recruitment of subjects for the educational model simulation exercise was conducted via two recruitment flyers for CP demonstration (Appendix M) at the annual fall NJANA meeting. Recruitment flyer 1 was displayed at a booth where the surveys and

simulation took place during fall NJANA meeting. DNP recruitment flyer 2 was emailed to the RNAP students one week prior to the fall NJANA meeting. This flyer was also displayed within the conference room of the NJANA meeting to facilitate recruitment of attendees.

A small booth was set up to enable participants to attempt to correctly place and apply CP on the life-like simulation model. Additionally, verbal advertisement of the CP simulation video was conducted via Flyer 1 being displayed at the simulation booth and verbal recruitment to all participants. Information about the CP simulation video was spread throughout the SRNA community at Rutgers University by way of group emails and advertisements on social media platforms for both RNAP and NJANA. Participating in the CP simulation model and CP YouTube was voluntary.

Both the primary researchers absorbed cost for the entire study. A breakdown of the total costs can be found within Appendix H. There was no monetary compensation. Subjects were not required to contribute any financial supplementation to participate in any of the study's interventions.

Consent Procedure

Consent to voluntarily complete the surveys and simulation was administered to participants. Each participant was given the consent form once they verbally agreed to volunteer to take part in the study. The participant was then given the pre-simulation survey once the consent form was signed, which was then directly given back to a member of the study team who stored the consent in a private filing system. The consent

form explained that confidentiality would be maintained while using the responses for data collection (see Appendix I).

Project Timeline

See Appendix J for detailed accounts regarding the project timeline. A goal to initiate the project commenced with the delivery of surveys at the Fall NJANA meeting on October 13th, 2018. Completion of the project occurred February 2019.

Resources/Economic Considerations

Costs encompassing the survey portion of the project included fees for paper, ink, and attendance for the fall NJANA meeting. The expenses accrued developing the CP model included a weighing scale and a life-like airway model. To record the CP simulation video, the researchers obtained a video recording device, video editing software, and microphones. The primary researchers financed all resources required to complete the project. All information was retrieved from research databases by way of RNAP tuition via Rutgers Library access. These databases included PubMed, CINAHL, Ovid Medline, and UpToDate (Appendix B). The researchers also investigated the project's topic in anesthesia texts used previously during the core didactic period of RNAP. Please see Appendix H for the budget.

Evaluation Plan

Data Maintenance & Security

During the entire course of the project, all participants' personal identification information was protected and remained secure. The surveys collected at the fall 2018 NJANA meeting did not request or require the participant to disclose any information that would divulge personal identifiers. Participants were asked the following identifying questions: 1.) professional role (CRNA or SRNA); and 2.) years of clinical experience. Neither of these inquiries jeopardized the participant's privacy. However, consents required participant signatures, which are personal identifiers. Therefore, the completed surveys and consents remain secured within Dr. McLaughlin's office on RBHS campus.

The CP video was uploaded to the SRNA driven YouTube channel, *Total Recall*. YouTube has a standard set of guidelines for appropriate conduct and maintaining privacy while utilizing the webpage (YouTube, 2017b). *Total Recall*, has a disclosure statement to all participants stating that any user that chooses to provide personal identifiers understands it is of their own accord and is not suggested under the YouTube standard community guidelines. Participants were able to make non-identifying usernames while using *Total Recall* to prevent breaches in privacy.

Data Analysis

Both quantitative and qualitative data were acquired from the implementation of the various study interventions. Quantitative data was extracted specifically from the active CP simulation model. The quantitative data points were analyzed using descriptive statistics and are represented in within the results section below. A mixture of qualitative and quantitative data were obtained during the pre and post simulation survey data collection. These data points included professional status (CRNA, SRNA), length of

practice, location of correct cricoid pressure, and correct force of CP. The results were analyzed using descriptive statistics and were represented graphically in the Appendix.

Results

The purpose of this project was never to confirm or deny the effectiveness of CP, but rather gather supporting evidence that both SRNAs and CRNAs are lacking a standardized mode of education to develop and maintain the knowledge and skill level required to perform CP appropriately in the clinical setting. The implementation of the CP simulation model at the fall 2018 NJANA meeting recruited 53 total volunteers that met the inclusion criteria. Of the 53 participants, 26 identified as CRNAs and 27 identified as SRNAs (Appendix N). 92% of participants stated they use CP on a monthly basis within their current practice. 70% indicated the primary use for CP in their practice as both RSI and improvement of the glottic view during endotracheal intubation. This piece of information was a critical component to support the study's endeavors, as the use of CP for improvement of Cormack-Lehane views is an incorrect use of the skill. The backwards upwards rightwards pressure (BURP) maneuver is the true skill that should be performed to enhance glottic views. This was addressed within the CP YouTube video uploaded onto *Total Recall*.

All of the participants completed the active simulation on the CP anatomical model and of the 53 total participants only 8 (15%) could identify the correct anatomical landmarks and apply the appropriate amount of force for safe, effective CP. There was no statistically significant evidence linking the experience level of CRNAs or SRNAs within this group to the placement of correct CP application (5 were SRNAs and 3 were CRNAs). The chi squared analysis comparing years of experience to correct recognition

of CP anatomical landmarks yielded a p value of 0.646. This supports the statement that correct CP knowledge is not statistically significant relative to provider experience (Appendix O, Figure 3).

The mean force (kg) of CP application was 5.34 kg with a median of 4.80 kg, both of which are greater than the recommended 3-4 kg during an RSI (Appendix O, Figure 2). There p value of 0.199 provided no supporting statistical evidence linking years of experience to correct CP force. When participants were polled whether they had received formalized training for CP application 67% responded they had not. A chi squared analysis comparing formalized training to correct CP anatomical landmark recognition on the simulation model produced a p value of 0.001 showing statistically significant evidence that formalized training may play a role with correct CP anatomical knowledge (Appendix O, Figure 4).

The CP YouTube video was assessed and valued as a sustainable, formal education platform for the anesthesia community. The video was approved by site administrators on January 15th, 2019 and promptly uploaded to *Total Recall* on the same date. Analytical data was collected and reported for the first two weeks of the video streaming on YouTube with a focus on number of views, likes and comments (Appendix P) Analytical data continues to be collected on a regular basis and will be utilized by RNAP as an educational tool for SRNAs. The feedback that continues to be received will dictate any changes made to the CP video in the future to enhance the learning module.

Discussion

Implications for Clinical Practice

CP remains a technical skill that is required of all medical professionals directly involved with airway management. This study has unveiled many of the inconsistencies in the knowledge and clinical practice of CP, along with the limited evidence based research to support or deny its legitimacy.

The anticipated benefits of the study's CP simulation model far outweigh the costs of acquiring or instituting it. Based on current research regarding inaccurate CP placement and the amount of force used, development of a standardized method to educate clinicians performing CP is necessary for a multitude of reasons. Lack of proper CP technique completely neutralizes the goal of preventing aspiration in at risk populations. On a large scale, the financial detriments of aspiration are monumental to the patient, health care provider, and health care facility. Therefore institutions, such as anesthesia education programs or health care facilities, may wish to adopt a standardized training model to improve healthcare quality and patient safety. Additionally, when accurate technique is widely performed, randomized control trials can be efficiently carried out to determine the value and efficacy of CP. New policies for adopting standardized CP technique training may be incorporated once further investigations have been conducted beyond the scope of this project.

Implications for Healthcare Policy

Until high quality research has been conducted in a systematic manner the true legitimacy of CP will remain a mystery. The first step towards reaching the goal of proving or disproving the effectiveness of CP is to create a uniform method for training and measurement of this long-standing technique. This study uncovered a lack of formalized training in addition to a gap in knowledge and application of CP within a

small subset of NJ practitioners. If a similar research endeavor could be conducted on a larger scale, the need for standardized CP training could be illuminated. Subsequently, this would lead to a standard way of practicing to allow for RCTs. If evidence based research found CP to be an efficient skill for the prevention of aspiration, health care organizations would be able to formally adopt CP into written policy as a protocol to improve safety for high-risk aspiration patients. These findings could potentially decrease preventable adverse event and litigation costs associated with aspiration events.

