Ultrasound Workshop: By the SRNA for the SRNA

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Abstract

Although only adopted recently, the use of ultrasound in anesthesia practice has been defined through its reduction in complications, increased effectiveness of regional anesthesia, and enhanced quality of central venous catheter placement. As noted by the Council on Accreditation (COA), Student Registered Nurse Anesthetists (SRNA's) should have ultrasound education incorporated into their curriculum for it use both in regional anesthesia as well as central venous catheter placement. The purpose of this study was to determine whether incorporating an ultrasound educational workshop for novice SRNA's at the Rutgers Nurse Anesthesia Program (RNAP) would increase their clinical confidence for the use of ultrasound in peripheral nerve blocks. Using a pretest posttest interventional study, 26 SRNA underwent a workshop consisting of both a didactic lecture and supraclavicular peripheral nerve block simulation. Confidence levels of SRNA's were shown to increase by (x) amount between the pretest and posttest in which significance level of <0.001 was found. The findings concluded that the use of ultrasound education in regards to regional anesthesia is beneficial for novice SRNA's.

Keywords: Nurse anesthetist, ultrasound, ultrasound guided regional anesthesia, ultrasound workshop, ultrasound simulation

Introduction

Developed in the late 19th century, ultrasound technology aided practitioners in their desire to visualize the inside of the human body. Originally founded to assist in the assessment of fetal health and cardiac abnormalities, ultrasound was tardily adopted by anesthesia providers. Prominently used for the insertion of central vascular devices and placement of local anesthetics for regional anesthesia, ultrasound has found a place in the everyday practice of anesthesia providers. Although a great asset for anesthesia practice, the strength of ultrasound relies on the proficiency and experience of the user to maximize the benefits of this technology (Faylar, 2010).

In this study, we examined the efficacy of whether an ultrasound educational PowerPoint module and simulation workshop would increase novice student registered nurse anesthetists' (SRNAs) knowledge and confidence in ultrasound application. The study group included second-year Rutgers nurse anesthesia program SRNAs. Findings from the study can now be used by the DNP team to evaluate the impact for such a module in the Rutgers nurse anesthesia program curriculum and how it relates to the clinical usage of ultrasound amongst SRNA's.

Background and significance

Regional anesthesia is a commonly employed anesthetic technique which provides optimum surgical conditions and enhanced postoperative analgesia. Used in combination with other anesthetic techniques or alone, the effects of regional anesthesia allow for improved outcomes with fewer side effects. According to the American Association of Nurse Anesthetists (AANA) scope of practice for Certified Registered Nurse Anesthetists (CRNA) (AANA, 2013), CRNAs contribute to the planning, initiation, management and post-operative care of patients undergoing regional anesthesia in accordance to federal and state laws as well as institutional policy. Capable of providing advanced care, CRNA's must evolve into lifelong learners becoming the forefront of evidenced-based medicine by applying the most current knowledge and safest techniques into clinical practice.

Through the evolution of ultrasound technology, the administration of peripheral nerve blocks has become a more definitive process eliminating the need for a blind landmark-based technique, allowing it to become the gold standard in regional anesthesia. With increasing evidence and advancements in technology, ultrasound use in regional anesthesia has significantly increased its safety and efficacy as compared to general anesthesia with decreased morbidity and mortality, superior postoperative analgesia, increased cost-effectiveness and improved postoperative course (Griffin & Nicholls, 2010).

The use of ultrasound guidance allows for the practitioner to directly visualize the target nerve or plane while guiding a needle in real time under observation to the desired area. Ultrasound also allows for the monitoring of local anesthetic spread following injection, ensuring its exact placement. With variations in individual anatomy, studies have shown traditional landmark techniques are not as safe or effective when compared to the use of ultrasound-guided placement (Griffin & Nicholls, 2010). According to a recent Cochrane review, the routine use of ultrasound is currently indicated for upper and lower extremity nerve blocks (Lewis, Price, Walker, McGrattan, & Smith, 2015). During this review, results concluded that ultrasound provides clinicians with a means to administer peripheral nerve blocks with a higher quality of sensory blockade, reduced local anesthetic dosage and fewer associated complications.

A longstanding argument against the use of ultrasound generally predicates on the high cost of initially purchasing an ultrasound machine. However, in a study by Sandhu et al. (2002) at Bellevue Hospital Center, they found that the use ultrasound technique to be more cost efficient when compared to a traditional nerve stimulator. In their study they found that the use of ultrasound saved approximately 21 minutes of operating room time due to quicker placement and block onset. With an estimated cost of $8.00 per minute of operating room time at this facility, it equates to a savings of $168.00 per block. If estimating an average of 5000 blocks over a five-year period at this facility, it would amount to $84,000 in savings in a year. In addition, as mentioned previously benefits of ultrasound-guided placement includes improved safety, less anesthetic use and subsequently decreased complications and litigation costs. There are even more cost-saving benefits for day surgery patients, eliminating the need for lengthy recovery periods.

With the more precise administration and an increase ease in the implementation of regional anesthesia, patients can recover from surgery faster, without the negative effects of opioid pain medication. Currently, perioperative management of patients undergoing various abdominal surgeries have shown a decrease in opioid administration during and after surgery through the implementation of transverse abdominis plane blocks. In addition, incorporating peripheral nerve blocks into the anesthetic management of orthopedic surgery has lead to lower postoperative pain score, limited opioid administration, decreased post-operative complications and shorter hospital admissions.

As the United States faces the challenge of battling the opioid epidemic, the use of these medications in the perioperative management of surgical pain has faced a great amount of scrutiny. Looking for answers, the anesthesia community has implemented a vast array of pain management modalities to limit the use of opioids. Therefore, the use of regional anesthesia has become a prominently employed technique as healthcare races to battle this horrific plague to its society. It has been estimated that the implementation of regional anesthesia has decreased the amount of postoperative opioid pain medication being required by the patient.

Problem statement

As research outcomes and provider preferences point toward a preferred use of regional anesthetic technique, a greater emphasis on education is required to ensure that proper knowledge and skill is obtained in the novice anesthesia provider. Therefore, the DNP team asked would implementing an ultrasound technology workshop utilizing simulation for the student registered nurse anesthetists (SRNAs) in the Rutgers Nurse Anesthesia Program (RNAP) help build confidence and knowledge for ultrasound guided regional anesthesia in clinical practice?

Needs Assessment

While the benefits of ultrasound technology for regional anesthesia have been defined, the education advancing these methods for current practice have not. According to the Council on Accreditation of Nurse Anesthesia Educational Programs (COA), ultrasound education should be incorporated into the course content of nurse anesthesia programs; however, the delivery of this education is not defined (COA, 2017). In addition, the COA states that Student Registered Nurse Anesthesia must perform a minimum of ten peripheral regional anesthesia techniques through a combination of simulation and clinical practice to satisfy clinical graduation requirements.

According to the American Society of Regional Anesthesia and Pain Medicine (ASRA) and the European Society of Regional Anaesthesia and Pain Therapy (ESRA), ultrasound-guided regional anesthesia education should not only include didactic learning modules but also a hands-on approach to guide practitioners in the combined use of ultrasound and needle insertion

(Sites, Chan, Neal, Weller, Grau, Koscielniak-Nielsen, & Ivani, 2009). This skill has been shown to require precise eye-hand coordination which should be established through the use of regional anesthesia simulation models (Xu, Abbas, & Chan, 2005). Simulation now stands at the forefront of this growing technique where current studies have now identified that simulation be performed in excess of 30 attempts before developing proficiency in this skill (Barrington, Wong, Slater, Ivanusic, & Ovens, 2012).

Therefore, although there is didactic education tailored toward ultrasound-guided regional anesthesia, the RNAP located at the Rutgers Biomedical Health Science campus in Newark, New Jersey does not currently have a standard method of ultrasound education incorporating simulation.

Aims and objectives

SMART is an acronym for a goal setting practice that stands for specific, measurable, attainable, relevant, and timely. Its creation is attributed to Peter Drucker's Management by Objectives strategy and is used to formulate a goal or action plan (Campbell, J., 2015).

The SMART objectives for our project:

Specific: What is the specific task?	To evaluate and assess whether an ultrasound workshop would improve Rutgers SRNA confidence and knowledge in the use of ultrasound-guided regional anesthesia.
Measurable: Metrics used to	Pre and post-surveys were used to assess any change in pre-workshop SRNA knowledge and confidence in ultrasound use compared to post-

determine if goal is met	workshop knowledge and confidence.
Attainable: Is the task achievable, how to accomplish it?	A PowerPoint lecture was created to educate RNAP SRNAs on how to interpret ultrasound basics and its use. To complete the simulation portion of the workshop, an ultrasound machine was required. Due to the outcome's significance, the lecture/workshop is now be implemented into the RNAP regional curriculum.
Relevance:	SRNAs on a daily occurrence come into clinical situations when regional anesthesia and the knowledge and skills to use an ultrasound are required. Since ultrasound is now considered the standard for peripheral nerve blocks, it is expected SRNAs will become proficient in ultrasonography for entry into practice.
Time: Start and end dates	The ultrasound workshop including the Powerpoint module and hands-on simulation lab took place on October 15th, 2018 for SRNA's who met inclusion criteria. The pre and post-assessment survey were distributed and collect both immediately before and immediately after the workshop.

Review of literature

The review of literature was conducted through databases from the Rutgers George F. Smith Library including Medline, EBSCOHOST, Cochrane, PubMed, the Cumulative Index to

Nursing and Allied Health Literature (CINAHL) was utilized. The search terms used to compile the research included, regional anesthesia, ultrasound, ultrasound-guidance, peripheral nerve block, nurse anesthesia, anesthetists, anesthesia, and simulation. This search was conducted over the period of a few months and is represented in appendix A.

With ultrasound now the gold standard in regional anesthesia, there is increasing evidence confirming the significant benefits of its use over conventional techniques such as traditional landmarking and loss of resistance. Regional anesthesia, when compared to general anesthesia, provides specific benefits; however, regional anesthesia remains less prominent than general anesthesia mainly due to its lower reliability. Due to variable anatomy in individuals, the use of landmarking techniques alone may not be favorable. With the addition of ultrasound technology, many of these shortcomings are eliminated.

Patient Safety

In a systematic review by Lewis et al. (2015), 32 randomized control trials involving the use of ultrasound for peripheral nerve blocks were analyzed for the purpose of identifying if ultrasound technology was a superior method of identifying nerves in regional anesthesia than previous traditional methods such as peripheral nerve stimulation and landmark identification. The 32 studies included in this review amassed 2844 patients and concluded that ultrasound-guided peripheral nerve blocks generated a greater number of successful sensory blockade with an odds ratio of 2.94. In addition, the use of ultrasound-guided regional anesthesia (UGRA) was less likely to require a supplemental dose of local anesthetic to maintain the blockade showing an odds ratio of 0.28. Although no study identified significant complication in any technique, it was found that UGRA was less likely to cause minor complications such as paraesthesias (odds ratio-0.42) and vascular puncture (odds ratio- 0.19). The researchers concluded that UGRA is superior to traditional techniques and routine use of ultrasound is indicated for peripheral nerve blocks. The researchers acknowledge that future research be conducted on the basis of provider skill level.

In a meta-analysis conducted by Qin and colleagues (2015), they reviewed seven randomized trials, one cohort study, and three retrospective studies. Their inclusion criteria consisted of all randomized and non-randomized clinical trials comparing ultrasound-guided axillary brachial plexus blockades to traditional approaches. In their analysis they found the success rate to be higher in the ultrasound groups compared to the controlled group, 90.64% vs. 82.21% with a total of 1992 patients ($p < .00001$). The average time to complete the block was shorter in the ultrasound group compared to the controlled group with a total of 1706 patients ($p < .00001$) and the onset of sensory time was also shorter in the ultrasound group ($p = 0.004$). The authors were able to conclude that ultrasound guidance for axillary brachial plexus block improved the success rate, performance time and onset time.

In another study by Kapral et al. (2008), similar results were found. They conducted a randomized control trial that included 160 patients who were scheduled for upper arm surgery and to receive an interscalene brachial plexus block. These patients were divided into two groups based on its guidance method, either ultrasound guided or nerve stimulation. Sensory and motor blockade parameters were measured throughout the surgery. It was found that surgical anesthesia was achieved in 99% of the patients in the ultrasound group while only 91% of patients in the nerve stimulation group had achieved the same ($p < .01$). Sensory, motor, and extent of the blockade were significantly more effective in the ultrasound group when compared to the nerve stimulation group. The authors concluded that ultrasound guidance improved the success rates and quality of interscalene brachial plexus blocks when compared with nerve stimulation technique.

Healthcare Costs

Peripheral nerve blocks have also been associated with a decreased cost of anesthesia administration. Kokulu et al. (2014), concluded that the use of a TAP block was associated with a significant decrease in the amount of desflurane used in patients undergoing cholecystectomies. Although similar amounts of fentanyl were administered during the operations, the TAP block cohort was found to have a significant decreased level of anesthetic agent utilized as well as a significant decrease for the cost of perioperative anesthesia while maintaining similar anesthetic levels through the use of bispectral index (BIS) measurements. However, the study did not take into account the cost of the TAP due to its utilization in post-anesthesia care.

In addition, due to greater efficiency gained from direct visualization of blood vessels, nerves, and muscles when using ultrasonography, it decreases the time spent on achieving proper peripheral nerve blocks. In a study by Sandhu et al. (2002) at Bellevue Hospital Center, they found the use of ultrasound to have saved approximately 21 minutes of operating room time due to quicker placement and block onset. They estimated the cost of operating room time at this facility to be $8.00 per minute, equating to a savings of $168.00 per block. Estimating an average of 5000 blocks over a five-year period based off of statistics gathered from the hospital center, it would amount to $84,000 in savings in a year.

ERAS/Opioid Sparing Effect

Regional anesthesia’s effect on patient outcomes has led to its incorporation in early recovery after surgery (ERAS) protocols. Focused around reducing post-operative pain, regional anesthetic blocks such as the transverse abdominis plane (TAP) block have been proven effective in its use for various abdominal surgeries. According to a systematic review from Tubog, Harenberg, Mason-Nguyen, and Kane (2018), which included 23 studies, identified that TAP blocks incorporated into hysterectomies have a moderate opioid sparing effect for 48 hours post operation. Lower opioid dosing in post-operative pain management through the inclusion of regional anesthesia in multimodal pain management protocols was then correlated with lower incidence of post-operative nausea and vomiting and sedation.