Implications for Quality and Safety

The goal of this project was to raise awareness of incorrect placement and force of CP technique within the clinical community, with the ultimate achievement to improve clinical practice and patient safety. Johnson, Cannon, Mantilla, and Cook (2013) recognized that although CP has limited, substantial evidence supporting it, it remains in daily practice due to the notion it is the only mechanical maneuver to protect patients from regurgitation and subsequent aspiration during RSI. As time goes on, patient quality and safety measures are becoming of great importance to an institution's rapport, funding, and reimbursement (Klevens et al., 2009). Although there are minimal incidences of aspiration following induction of anesthesia leading to sentinel events, the consequences remain incredibly detrimental. Nason (2005) investigated patient admissions secondary to perioperative aspiration and noted the average length of stay to be \$40,000 with a 1 in 45,000 mortality rate. The provision of a standard CP education model may further decrease the incidence of these adverse patient outcomes.

Implications for Education

67% of participants claimed to have received formalized training for CP administration, which was underestimate of the study's original postulation that there is an even greater lack of formal training. To clarify, participants who claimed to have received formalized training were asked to specify after they had completed all aspects of the study. Most of these participants described their formalized training as learning within the clinical realm sporadically when it was required during airway management. This information was not included in the formal results, but is important to note as it coincides with the study's projections about the need for a formalized education model for CP.

The benefits of creating a standardized education regimen have been thoroughly discussed in the literature. Exposing the lack of formal education for this skill has created a platform that was utilized in this project for the development of an adoptable, education model. The importance of standardizing education and technique of CP cannot be undermined by stigma. Brisson and Brisson (2010) discovered significant gaps in provider technique, knowledge and skill of CP, which continue to hinder the conduction of valuable research. Ellis, Harris, and Zideman (2007) discovered in their research endeavors that correct CP force and recognition of airway landmarks was enhanced in both formal training and simulation sessions. These findings fueled the premise for this project's vision. When participants were polled after completing the active simulation model, 94% recommended the model be instituted into RNAP for sustainable education on CP. 94% of participants also reported the CP model was easy to use and provided valuable knowledge on anatomy and required force. Under the discretion of RNAP faculty, the CP model will be used during airway management education for future

SRNAs.

Plans for Future Scholarship

Primarily, the RNAP simulation lab will inherit the CP model to provide SRNAs a supervised arena to execute accurate placement and force of CP. The continuous availability of the CP model within the simulation lab allows students a more formal, hands-on training method in addition to theory discussed during classroom lecture. After demonstration and repetitive application, the CP model may also be used as a testing tool to assess CP accuracy. In addition, RNAP holds an annual airway workshop at which students participate in advanced airway activities. The CP airway model will be available to students at this yearly workshop for monitored reproduction of their CP technique.

Furthermore, the *Total Recall* CP technique video will be continuously available to SRNAs and CRNAs. As the CP video continues to garner attention and feedback, updates will be made based on any critiques to facilitate the most enriched learning experience possible. The video will be an easily accessible, supplemental learning tool for any anesthesia provider wishing to review CP technique.

Finally, the CP airway model can be considered a starting point. Future anesthesia providers may expand upon the idea of a formalized training model and develop an even more life-like, user-friendly CP model replica. Once created, such a model could be adopted into practice and employed on real patients in the operating room in hopes of ensuring accurate CP technique without the detrimental effects of its misuse.

Conclusion

The use of CP is a hallmark of airway management, specifically RSI. It remains pertinent as there are limited studies documenting CP's efficacy, mostly due to a lack of standardized practice. The premise of this study assessed the gap in important CP knowledge and technique among NJ CRNAs and SRNAs present at the fall 2018 NJANA conference via surveys and an active CP simulation model. The results supported the study's projections that formal CP training is associated with a clinician's ability to correctly apply CP. In an effort to create a sustainable method of accessible standardized education, a CP technique video was uploaded to *Total Recall* and continues to be assessed for its effectiveness. Education and standardization is the key to CP's value and ultimately its place in airway management. The major limitations of the study included a small sample size, a sample inclusive of only NJ nurse anesthesia personnel, the inability to assess the effectiveness of the CP model over an extended period of time, an unclear definition of what constituted formal CP technique training during the simulation, and a lack of true inclusion criteria for viewing the YouTube video for focused results.

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Appendix A

Table of Evidence

Article #	Author & Date	Evidence Type	Sample, Sample Size & Setting	Study findings that help answer the EBP question	Limitations	Evidence Level & Quality
1	Lefave, M., Harrell, B., & Wright, M. (2016).	Quasi-Experimental	Sample: 61 total participants; 2 anesthesiologists, 17 nurse anesthetists, 7 preoperative registered nurses, 15 intraoperative registered nurses, 10 postoperative registered nurses, and 10 intensive care nurses Setting: 635-bed tertiary care hospital.	Compared to the recommended cricoid pressure of 3 to 4 kg (30 to 40 N) the mean pretest force was 2.47 kg. After implementation of a 2-minute educational video, the mean post-test force was 3.78 kg. The sample had a mean of 10.66 years of experience applying cricoid pressure. Twelve participants (19.7%) identified correct cricoid cartilage pretest. All participants correctly identified correct cricoid cartilage post-test.	Small sample size. No control group utilized in study design. The sample size did not have equal representation of anesthesia providers.	Evidence level: II Quality: B
2	Algie, C.M., Mahar, R.K., Tan, H.B., Wilson, G., Mahar, P.D., & Wasiak, J. (2015).	Systematic review	Sample: Cochrane Central Register of Controlled Trials (CENTRAL 2015, Issue 4), MEDLINE via OvidSP (1946 to May 2015), EMBASE via	There is currently no information available from published RCTs on clinically relevant outcome measures with respect to the application of cricoid pressure during RSI in the context of tracheal intubation. Due to the lack of evidence in support or against the use of cricoid, it is crucial that we at least are applying the technique in the most appropriate manner until further studies can be	Only one RCT met inclusion criteria. It did not report any clinically relevant outcomes. There is potential for publication bias due to the possibility that	Evidence level: I Quality: C

			<p>OvidSP (1980 to May 2015), ISI Web of Science (from 1940 to May 2015) and CINAHL via EBSCOhost (1982 to May 2015). 493 RCTs identified from databases as a result of the search, 70 were identified as potentially relevant studies, 29 of the 70 were considered relevant after independent scrutiny, 1 study met criteria for inclusion. An RCT with 40 participants, 20 whom had cricoid applied and 20 of whom had cricoid stimulated.</p> <p>Setting: The Epworth Hospital, Richmond, Australia</p>	conducted to reduce potential patient harm.	negative studies have not gone to publication or have been rejected during the peer review process during journal submission.	
3	Zeidan, A.M., Salem, M.R., Mazoit, J., Abdullah, M.A.,	Experimental /Observational study	<p>Sample: 107 non-obese patients of ASA physical status I-II. The recruits consisted of 49</p>	The study provides visual and mechanical evidence supporting a 95% success rate to occlude esophageal entrance of a gastric tube by using cricoid force of 30 N. This supports the clinical application and pursuit to	The population included non-obese adults and therefore cannot be extrapolated	Evidence level: II Quality: B

	Ghattas, T., & Crystal, G. (2014).		males and 58 females ages 19-60 years. The patients were anesthetized and paralyzed. Setting: Riaya Hospital Al-Khobar Saudi Arabia	implement a standardized educational tool for all practitioners applying cricoid pressure.	to other populations such as children, morbidly obese, etc. The application of 30 N was the only level of force used within the study design. This presents the possibility of a lesser or greater force having equal success.	
4	Yahana, N. H., Teo, R., Izaham, A., Tang, S., Mohamad, Y. A., & Abdul, M.N. (2016).	Prospective randomized single-blind clinical study	Sample: 85 participants: 42 anesthetic trainee doctors, 43 nursing anesthetic assistants Setting: University of Kebangsaan Malaysia Medical Center	The anesthetic trainee doctors were more skilled at cricoid cartilage identification. However, both groups were equally poor in their knowledge and application of cricoid pressure. The study revealed that there is a significant knowledge deficit in the identification of cricoid cartilage, which is essential for cricoid pressure application.	A lack of real-time monitoring during application of cricoid pressure on actual patients. The amount of pressure applied on the manikin and on the real patient may differ, with the patients' tissue consistency being softer. The institution from which the sample was obtained was skewed towards	Evidence level: I Quality: B