Furthermore, a systematic review from Xu, Chen, Ma, and Wang (2014) concluded that peripheral nerve blocks significantly reduce post-operative pain in patients undergoing total knee replacement. 23 studies were included in the review, assessing peripheral nerve blocks in 1,571 patients and its correlation to post-operative pain management. Primary results of the review found that the addition of peripheral nerve blocks decreased the level of pain at rest up to 72 hours post-surgery. In addition, pain intensity during knee movement up to 23 hours post-operatively was reduce with the incorporation of peripheral nerve blocks into post-operative management. Secondary results from the systematic review gathered that peripheral nerve blocks significantly decreased the amount of opioid administration post-operatively, as well as the delayed the timing of the first dose of opioid (Xu, Chen, Ma, & Wang, 2014). The authors of this review conclude that peripheral nerve blocks should be instituted into clinical practice for patients undergoing total knee replacement surgeries for the reduction in post-operative pain.

Education

Having examined the effectiveness of ultrasound-guided regional anesthesia as a superior method of identifying and delivering local anesthetics to peripheral nerves, the process of educating novice providers must be undertaken to provide the highest quality of knowledge in a correct manner. One method of education which has gained popularity in the medical field is the use of high fidelity simulation. With patient-centered care becoming the focus of both clinicians and healthcare institutions, the educational mindset of "see one, do one, teach them" is becoming difficult to find. In a systematic review by Issenberg, Mcgaghie, Petrusa, Gordon, and Scalese (2005), it was concluded that medical simulation allows for novice learners to obtain and rehearse patient care skills in a controlled environment; however, it cannot be substituted for real life experience. With the correct conditions such as clinician feedback, repetitive practice, increasing difficulty levels and simulation validity, high fidelity simulation becomes an irreplaceable tool to enhance the confidence, perseverance and clinical competence of inexperienced providers.

Similarly, Ortiz (2012) conducted a prospective cohort study to establish the efficacy of an ultrasound guided regional anesthesia workshop for an anesthesia residency program. Utilizing the objectives of basic ultrasound anatomy identification, application of ultrasound physic, basic ultrasound imaging skills on human models; and needle visualization skills on gel models, a workshop was developed incorporating both didactic and hands on sessions. Pre-test and post-test competencies were administered and showed a significant increase in ultrasound knowledge based upon mean test scores. Residents were then administered the same exam after one year showing similar mean test scores correlating the workshops significance for the development of knowledge retention. The author concluded that the workshop was necessary to improve the knowledge and skill set of anesthesia residents regarding ultrasound use for peripheral nerve blocks.

In addition, although simulation has become the wave of the future for medical education, it should be noted that without proper instruction prior to simulation the effect of the education become diminished. In a study by Gasko et al. (2012), the effects of an online based module in combination with simulation training were assessed for the education of CRNA's regarding peripheral nerve blocks. 29 subjects were split into three groups consisting of an online module or simulation only or in combination of both strategies. It was found that the combination of both an online module coupled with simulation has a statistically significant advantage in the education of peripheral nerve blocks for both the one-month and two-month post tests. Furthermore, it indicated that when used alone neither of these educational strategies had statistically significant greater outcomes regarding the apprehension of the education administered.

Simulation

In a systematic review by Chen et al. (2017), the effectiveness of simulation-based education on ultrasound-guided regional anesthesia was examined. Of 176 citations and 45 full-text articles, 12 studies were included in the review. Of these studies, seven that measured skill acquisition found simulation to have had enhanced UGRA more effectively than alternative methods. In two studies that examined patient outcomes, one found simulation training to have improved patient outcomes and only one study found no difference between simulation enhanced UGRA training to non-simulation based training, though this study was terminated early due to technical challenges. Overall, UGRA knowledge and skills were found to have improved much more significantly when simulation training was used compared to alternative methods.

Furthermore, in a randomized control trial from the University of Toronto 20 second-year anesthesia residents underwent UGRA education to identify if the simulation was a superior educational platform for UGRA than ordinary didactic methods (Niazi, Haldipur, Prasad, & Chan, 2012). Results of this study concluded that novice anesthesia providers learning UGRA with additional simulation training were significantly more likely to have a higher rate of successful blocks in clinical practice than those who learned with just didactic education. In addition, although this study found that double the number of anesthesia providers who underwent the simulation were more proficient at UGRA in clinical practice, the results were not significant.

The use of simulation in medical education has become mainstream in many educational programs throughout the world, however, the specifics of task-based learning for the use of ultrasound has minimal research (Niazi, Haldipur, Prasad, & Chan, 2012). However, the current research suggests that the skills associated with UGRA which have been found to be the most difficult to comprehend include the interpretation of sonography and needling. In a study from Sites et al. (2007), utilizing a quasi-experiment design, video-taped anesthesia residents performing UGRA over the course of 520 regional blocks were found to have committed 322 errors. The most common and repeated errors committed by novice anesthesia providers when providing UGRA were the inability to visualize the needle before advancing further into tissue and the unintentional movement of the ultrasound probe. As Sites et al. (2007) acknowledges, the results of this study allows for future UGRA education to focus on consistent needle imaging, visualizing the correct spread of local anesthesia, visualizing intramuscular needle tip location and direct muscle stimulation, and reducing the amount of unintentional probe movement.

Theoretical framework

The Knowledge to Action Framework (KTA) is a theoretical framework that is used to help translate knowledge into action or evidence-based practice. Created in the 2000s by Graham and colleagues, it consists of two major components. One of these components is knowledge creation, depicted as the knowledge funnel or cycle and the other is the action cycle. Each component involves multiple phases that can be conducted either sequentially or simultaneously with the ability to influence each other. The knowledge funnel is used to derive information or knowledge from primary studies (knowledge inquiry) which is then used to synthesize secondary knowledge such as systematic reviews and meta-analyses. Finally, the third phase of the funnel involves creating tools such as practice guidelines to utilize the synthesized information best. The action cycle is used to implement the knowledge obtained from the first component into practice to bring change to a targeted group or population (Graham, I., Straus, S., & Tetroe, J., 2013).

Following the KTA framework, we compiled research and data collected from the databases Medline, EBSCOHOST, Cochrane, PubMed, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) as part of our knowledge creation. Utilizing research that supports the use of simulation training in students and the benefits of ultrasound guided regional technique, we developed a PowerPoint module to educate Rutgers University SRNAs on the use of ultrasound and then reinforced their new knowledge using simulation training. Additionally, during the knowledge creation cycle of the framework we created a survey tool to measure the efficacy of our education module. The action cycle incorporates a simulation workshop which further reinforced their knowledge as mentioned previously and to evaluate whether simulation training is an effective method of education. Again, we used our survey tool to measure the efficacy of the simulation workshop. Refer to the framework in the appendix B.

Design of Project

The study consisted of a quasi-experimental pretest-posttest design. All study participants received a survey assessing their level of knowledge and comfort in the use of ultrasonography and its implementation in an anesthesia setting prior to implementation of our intervention.

Without a control group, all participants were enrolled into an ultrasound workshop which was offered to them during the fall semester of their second year in the RNAP. The workshop incorporated two portions, first a didactic lecture on the basic knowledge and understanding of ultrasonography. The lecture consisted of a PowerPoint presentation focusing on ultrasound technology, imaging, handling, dynamics and landmark identification and assessment. The second portion of the workshop was a hands-on needling simulation utilizing regional anesthesia manikins with a focus on the identification of proper anatomy via ultrasonography coupled with the proper technique and positioning of regional anesthesia needles through ultrasound guidance. Subsequently all subjects who completed both portions of the workshop received a post intervention survey assessing their level of knowledge and comfort during ultrasonography.

Setting

The study will took place at the Rutgers Biomedical Health Science campus in Newark, New Jersey. The didactic portion of the workshop was conducted in an assigned classroom for the RNAP and the simulation portion was implemented in the RNAP simulation laboratory located on the 10th floor. All study interventions were conducted during assigned classroom time and did not require additional time allotment for subjects to participate in the study.

Study Population

The study population consisted of second year SRNA's enrolled in the Rutgers University nurse anesthesia program. All participants had minimal exposure to clinical experience in anesthesia, approximately 200 hours, but had already completed the RNAP regional anesthesia course prior to participating in our study. Exclusion criteria for this study were SRNA's who had already completed a clinical rotation in regional anesthesia or those participants who failed to successfully complete both portions of the ultrasound workshop. Enrollment in this study was voluntary and the sample size consisted of 25 SRNAs.

Study Intervention

The study interventions consisting of a two-part workshop which took place on October 15th, 2018. The workshop included a didactic portion where the subjects were lectured using a PowerPoint presentation on ultrasound technology, imaging, handling, dynamics and landmark assessment (appendix C). Following the lecture subjects then participate in a hands-on simulation which incorporate the knowledge gained from the lecture coupled with real time use of ultrasonography to assist subjects in landmark identification and needling techniques for peripheral nerve blocks.

There were three ultrasound machine stations with manikins. Participants were divided into groups of four and each student had 15 minutes to practice identifying anatomy on the ultrasound (blood vessels, nerves, muscle, fat), needling, and manipulating and handling the ultrasound probe. The estimated duration of the PowerPoint lecture was approximately one hour followed by a two-hour simulation session.

Immediately prior to the didactic portion of the workshop all participants were required to complete a pre-intervention survey assessing their knowledge of ultrasonography, confidence level in application, etc. (See pre-intervention survey in appendix D). After the simulation portion of the workshop all participants were asked to complete a post intervention survey reassessing their knowledge of ultrasonography, confidence level in application, etc. (See post intervention survey in appendix E). We extrapolated and modified our surveys from a study by Keddis et al. (2011), who assessed the use of an ultrasound training module for internal medicine residents. Using a five point likert scale, Keddis et al. (2011) assessed residents confidence in ultrasound use, as well as their confidence in identifying anatomy utilizing ultrasonography. Using the data collected, we were able to determine the impact of the workshop on SRNA's knowledge and confidence in ultrasound application.

Subject Recruitment

All subjects were recruited from the RNAP through the use of a recruitment flyer (Appendix F) distributed during the September 2018 RNAP program meeting. Participation in the study was completely voluntary for all second year RNAP students who had completed the Rutgers University regional anesthesia course ANST 6006.

Consent Procedure

All participants were required to understand and sign consent prior to the individual's involvement in the study. It should be noted that no participants were at risk of injury and could have rescinded their consent and participation from this study at any time. Written consent for permission to participate in both the didactic lecture and simulation workshop was distributed immediately prior to the PowerPoint presentation on the ultrasound. Refer to written consent in Appendix G.

Subject Costs and Compensation

There was no subject costs or compensation. The study was conducted during regular classroom hours of the RNAP which did not require additional time outside of the allotted class hours.

Project Timeline

After IRB approval, subjects for the study were recruited through the use of recruitment fliers distributed to the second year RNAP students. On October 15th, 2018 subjects will then participate in the one day workshop where they will complete both the didactic portion as well as the simulation component of the intervention. Following the intervention subjects will then complete the post-workshop survey. After collection of all surveys and data, results were then analyzed for two months post completion of the study being November and December 2018. Dissemination of findings are then to be presented during the spring of 2019. Refer to Gant Chart in Appendix H.

Sources of Data

Data was obtained through the use of surveys completed by participants prior to and after the implementation of the ultrasound workshop. Focused on the assessment of knowledge and comfort with ultrasound, the survey assessed each participant utilizing a five-point likert scale. In addition, pre-survey questions assessed the prior use of ultrasound in nursing practice as well as SRNA practice.

Required Resources/Economic Considerations

All resources for this study were obtained through the RNAP at the Rutgers Biomedical Health campus in Newark, NJ. Both classroom and simulation center use were scheduled and reserved prior to the study at no cost. The study also required the use of the RNAP ultrasound machine and regional anesthesia peripheral nerve block manikins. The need for additional resources was assessed prior to implementation of the workshop and coordinated with the RNAP faculty to obtain adequate supplies for the simulation of peripheral nerve blocks.

Data Maintenance/Security

All participant and survey information were locked and stored on the 10th floor of the Bergen building inside the RNAP faculty office. Only members of the DNP team consisting of Dr. Maureen McCartney, Dr. Michael Mcloughlin, Joseph Lam, and Kyle Beuttenmuller had access to the data. All participant data was destroyed immediately after the study was completed.

No personal identifiers were collected and recorded during this study, study participants will be notified if personal identifiers are need for the success of the study.

Data Analysis

All data obtained through the pre and post surveys was statistically analyzed using the Wilcoxon signed rank test which is a nonparametric test used to measure ordinal data gathered from dependent samples. Likert scale data is considered ordinal data because it is based off of ranked categories that do not have clear differences between adjacent scores. The Mann Whitney U test is often used to measure nonparametric data, but it is also used for independent samples. In our study we are examining repeated measurements on a single sample therefore it is considered a dependent sample.

Findings

Through the pre-survey it was found the sample consisted of 25 SRNA's in which 56% were nurses with three to five years of experience. In addition, the sample of SRNA's showed that most nursing experience was from the Cardiothoracic Intensive Care Unit (CTICU) (32%), and Surgical Intensive Care Unit (SICU) (28%). As bedside nurses 14 SRNA's (56%) had experience utilizing ultrasound during their tenure. The sample also showed that 15 SRNA's had utilized ultrasound in their clinical rotations with 6 SRNA's utilizing it more than 5 times. However, 10 SRNA's in the sample (40%) had never used ultrasound in clinical practice. Out of the sample of SRNA's which had used ultrasound during clinical rotations two thirds of had only used ultrasound for the vascular access. See appendix I for pre-survey results.

Comparing results from the pre-survey to the post-survey utilizing the Wilcoxon Signed Rank test, all areas of confidence were found to have z values which represented a rejection of our null hypothesis (Appendix J). The results from each area of confidence where all shown to have statistically significant increases in confidence (p<.001). Therefore, the implementation of this workshop can be seen as a positive educational tool to benefit SRNA's in their education on ultrasound and peripheral nerve blocks.