					females.	
5	Brisson, P., & Brisson, M. (2010).	Observational study	<p>Sample: 32 health care providers consisting of 6 MDs, 1 DMD, 16 RNs, 2 CRNAs, 1 RT, 3 paramedics, 3 EMTs</p> <p>Setting: Over 30 month period, an unspecified 5 separate hospital settings were utilized</p>	The study demonstrates that there is a great variability in the application of cricoid pressure: identifying 10 different techniques. Misapplication of cricoid pressure was observed most notably to the thyroid cartilage and sternocleidomastoid muscles. A review of five national training courses revealed that none provide specific cricoid pressure training.	Small sample size. Various health care professionals were observed many of whom did not have anesthesia-based training.	Evidence level: III Quality: B
6	Taylor, R.J., Smurthwaite, G., Mehmood, I., Kitchen, G.B., & Baker, R.D. (2014).	Quasi-Experimental	<p>Sample: 20 operating department practitioners with more than three years experience in the application of cricoid pressure.</p> <p>Setting: Central Manchester University Hospital</p>	Comparing practitioner's performance of cricoid pressure on a training simulator using both the experimental cricoid pressure compression device and a manual unaided technique. The device significantly reduced the spread of the applied force. The practitioners applied a variety of forces to the cricoid pressure simulator during the unaided method while believing it to be the correct level of force of 30 N. The study's findings further enforce the variability seen in practitioner's application of cricoid pressure and the need for a standardized method/training.		Evidence level: II Quality: B
7	Sellick, B. A. (1961).	Observational case series	<p>Sample: 26 patients at high risk for aspiration</p> <p>Setting: A London Hospital</p>	The original creator of the "Sellick maneuver" three-finger technique to apply cricoid pressure is the author of this case series. The correct application and position, including illustrations of this maneuver that is now used worldwide is thoroughly described	The study was a small, nonrandomized, un-blinded, design with no control implemented. The force	Evidence level: III Quality: B

				in his writing.	applied to the cricoid cartilage was not quantified. Anesthetic agents or techniques were not clarified.	
8	Stewart, J., Bhananker, S., & Ramaiah, R. (2014).	Expert opinion	<p>Sample: various evidence based research articles used throughout the review. No specific methods on selection of research.</p> <p>Setting: Harborview Medical Center, University of Washington School of Medicine, Seattle, Washington, USA</p>	Investigating the validity of cricoid pressure and developing tools to facilitate correct application are the focus of future research endeavors. Recent research has shown a lapse in consistency of cricoid pressure application and knowledge of correct airway anatomy among anesthesia providers.	The majority of literature supporting the use of cricoid pressure is more than a decade old.	Evidence level: V Quality: A
9	Ellis, D. Y., Harris, T., & Zideman, D. (2007).	Literature review	<p>Electronic search carried out independently by the first 2 authors, using the terms “cricoid pressure” and “Sellick’s maneuver.”</p> <p>Limit: English language.</p> <p>Searches included: MEDLINE</p>	International studies consistently show the majority of operating room practitioners including physicians, nurses, and other personnel are unable to correctly apply cricoid pressure. The ability of staff to apply cricoid pressure consistently improved with immediate training. However, 1 study followed up staff for 3 months, and it found an inability to retain the improved skills. The teaching of cricoid pressure to medical students with a model and only verbal instruction of the force	The authors found that the evidence supported the effect of cricoid pressure on laryngeal view is likely to vary from patient to patient and with the individual applying it.	Evidence level: V Quality: A

			<p>(1950 to June 2006; 240/254 titles identified), EMBASE (1974 to June 2006; 216/233 titles identified) and CINAHL (1982 to June 2006; 79/80 articles identified), MEDLINE through Pubmed (1966 to June 2006). Duplicate articles were removed, producing 340 titles of which 141 articles were read and included.</p> <p>Setting: Hammersmith Hospital, London, UK</p>	required gave poor results.		
10	Kumar, N., Behera, D., Dali, J., Arya, M., & Gupta, A. (2011).	Randomized control trial	<p>Sample: 50 patients of ASA physical status I-II, 18 to 60 years of age scheduled for elective surgery.</p> <p>Setting: Lok Nayak Hospital, New Delhi, India from November 2009 to February 2010.</p>	<p>Both group's glottis opening score (POGO) was obtained with and without the application of cricoid pressure (CP). Group 1: application of CP was applied for intubation. Group 2: no application of CP was used for intubation. The mean POGO score obtained after the application of CP was 93% compared with 81% in patients without CP ($P < 0.01$). Time to intubation was similar in the two groups: 14.2 seconds vs 14.0 seconds in Groups 1 and 2. The evidence shows the benefit to achieve a better glottic view with the application of cricoid pressure.</p>	There was no measure of the amount of force used during the application of cricoid pressure. No assessment of technique and correct application of CP using appropriate landmarks were used for potential barriers for	Evidence level: I Quality: B

					intubation time. Sample size was small.	
11	Black, S., Carson, E., & Doughty, A. (2012).	Cohort study	<p>Sample: 45 EMTs/paramedics, 21 respiratory therapists, 21 ED nurses, 43 OR nurses, and 42 ICU nurses compared to the sample from Nafiu et al, which included 83 ED personnel: 38 residents, 25 attending physicians, and 20 nurses.</p> <p>Setting: 254-bed level 1 trauma medical center in the Midwest.</p>	<p>The sample was surveyed on their current knowledge of cricoid pressure (CP) including anatomical landmarks and correct application. Conclusion supported a need for improvement in the knowledge level of the application of CP within the population surveyed. Although the application of CP is no longer recommended, it is still routinely performed during intubation. In support of patient safety, it is imperative that the correct technique be used.</p>	<p>The sample size was limited and did not include anesthesia personnel. Study design included a limited 10-question survey with no hands on assessment of cricoid pressure technique or pressure applied.</p>	<p>Evidence level: III Quality: B</p>

Appendix B
Search Strategy

Date	Database	Search terms	Notes/comments
02/05/18	PubMed, CINAHL	“cricoid pressure”, “benefits and risks”, “randomized control trials”, “aspiration”, “perioperative”	Limit search to past 10 years, adults, humans, scholarly and academic journals
02/11/18	Ovid MEDLINE	“cricoid pressure” and “efficacy”	Limit search to past 10 years, adults, humans, scholarly and academic journals
02/16/18	PubMed	“knowledge ”, “cricoid pressure”, “video-assist”, “current teaching methods”	Limit search to past 10 years, adults, humans, scholarly and academic journals