An analysis of correlations was conducted through a spearman rho non-parametric test between years of nursing experience, ultrasound use as a bedside nurse and ultrasound use in clinical rotations with presurvey confidence levels. Significant positive correlations were found between the prior use of ultrasound as SRNA's and pre-survey confidence in ultrasound use (.431, p=0.16), confidence in identifying vascular anatomy (.508, p=.005), and confidence in needling visualization (.555, p=.002). A significant negative correlation was found between the prior use of ultrasound as a bedside nurse in relation to the preworkshop confidence level in needle identification (-.402, p=.023). Please refer to appendix K for spearman rho chart.

Recommendations and Discussion

Implications for Clinical Practice

Our results have shown an increase in SRNA confidence in ultrasound application after implementation of the workshop. With the increased utilization of ultrasound in obtaining central vascular access and regional blocks in the clinical setting, it is an important tool for SRNAs to become familiar and proficient at using. With an increase in confidence in ultrasound application we hope that the workshop not only increases SRNAs' knowledge in ultrasonography but will encourage them to utilize it more in the clinical setting.

Implications for Quality/Safety

Studies have shown that the utilization of ultrasound for peripheral blocks and vascular access allows for higher quality blocks, reduced local anesthetic usage, and fewer complications. Ultrasound is now considered the gold standard when used in conjunction for regional anesthesia and to obtain central access. It appears that is the direction the medical community is moving towards in the near future. By incorporating the ultrasound workshop into the Rutgers Nurse Anesthesia program, we hope that it will continue to help educate SRNAs and will translate to better application in the clinical setting.

Implications for Education

Currently the Rutgers Nurse Anesthesia Program contains a regional anesthesia course in their curriculum but there is no defined method of education on ultrasonography. The Council on Accreditation of Nurse Anesthesia Programs states that ultrasound education should be included in each program’s curriculum but does not specify any particular method of instruction. With the increased utilization of ultrasound in the clinical setting it is important that SRNAs are well educated and confident in its application in preparation for clinical practice. As our results have shown, the ultrasound workshop is a potential method for delivery of the required education on ultrasonography and we hope to incorporate it into the Rutgers Nurse Anesthesia program.

Implications for Economic costs

The goal of the ultrasound workshop is to increase SRNA knowledge and confidence in ultrasonography and its application in the clinical setting. While there are no direct benefits to economic costs that we can link to the ultrasound workshop, research has shown that ultrasound allows for quicker placement of peripheral blocks and improved quality of blocks leading to faster onset thus saving operating room time which translates to cost savings. With more precise administration and ease in implementation of regional anesthesia, it allows for patients to recover faster from surgery without requiring as much opioids and allows for earlier discharge eliminating lengthy recovery periods. Ultrasound also allows for decreased complications and litigation costs.

Translation and Sustainability (Plans for Future Scholarship)

With a positive correlation reflected in the study, the Ultrasound Workshop has been shown to be an effective tool for SRNA learning. By demonstrating the workshops ability to increase clinical confidence in the novice SRNA, the workshop can be incorporated into the RNAP Regional Anesthesia course (ANST 6006G). Through this incorporation, RNAP students will continue to have an increased preparation for the use of ultrasound technology and its use in Regional Anesthesia in the clinical setting.

In addition, the inclusion of this workshop into the RNAP curriculum will serve as catalyst for supplementary research on the effectiveness of simulation for the SRNA. By gaining a predefined simulation into its curriculum the RNAP can expand research to focus on the effectiveness of simulation in regards to the amount of clinical exposure to regional anesthesia and ultrasound use, as well as simulation and the effectiveness of SRNA regional blocks. These studies will allow a defined data set on how well students can incorporate skills learned in this simulation and transfer it into clinical practice.

Dissemination

Following the completion of the project, results of the findings will be disseminated to RNAP faculty and students through a PowerPoint presentation at a spring 2019 RNAP program meeting.

Professional Reporting

The results of the project are to be reported through a poster presentation at the NJANA spring 2019 meeting on April 13th, 2019 in Princton, New Jersey. Furthermore, upon completion and defense of the project it will be developed into a manuscript and applied for peer review publication in the AANA journal.

Conclusion

With the application of ultrasound advancing to the forefront of regional anesthesia and obtaining vascular access, there is a greater need for practitioners to obtain the enough skills required to utilize it. Under the AANA's scope of practice, CRNAs contribute to the planning, initiation, management and post-operative care of patients including those who receive regional anesthesia. As advance practitioners, CRNAs need to continue applying the most current evidence-based practice to provide the safest care to patients. High fidelity simulation has been shown to be an effective method of educational instruction, leading to improved confidence, perseverance, and clinical competence for inexperienced providers. By incorporating an ultrasound workshop into nursing anesthesia programs, it will help SRNAs gain the confidence and skills required to begin to effectively utilize ultrasonography in the clinical setting to bring safe and effective care to patients.

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Appendices

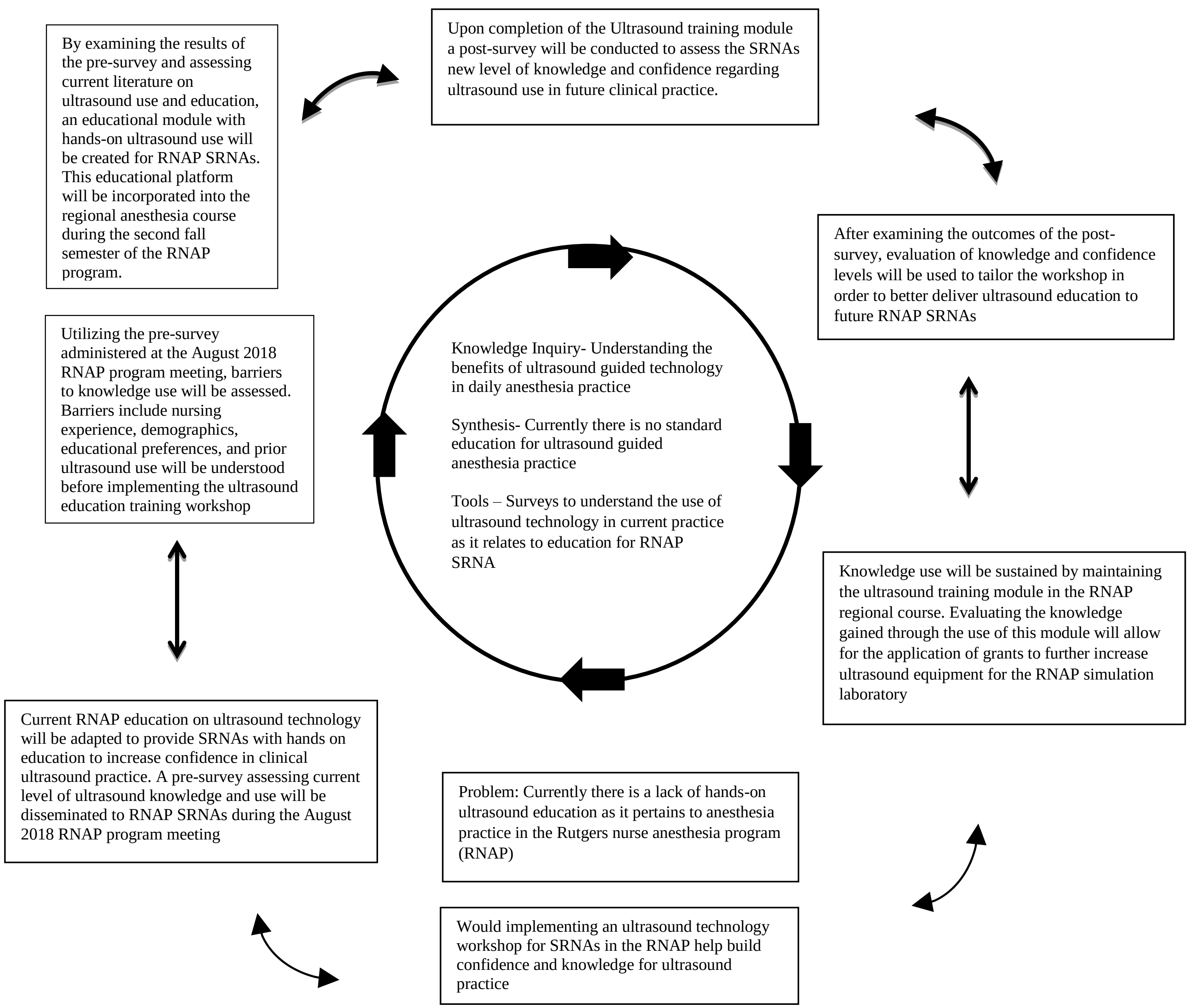
Appendix A

Date	Database	Search terms	Notes/Comments
2.11.2018	Pubmed	Ultrasound and simulation and regional and anesthesia	Yielded 58 results, 1 article relevant to our study retrieved
2.11.2018	CINAHAL	Ultrasound and simulation and regional and anesthesia	Repeated previous search on CINAHAL, found no relevant results
2.11.2018	CINAHL	Ultrasound and patient and safety and regional and anesthesia	Yielded 35 results, 1 article relevant to our study retrieved
2.11.2018	Google Scholar	Impact and ultrasound and regional anesthesia	Yielded 50,000 results, adjusted search limiting to studies after 2010. 3 articles relevant to our study retrieved
2.17.2018	Medline	Ultrasound and regional and anesthesia and opiods	Limited search to nerve block and pain management
3.03.2018	EBSCOHOST	Simulation and education and residents	Yielded 400 results, 1 article relevant to our study retrieved
3.03.2018	Pubmed	Simulation and training and ultrasound	Yielded 14800 results, 2 studies retrieved
3.04.2018	Pubmed	Regional and anesthesia and ERAS	Limited search to nerve block and pain management
3.22.2018	Pubmed	Ultrasound and	Yielded 950 results,

		education and simulation	2 studies retrieved

Appendix B

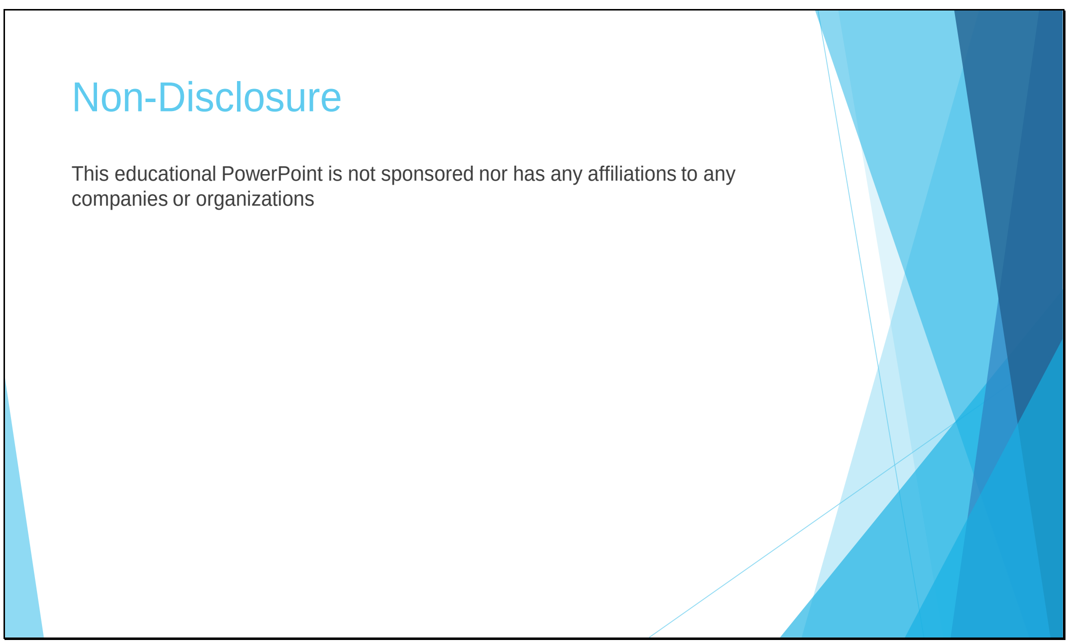
Knowledge to Action Framework



Appendix C

Slide 1

Slide 2



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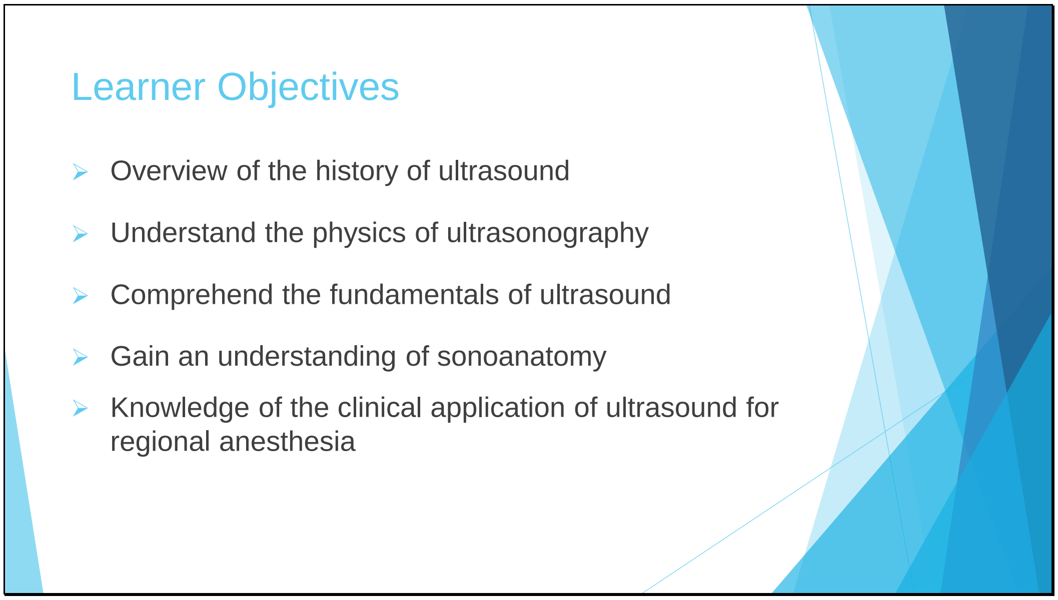