Appendix C

Theoretical Framework

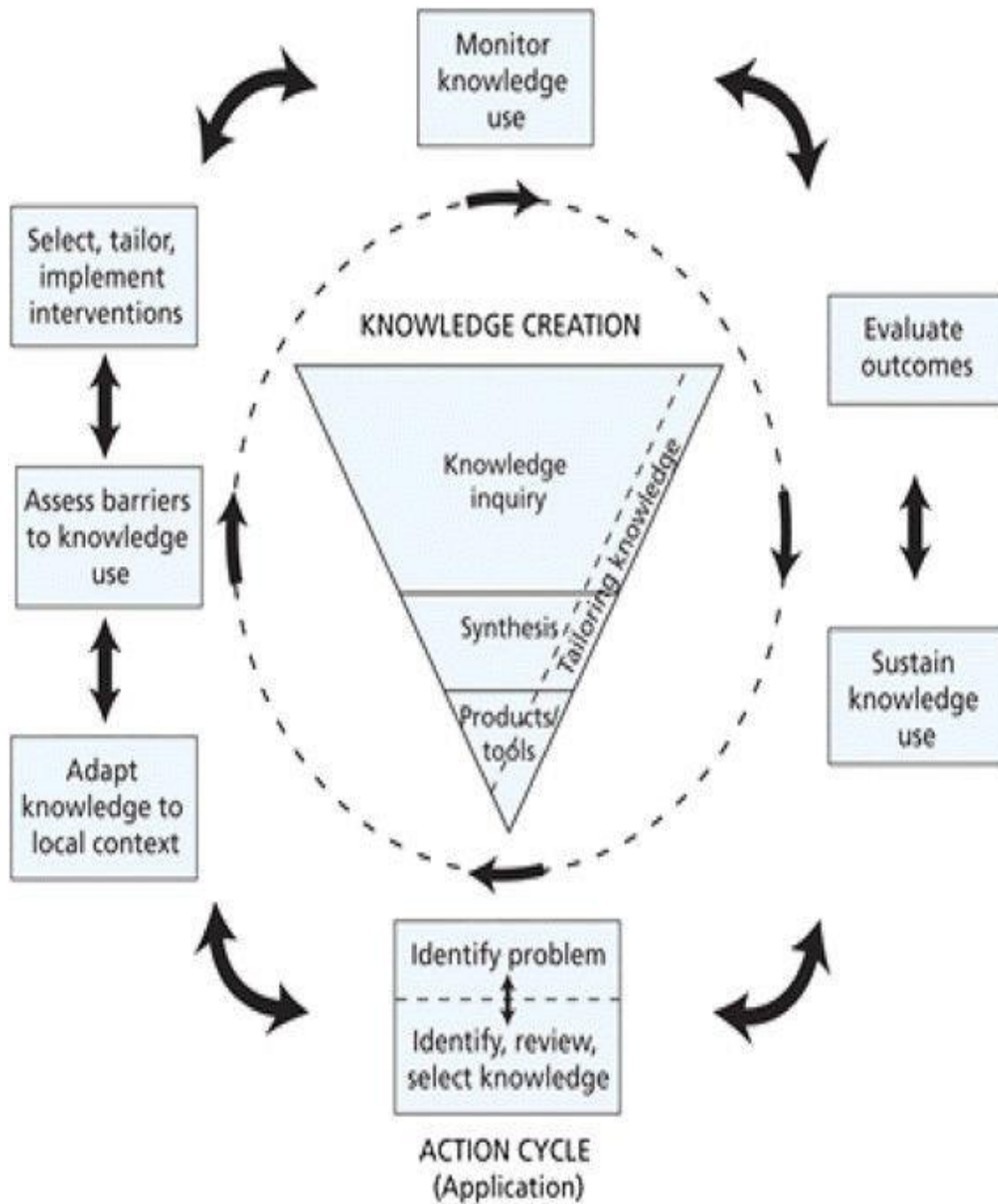
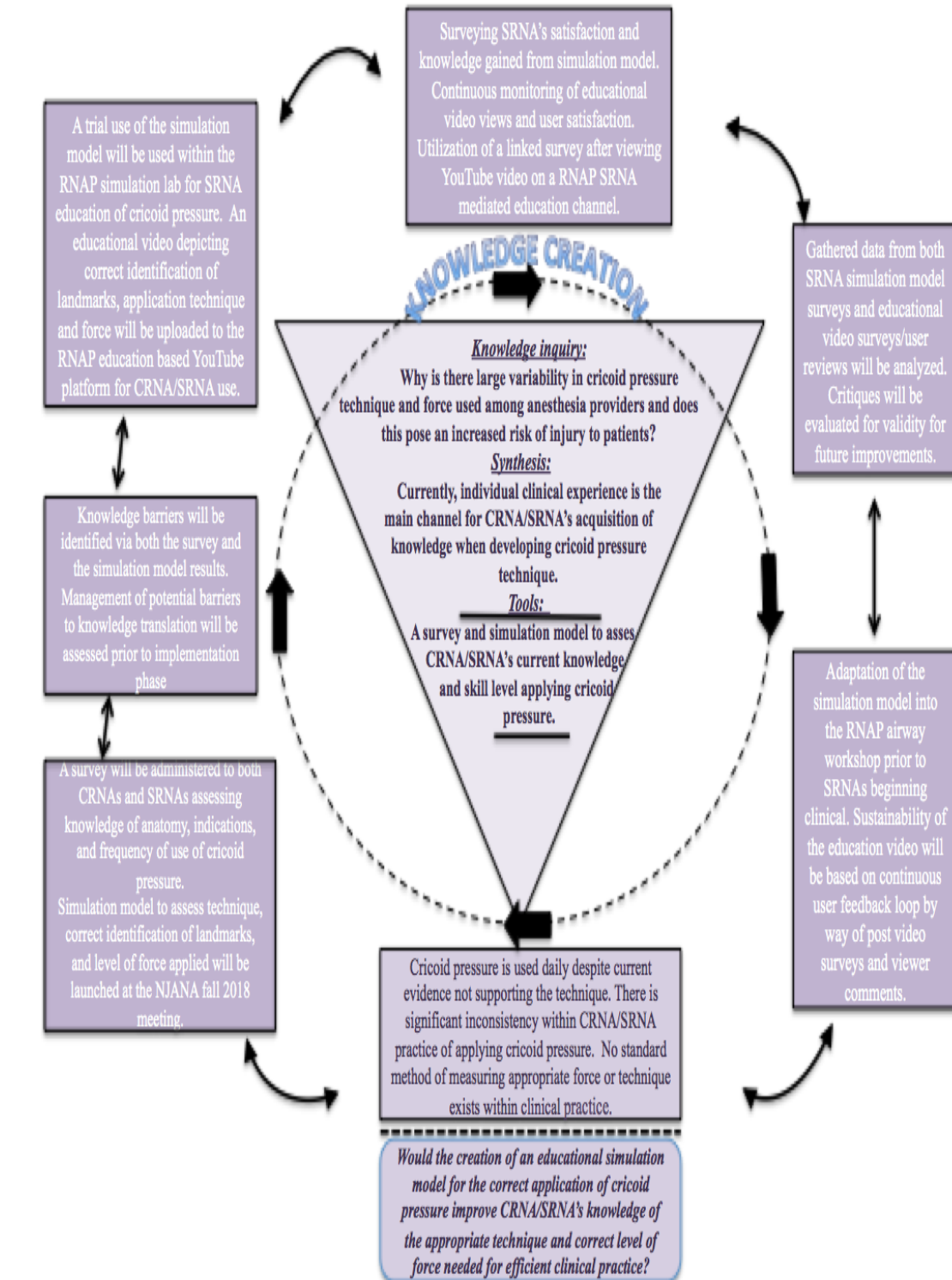


Figure 1

The Knowledge to Action Framework. From Graham I, Logan J, Harrison M, Strauss S, Tetroe J, Caswell W, Robinson N: Lost in knowledge translation: time for a map? *The Journal of Continuing Education in the Health Professions* 2006, 26, p. 19. Reprinted with permission from John Wiley and Sons.

Appendix D

Adapted KTA Theoretical Framework



Appendix E

Cricoid Pressure Simulation Model





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Pre-Simulation Survey

1.) What setting do you practice in?

- A.) teaching hospital
- B.) community hospital
- C.) private practice
- D.) other

2.) How many years of experience do you have?

- A.) 0-4
- B.) 5-10
- C.) 10-15
- D.) 15+

3.) Which provider status applies to you?

- A.) CRNA
- B.) SRNA
- C.) other

4.) How often do you apply cricoid pressure?

- A.) daily
- B.) 1-2 times per week
- C.) 1-2 times per month
- D.) never

5.) Why do you use cricoid pressure in your clinical practice?

- A.) to improve the glottic view
- B.) to prevent aspiration during RSI
- C.) both A & B
- D.) N/A

6.) What anatomical landmark(s) do you use to place cricoid pressure?

- A.) the tracheal rings
- B.) below the hyoid bone and above the thyroid cartilage
- C.) just below the laryngeal prominence and above the tracheal rings

7.) What is the adequate amount of pressure that is to be applied to the cricoid cartilage?

- A.) 3-4kg (30-40 newtons)
- B.) 1-2kg (10-20 newtons)
- C.) 5kg (50 newtons)
- D.) enough pressure to improve the glottic view

8.) Did you receive formal training for correct cricoid pressure technique?

- A.) Yes
- B.) No

VERSION 1: 08/10/2018





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Post-Simulation Survey

- 1.) Did you feel as if this model was useful in developing correct cricoid pressure technique?**
A.) Yes
B.) No
- 2.) Did you find this model was easy to use?**
A.) Yes
B.) No
- 3.) Were you able to correctly identify the cricoid cartilage anatomical landmarks?**
A.) Yes
B.) No
- 4.) Would you advocate for the use of the model as a standardized cricoid pressure teaching model?**
A.) Yes
B.) No



Cost Analysis Table

Equipment/Expenses	Cost	Method of Payment
Survey & Flyer Printing	\$50	Student Researcher Absorbed
Cricoid Pressure Model	\$350	Student Researcher Absorbed
Weighing Scale	\$50	Student Researcher Absorbed
NJANA Fall Conference	\$200 x 2	Student Researcher Absorbed
Anesthesia Textbooks/References	N/A	Student Researcher Tuition
Camera	N/A	Student Researcher Owned
Microphone	\$50	Student Researcher Absorbed
Simulation Lab	N/A	Student Researcher Tuition
Video Editing Software	\$20	Student Researcher Absorbed
Social Media: YouTube	N/A	No Cost



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CONSENT TO TAKE PART IN A RESEARCH STUDY

TITLE OF STUDY: Cricoid Pressure: Standardizing Clinical Technique

Principal Investigator: Lauren Diskerud, BSN, RN, CCRN

This informed consent form provides information about a research study and what will be asked of you if you choose to take part in it. If you have any questions now or during the study, if you choose to take part in it, you should feel free to ask them and should expect to be given answers you completely understand.