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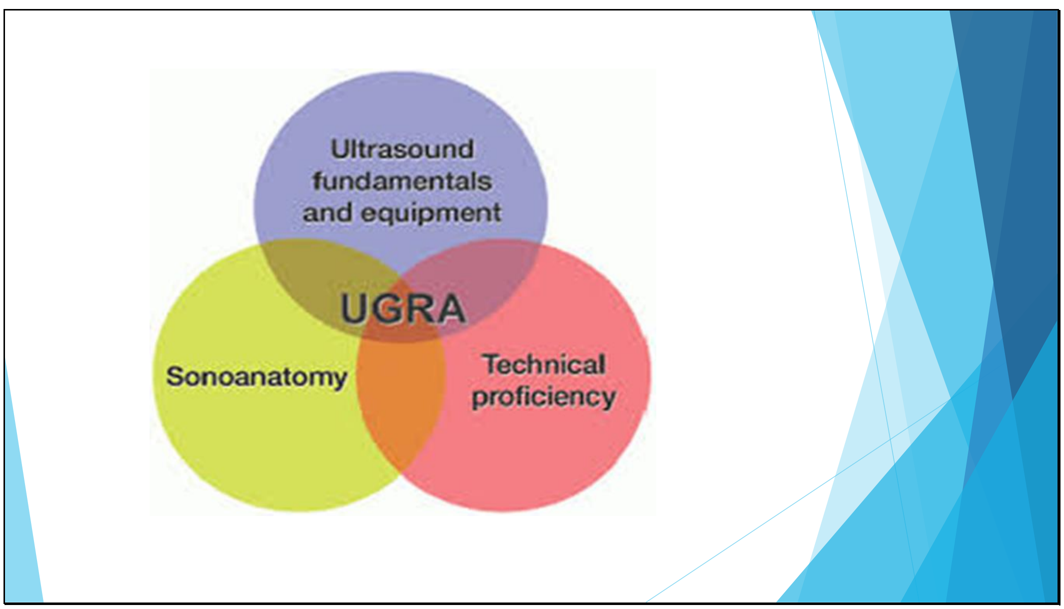


Slide 5

History of Ultrasound

- Evolved from **SO**und **NA**vigation and **R**anging technology in the late 19th century
- First described by Karl Dussik, University of Vienna neurologist
  - Utilized ultrasound to detect and locate brain tumors
- First application in regional anesthesia documented in 1978
  - La Grange and colleagues used doppler ultrasound to locate the third division of the subclavian artery for a supraclavicular block
- 1989, Ting and Sivagnanaratnam used ultrasound during a axillary block
  - Real-time imaging of local anesthetic spread described
- Today, ultrasound is used in regional anesthesia for its precise delivery of local anesthetic
  - Decrease onset of block
  - Increase block duration
  - Decrease complications

Slide 6

Physics of Ultrasonography

- Sound wave
  - Result of mechanical energy transmitted by pressure waves through matter
  - Common example, airs contact with vocal cords to produce voice
- Ultrasound occurs at a higher frequency than human hearing (20-20,000 Hz)
- Ultrasound systems create pressure waves through the application of rapidly alternating electrical fields to piezoelectric material inside an ultrasound transducer
  - Usually lead zirconate titanate
- Pressure waves produce zones of compression and decompression in a cyclical pattern
  - Repetitive nature of the compression and decompression produces a cycle
- The number of cycles that occur in 1 second is known as frequency and is measured in Hertz (Hz)

Slide 7

Sound Wave

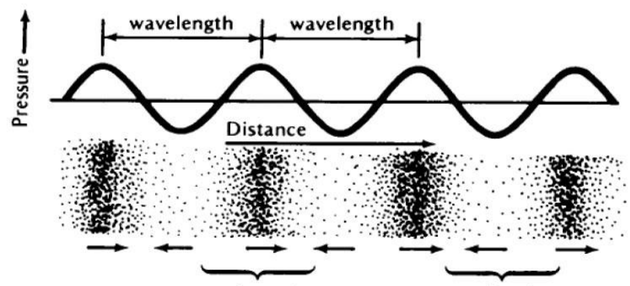
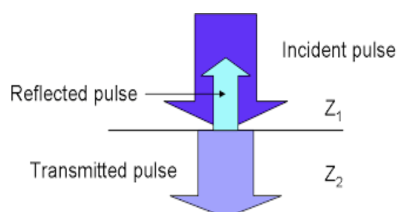


Figure 1

Slide 8

Physics of Ultrasonography

- Ultrasound beam contains energy which is transmitted through human tissue
  - Interaction of energy with tissue results in the reflection of energy back to the ultrasound systems transducer
- The ultrasound system converts reflected energy back into electrical energy
  - Results in digital image of ultrasound
- 1% of energy beam must be reflected to obtain a reasonable image
- Energy that continues on is known as the transmitted pulse
  - Transmitted to deeper tissue



Slide 9

Acoustic Impedance

- Defined as the resistance of a medium to the propagation of sound waves
- Different mediums (tissue) have different levels of acoustic impedance (see table)
- Acoustic Impedance is correlated to the amount of energy reflected back to the transducer
  - Air (minimal impedance) results in no reflection of energy resulting in poor image quality

Medium	Impedance, Z
Air	0.0004
Fat	1.38
Water	1.50
Blood	1.60
Muscle	1.70
Bone	6.50

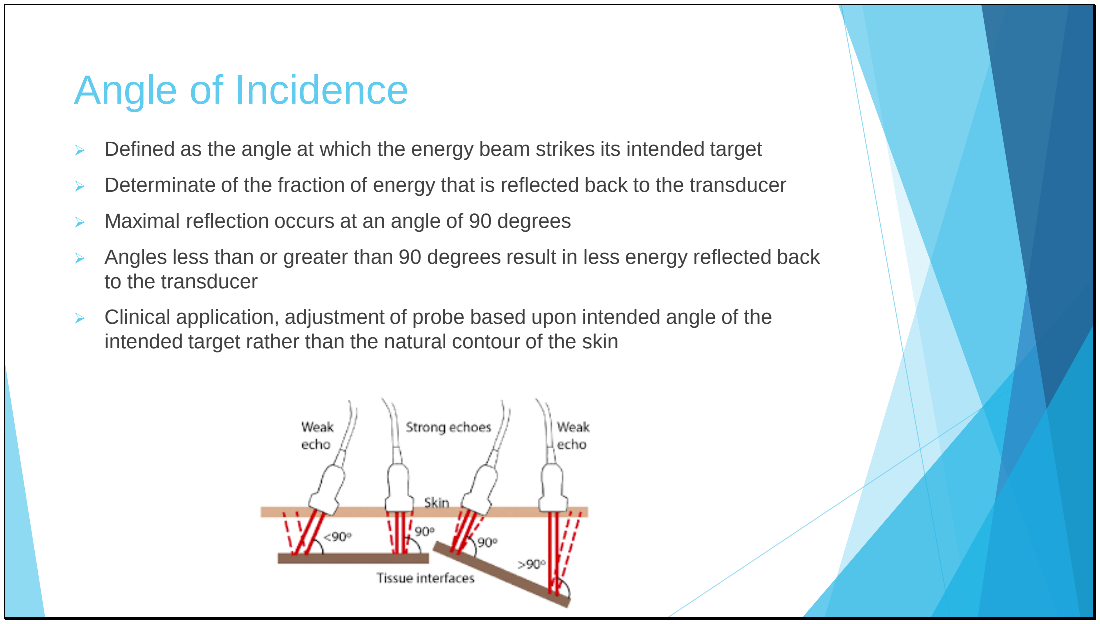
Slide 10

Attenuation

- Representative of the amount of energy absorbed by a medium
  - Measure by the attenuation coefficient which is medium specific (see chart)
- Total amount of attenuation is dependent upon multiple factors
  - Medium attenuation coefficient
  - Depth of ultrasound penetration
  - Ultrasound Frequency