It is your choice whether to take part in the research. Your alternative is not to take part in the research.

After all of your questions have been answered and you wish to take part in the research study, you will be asked to sign this informed consent form. You are not giving up any of your legal rights by agreeing to take part in this research or by signing this consent form.

Who is conducting this research study?

Lauren Diskerud, BSN, RN, CCRN is the Principal Investigator of this research study. A Principal Investigator has the overall responsibility for the conduct of the research. However, there are often other individuals who are part of the research team.

Principal Investigator: Lauren Diskerud, BSN, RN, CCRN may be reached at [REDACTED]

Co-Investigator: Jacquelyn Chestnut, BSN, RN, CCRN may be reached at [REDACTED]

*Rutgers University School of Nursing
65 Bergen Street
Newark, NJ 07107*

Jacquelyn Chestnut, BSN, RN, CCRN and Lauren Diskerud, BSN, RN, CCRN or another member of the study team will also be asked to sign this informed consent. You will be given a copy of the signed consent form to keep.

Why is this study being done?

This study is being done to assess the knowledge and skill level of Certified Registered Nurse Anesthetists (CRNAs) and Student Registered Nurse Anesthetists (SRNAs) about cricoid pressure and the appropriate technique to be used in clinical practice. A simulation model will also be used in addition to the survey to investigate whether an active simulation model can increase awareness of correct cricoid pressure application and facilitate translation of that knowledge into clinical practice.

Who may take part in this study and who may not?

VERSION 3: 08/25/2018



Exclusion criteria consists of any non-anesthesia personnel, those who are not active NJANA members, or nurse anesthesia students with less than 3 months clinical experience. The participant is either a current CRNA or SRNA enrolled to attend the fall NJANA 2018 meeting.

Why have I been asked to take part in this study?

You have been asked to take part in the study because either you are a current CRNA or SRNA enrolled to attend the fall NJANA 2018 meeting.

How long will the study take and how many subjects will take part?

The time requested from each participant will be approximately 10 minutes, with the surveys collectively taking 5 minutes to complete and an additional 5 minutes for the active simulation model. The number of potential subjects is estimated to be about 100-115 CRNAs/SRNAs total.

What will I be asked to do if I take part in this study?

You will be asked to fill out and return a brief pre survey questionnaire assessing non-identifying demographic information and current knowledge of cricoid pressure. You will then be asked to participate in an active cricoid pressure technique simulation and afterward complete and return a post survey evaluation of the simulation.

What are the risks and/or discomforts I might experience if I take part in this study?

The primary investigators expect minimal to no risks or discomforts for all participants during all aspects of the study. The surveys are non-identifying and the active simulation requires minimal physical exertion.

Are there any benefits to me if I choose to take part in this study?

The benefits of taking part in this study may be: Gaining awareness of current level of skill and knowledge of cricoid pressure application, enhanced professional development of a skill that is used consistently in the clinical realm, and new methodology for continuing education of cricoid pressure technique.

However, it is possible that you may not receive any direct benefit from taking part in this study.

What are my alternatives if I do not want to take part in this study?

There are no alternatives available. Your alternative is not to take part in this study.

How will I know if new information is learned that may affect whether I am willing to stay in the study?

The study will occur on Saturday October 13th, 2018 and no participants will be contacted after this date.

VERSION 3: 08/25/2018

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Approval Date: 8/22/2018
Expiration Date: 12/31/19

Will there be any cost to me to take part in this study?

There is no cost to any participant for taking part in the study.

Will I be paid to take part in this study?

You will not be paid to take part in this study.

How will information about me be kept private or confidential?

All efforts will be made to keep your personal information in your research record confidential, but total confidentiality cannot be guaranteed. Each survey is maintained as an anonymous entry. The survey questions do not request personal information about the participant. All data from the surveys will be collected and stored in a locked safe within Rutgers University Newark campus within the assistant director's, Michael McLaughlin, office.

What will happen if I do not wish to take part in the study or if I later decide not to stay in the study?

It is your choice whether to take part in the research. You may choose to take part, not to take part or you may change your mind and withdraw from the study at any time. Participation is strictly voluntary.

If you feel uncomfortable with a question, you can skip that question or withdraw from the study altogether. If you decide to quit at any time before you have finished the questionnaire, your answers will NOT be recorded.

Who can I call if I have questions?

If you have questions about taking part in this study or if you feel you may have suffered a research related injury, you can call the primary investigators:

*Jacquelyn Chestnut, BSN, RN, CCRN may be reached at [REDACTED]
Lauren Diskerud, BSN, RN, CCRN may be reached at [REDACTED]
Rutgers University School of Nursing*

If you have questions about your rights as a research subject, you can call the IRB Director at:

Newark Health Sciences IRB, Director: (973)-972-3608

or

Newark Rutgers Human Subjects Protection Program: (973)972-1149

AGREEMENT TO PARTICIPATE**1. Subject consent:**

I have read this entire consent form, or it has been read to me, and I believe that I understand what has been discussed. All of my questions about this form and this study have been answered. I agree to take part in this study.

Subject Name: _____

Subject Signature: _____ Date: _____

2. Signature of Investigator/Individual Obtaining Consent:

To the best of my ability, I have explained and discussed all the important details about the study including all of the information contained in this consent form.

Investigator/Person Obtaining Consent (printed name): _____

Signature: _____ Date: _____



IRB ID: Pro2018001429
Approval Date: 8/22/2018
Expiration Date: 12/31/69

Appendix J

Cricoid Pressure (CP) Project Timeline

- ◆ January- April 2018 Project planning & development
- ◆ July 2018 → IRB approval
- ◆ July -August 2018 → CP model development & completion
- ◆ October 13, 2018 → Implementation: CP model at fall NJANA meeting
- ◆ September- October 2018 → Completion of CP YouTube video
- ◆ November 1 2018 → Implementation: Uploading of CP YouTube Video
- ◆ November 2018 –December 2018 → Analysis: Data from NJANA meeting
- ◆ January 2019 → Analysis: CP YouTube video analytics
- ◆ January –February 2019 → Report Findings
- ◆ April 2019 → Rutgers University: Defense of final doctoral project
- ◆ May 1, 2019 → Rutgers University airway workshop

[illegible]

Appendix K



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Cricoid Pressure: Standardizing Clinical Technique
 Lesson Plan for Cricoid Pressure Simulation

- 1) Active simulation will begin once the participant has submitted their pre simulation survey to a member of the study team
- 2) Simulation experience will commence in the following order
 - a. Participant will be given paper consent to read and sign
 - b. Upon return of the signed consent, the participant will be given a short 10-question pre simulation survey that should take 2-3 minutes.
 - c. Once the pre simulation survey is complete, the participant will be asked to hand in the pre simulation survey to a member of the study team.
 - d. The participant's attention will be directed to the airway model to complete the simulation portion of the research study
 - e. The participant will be asked to physically place their hands in what they deem is the correct anatomical placement for cricoid pressure.
 - f. After the participant confirms they have their anatomical placement, a study team member will direct the participant to apply the amount of pressure they feel is accurate for effective cricoid pressure technique.
 - g. The participant will be instructed to notify a study member when they believe they are applying the correct force.
 - h. The study team member will document the participant's anatomical placement and the force administered via the scale measuring force as weight.
 - i. Once the study team has those two pieces of information, the participant will be informed the active simulation has concluded.
 - j. A study team member will quickly debrief the participant for 1-2 minutes. This will include disclosing to the participant where they physically placed cricoid pressure, how much force they actually delivered, if they had incorrect technique during any aspect of cricoid pressure application, and a quick demonstration by the study team member of correct cricoid pressure application and force.
 - k. The participant will then be handed a 4-question post simulation survey, which will take approximately 1 minute.
 - l. The participant will submit the post simulation survey to a study team member and the simulation will conclude.

Appendix L

Video Creation Template

- I. **Professional.** See Professionalism section.
- J. **Quality Picture and Sound.** See Technical Guidelines section/example on <https://www.youtube.com/channel/UCJ1Z1341am3FKdtgdQ-w5ag>

Professionalism

- A. Videos must not contain:
 - 1. Any attempt to sell products or services
 - 2. Obscene, indecent, slanderous, libelous, or unlawful material
 - 3. Any material that has been previously obtained and/or produced without necessary releases, licenses, or other permissions
- B. Professional setting should be utilized (i.e. Simulation lab, Operating Room)
 - 1. No actual patients will be used in videos
 - 2. If in OR setting, production will not occur during OR time
 - 3. All equipment, monitors, etc. will be de-identified
- C. Attire should appear professional
 - 1. Clean dress (scrubs and or lab coats, scrub caps as necessary)
 - 2. No excessive jewelry
 - 3. Hair appropriately maintained/pulled back
- D. No personal identifiers may be used during video production
- E. Bias-free presentation
- F. All subjects must consent to participation (See Consent Form)

Legal and Regulatory Issues

- A. The purpose of the SRNA YouTube channel is to act as an adjunct to formal education and not take the place of formal education.
- B. Video content and purpose of the YouTube channel will follow and abide by:
 - 1. YouTube Terms of Service (<https://www.youtube.com/static?template=terms>)
 - 2. YouTube Community Guidelines (<https://www.youtube.com/yt/policyandsafety/communityguidelines.html>)

Identifying and Utilizing Evidence-Based Material

- A. Video creation may follow the AANA Guidelines for Evidence-Based Practice (2017)
 - 1. Ask a clinical question
 - 2. Obtain the best research/literature
 - 3. Critically appraise the evidence
 - 4. Integrate evidence with clinical expertise/patient preferences
 - 5. Evaluate outcomes
- B. Additional Information can be found at:
 <http://www.aana.com/resources2/professionalpractice/Pages/Evidence-Based-Practice.aspx>

Technical Guidelines**A. Picture Quality.**

1. Visual aspect of the video must be able to be viewed in terms of focus, clarity, and color balance. Each frame and visual sequence should be free of any characteristics that detract from the intended message and impact of the video.
2. Camera Options
 - a. Camera phone
 - b. DSLR
 - c. Camcorder
3. Resolution and Format
 - a. High-definition (HD) Format should be used if possible/applicable (1080p, 1920x1080 resolution)
4. Stabilization
 - a. Recommended use of tripod or similar device to ensure still videos and even panning of frame
5. Lighting
 - a. 3-Point Lighting Setup
 - i. Key Light
 - a. Main light source
 - b. Brightest
 - c. Placed to right or left of camera and will point directly at subject from a 30 to 60 degree angle
 - d. Point down from slightly above eye level
 - ii. Fill Light
 - e. Softer light
 - f. Pointed at subject from opposite side of camera
 - iii. Back Light
 - a. Light source behind the subject
 - b. Used to create depth and separate the subject from the background

B. Sound Quality.

1. Audio portion of videos must be viewed in terms of clarity, volume, pace, and narrative music mix.
 - a. Appropriate dictation and dynamics
 - b. Multiple voices should utilize distinctive qualities
 - c. Music and/or sound effects should contribute to the message or meaning of video
 - d. Video should be free of any characteristics that detract from intended message
 - e. Continuous monitoring of volume, clarity, pace, and vocal energy
2. Recording environment that is quiet and free of excess noise
3. Control environment as much as possible (ex: avoid busy places, children, air conditioners, pets, etc.)

C. Sound Recording Options.

1. Lavalier Microphone (Lapel Mic)
 - a. Small in size
 - b. Can attach to clothing
 - c. Records omni-directional (from all directions), so work best in quiet environments
2. Handheld Microphone
 - a. Obvious use of handheld microphone may detract from video quality or intended message
3. Wired vs. Wireless Microphone
 - a. Caution: inadequate radio signal transmission/interference/dead battery may occur with wireless microphone
 - b. iPhone/iPod headphones as option for recording

D. Length.

1. The length of the video should take into account necessary content, intended audience, any technical considerations, and the overall entertainment or aesthetic value.
2. Video should be no longer than 5 minutes.

E. Overall Video Quality.

1. Maintain continuity of lighting and background
2. Take multiple shots and mark the best ones
3. Meticulous editing

F. Video Formatting Applications.

1. PC vs. MAC
 - a. Windows Movie Maker (PC - free)
 - b. Quicktime (Mac - free)
 - c. iMovie (Mac - free)
 - d. Lightroom (Available on Mac and PC, must be paid for)

G. Video Titles.

1. a Title:
 - a. Determine keywords that viewers will search
 - b. Add descriptive phrase to determine why viewers will want to watch video
 - c. Note if video is part of a series
2. Balance between attracting viewers and attracting search engines
 - a. First 100 characters of title will show up on desktop computer and 40 characters on mobile devices
 - b. Suggested 75 character maximum for each video title

H. Video Descriptions.

1. 5,000 character field to describe video
2. May choose to add details about each video, as well as the channel itself
3. Can add link to another similar video on channel or the next video in a series
4. Link to a website outside of YouTube that may provide additional information on a topic

I. Video Tags.

1. Tags are keywords or short phrases that describe the video. Tags are used by search engines to aid viewers in discovering appropriate videos
2. 500 character limit to tag field
3. Helpful hints for using tags:
 - a. Utilize both broad and specific key terms
 - b. Utilize synonyms for the topic
 - c. Provide an “action” as part of the tag (ex: “how to”)
 - d. Break up as well as combine keywords

J. Video Thumbnails.

1. Thumbnails are visual snapshots, or photos of your video
2. Thumbnails are chosen by YouTube
 - a. Optional frames are provided to choose from
 - b. May create a custom thumbnail for each video
 1. If creating a custom thumbnail, ensure that it is illustrative of video content

How to Submit:

- A. Email to smachannel@gmail.com and provide:
 1. Video File
 2. Title of video (75 characters or less)
 3. Description of video (must be less than 5,000 characters)
 4. Video Tags (see template)
 5. Video Thumbnail (if customized thumbnail is wanted by video creator)
 6. Contact information

Quick Reference Checklist For Video Submission by SRNAs

- ☐ Clear title
- ☐ Objectives
- ☐ Description
- ☐ Tags
- ☐ Thumbnail (optional)
- ☐ References
- ☐ Credits
- ☐ Quality picture and sound
- ☐ Current, accurate, and evidence-based anesthesia content
- ☐ Professional setting and attire
- ☐ Bias-free
- ☐ Accurate and appropriate presentation of concepts and information
- ☐ Discussion or activities for viewers (optional)
- ☐ Personal identifiers removed
- ☐ Consent to participation



IRB ID: Pro20170000575
Approval Date: 10/26/2017
Expiration Date:

*Guidelines adapted from the following sources:

References

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Appendix M

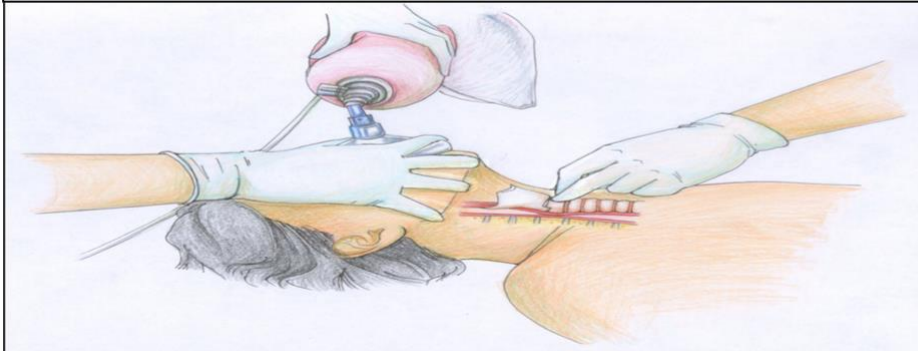
Recruitment Flyers



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ARE YOU EFFECTIVELY APPLYING CRICOID PRESSURE?

**TEST YOUR SKILLS AND PARTICIPATE IN OUR
ACTIVE SIMULATION!**

**WHAT:**

***RESEARCH STUDY: Cricoid Pressure: Standardizing
Clinical Technique***

WHEN:

OCTOBER 13TH, 2018

WHERE:

NJANA FALL MEETING

WHO:

***Available to SRNAs (with AT LEAST 3 MONTHS clinical
experience) and CRNAs attending the NJANA fall meeting***

WHY:

***Determining the need for a standardized cricoid pressure
application education model***

- ♦ ***Participants will complete a short 3 minute active simulation
administering cricoid pressure on an airway model as well as a pre
and post simulation survey, each requiring 1-2 minutes***

CONTACT INFORMATION:

PRIMARY INVESTIGATOR: LAUREN DISKERUD: LMD322@SN.RUTGERS.EDU

CO-INVESTIGATOR: JACQUELYN CHESTNUT: JJC421@SN.RUTGERS.EDU

Version 2

**RUTGERS | eIRB
APPROVED**
IRB ID: Pro2018001429
Approval Date: 8/22/2018
Expiration Date: 12/31/69

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Newark, NJ 07101-1709

ARE YOU APPLYING CORRECT CRICOID PRESSURE?

**FIND OUT BY PARTICIPATING IN
OUR RESEARCH STUDY: Cricoid
Pressure: Standardizing Clinical
Technique!**



See if your skills & knowledge measure up while using our active simulation model! Participants will take 2 short surveys pre and post an active simulation demonstrating cricoid pressure technique!!

**You
Tube**

Check out
our Cricoid
Pressure
Technique
video on the
SRNA
YouTube
channel:

*Total Recall:
Educational
Videos for
SRNAs.*

**Comments
& Sharing
Welcome!**

CONTACT INFORMATION:

PRIMARY INVESTIGATOR: LAUREN DISKERUD: LMD322@SN.RUTGERS.EDU

CO-INVESTIGATOR: JACQUELYN CHESTNUT: JJC421@SN.RUTGERS.EDU

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IRB ID: Pro2018001429
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Expiration Date: 12/31/69

Appendix N

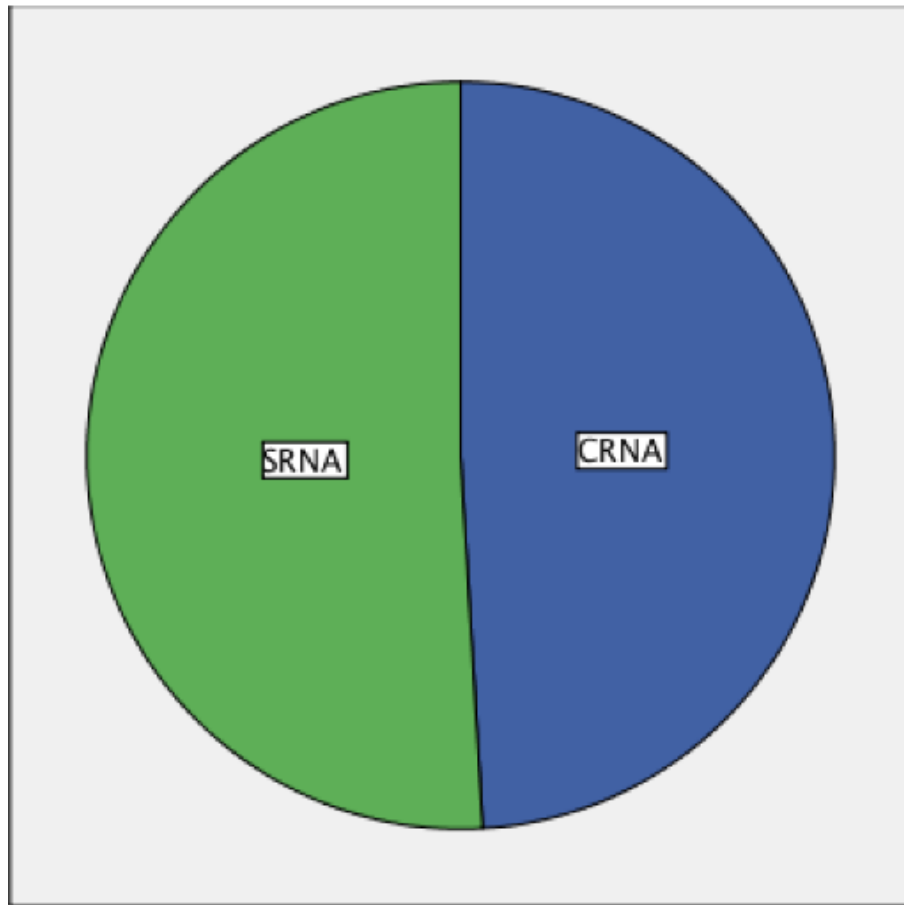
CP Simulation Model Population Data

Figure 1: Study Population Representation of CRNAs vs SRNAs

Appendix O

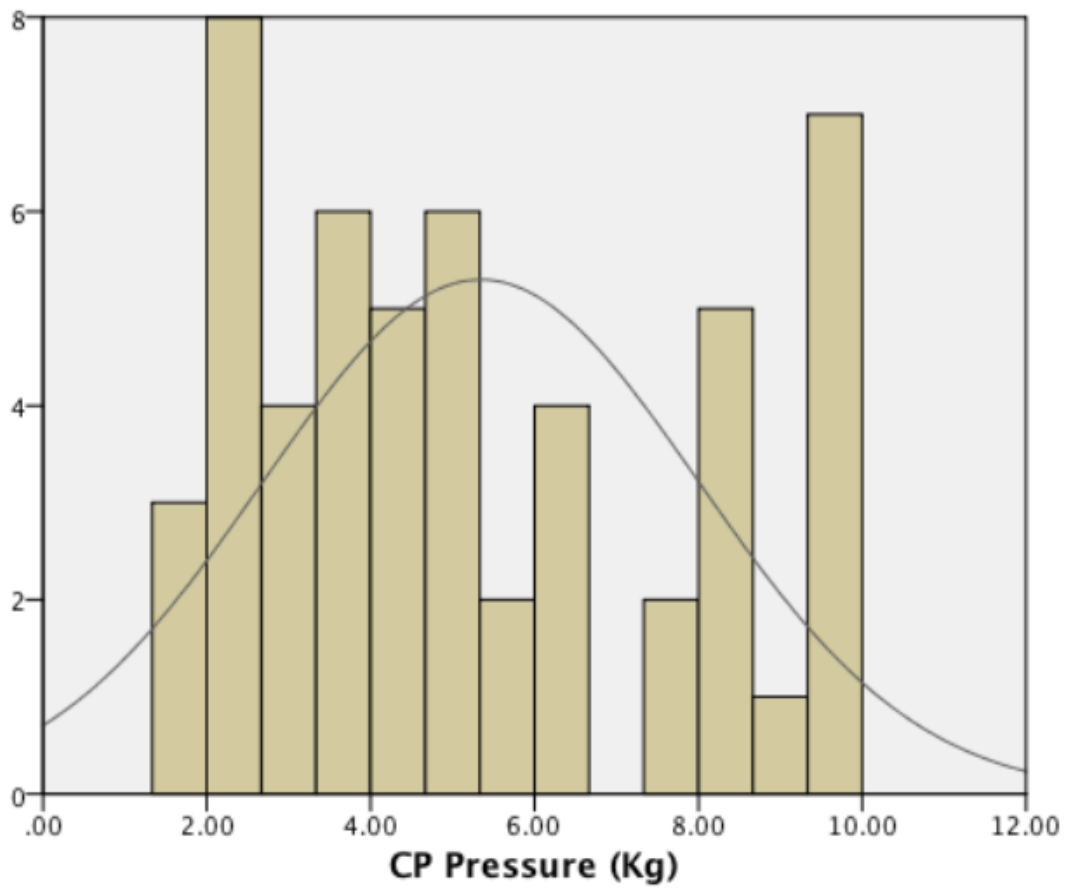
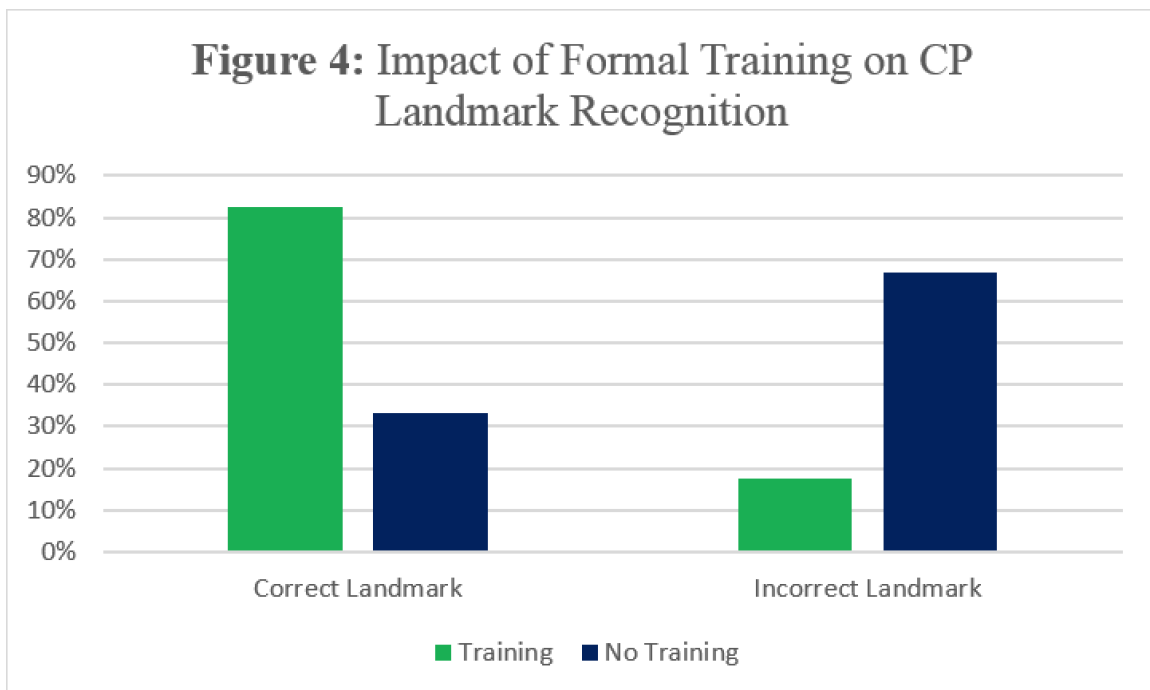
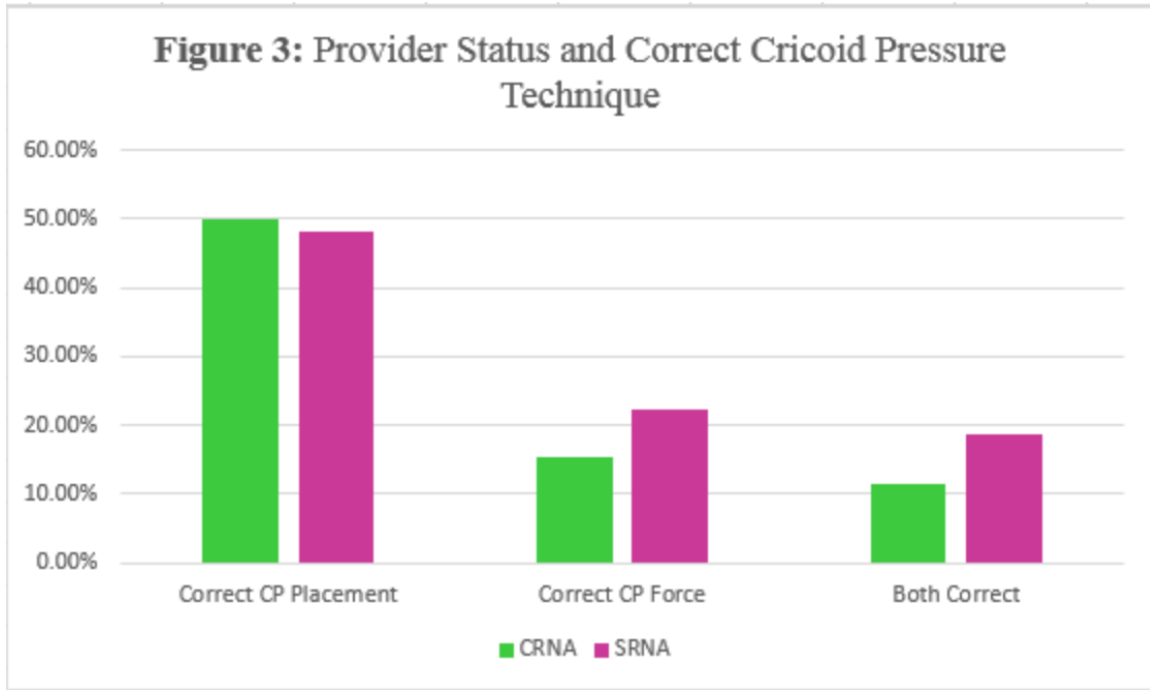
CP Simulation Model Results

Figure 2: Distribution of Force Applied on CP model



Appendix P

YouTube Analytics

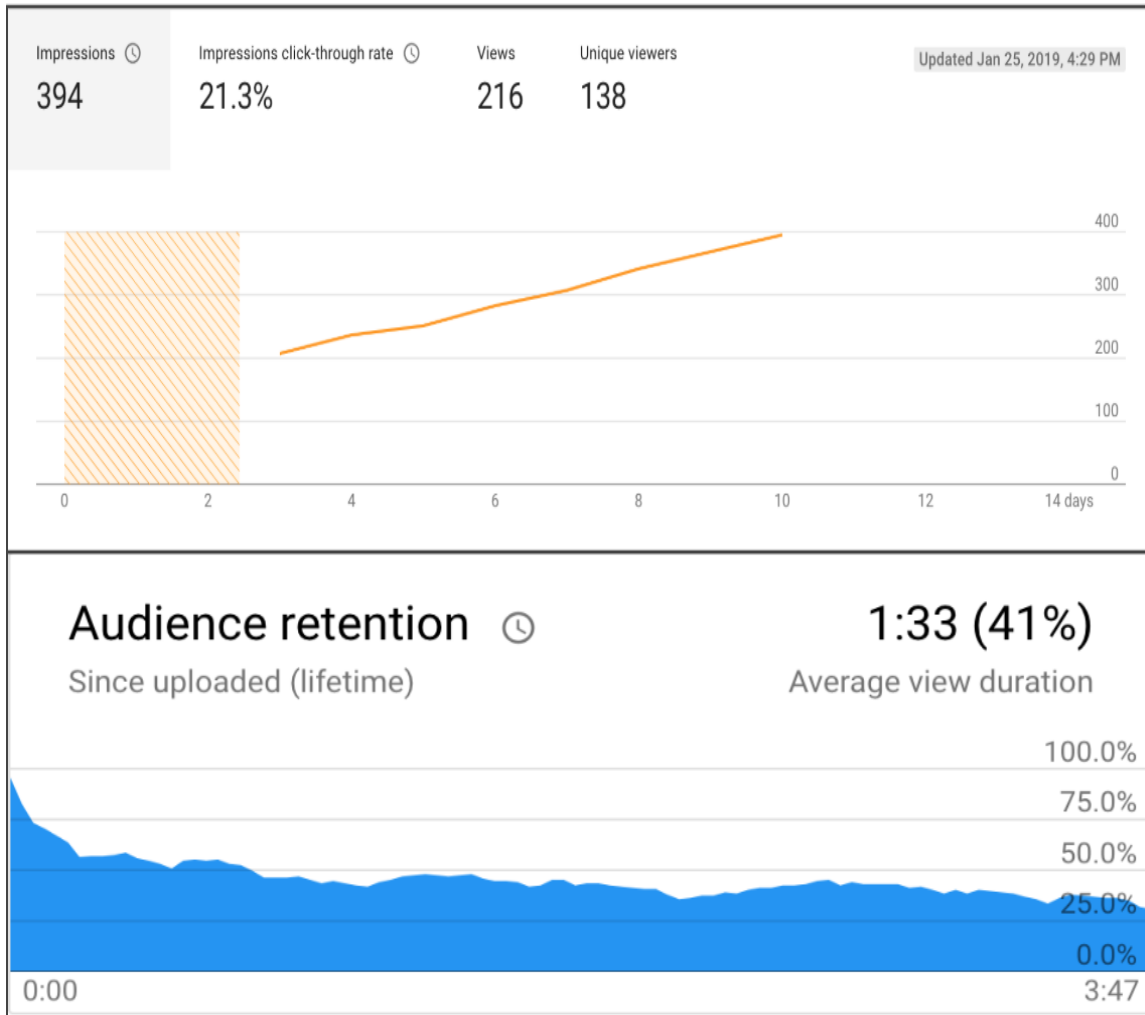
Figure 5: Total views, unique views, & average view duration

Figure 6: Likes, comments, subscriptions, demographics, and taglines

Likes	17
Comments	3
Subscriptions	3
Demographics	Unable to report
Tags	How to apply cricoid pressure? What is cricoid pressure? CP technique SRNA CRNA Anesthesia Nurse anesthesia

Figure 7: Search traffic sources