Medium	Attenuation Coefficient
Water	0.0002
Blood	0.18
Muscle	0.2-0.6
Soft Tissue	0.3-0.8
Fat	0.5-1.8
Tendon	0.9-1.1
Bone	13-26

Slide 11



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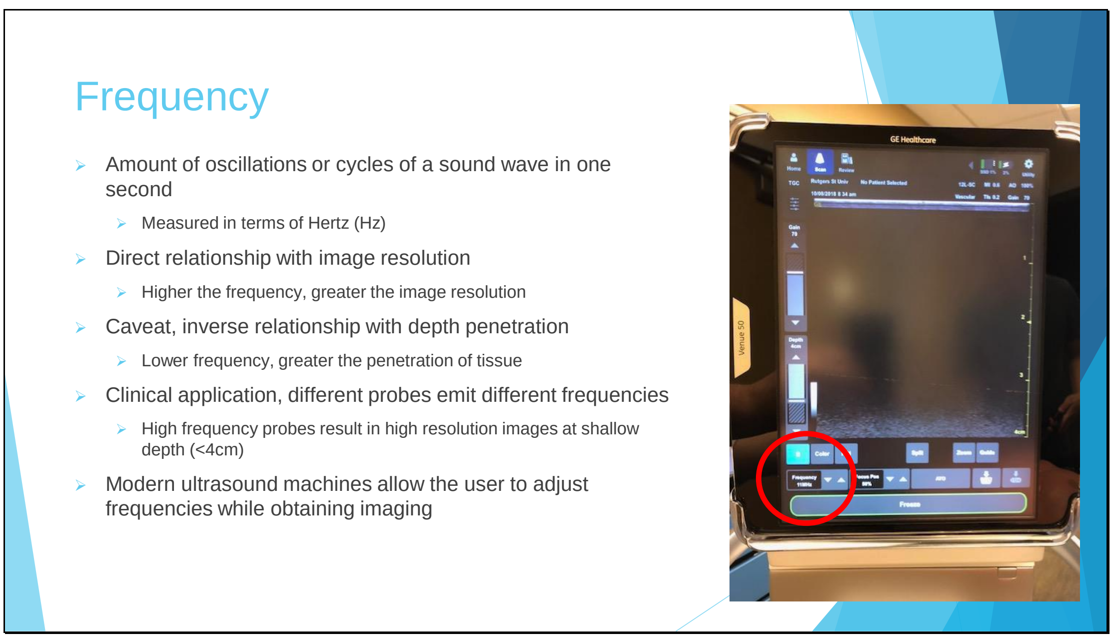
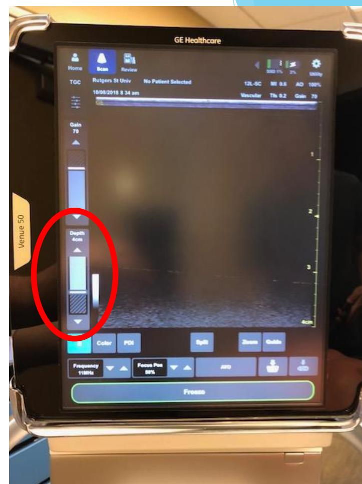


Slide 13

Depth

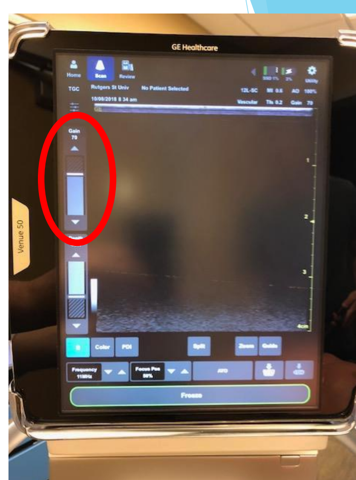
- Distance of tissue penetration measured in cm and calculated by hash markings on the side of the digital screen
- Adjustable measurement that is patient and image specific
- Depth usually adjusted accordingly to allow target tissue to be centered in the digital screen
- Upper extremity structure can usually be imaged at a depth of 2-3cm



Slide 14

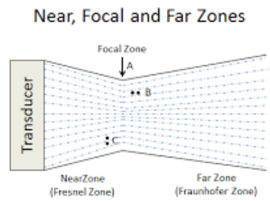
Gain

- Amplification of the ultrasound signal
  - Mathematically adjustment of the ratio of signal output to input
- Correlates to the overall brightness of the digital image
- No specific gain, based upon user preference
  - Can be adjusted during imaging



Slide 15

Focal Zone



- Ultrasound beams created 3 zones:
  - Near field
  - Focal zone
  - Far field
- Focal zone: region of greatest intensity (within 3 dB of maximum)
  - Created from the constructive interference of ultrasound waves
- Target structure should be located in the focal zone
  - Ultrasound machines allow proceduralists to adjust the zone accordingly

Slide 16

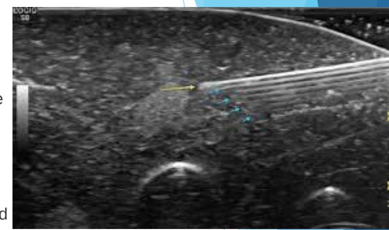
Ultrasound transducers (probe)

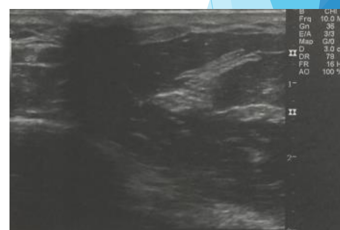
- Modern machines allow for the selection of different probes
- Three principles of probe selection
  - Frequency- Related to resolution and obtainable depth
    - Upper extremity structure easily imaged with frequencies from 7-14 MHz or higher
  - Array- Arrangement of piezoelectric crystals
    - Linear
    - Curvilinear
    - Phased
  - Footprint- Surface area of the probe in relation to skin contact
    - Patient and anatomically specific

Slide 17

Artifact

- Common disturbances in image quality that can lead to the misinterpretation of anatomy
  - Caused by equipment malfunction, practitioner error, or unavoidable interactions of ultrasound principles
- **Reverberation**
  - Identified as multiple reflections
  - Created when sound beams returning to the probe are then reflected back into the patient
  - Clinical implications: appears during needling and seen as multiple shafts in parallel
- **Shadowing**
  - "Attenuation" or "dropout"
  - Hypoechoic or anechoic zone following a hyperechoic structure
  - Clinical implications: Loss of structures deeper than needle or vessel wall or when the contact between probe and skin is poor





Slide 18

Conducting Gel

- Ultrasound frequencies used in medicine are poorly transmitted via air
- Conduction medium with similar acoustic properties of human tissue is required for imaging
- Gel displaces air and fills grooves and contours between the probe and the patient
- Can be sterilized but does not provide a antimicrobial barrier
  - Latex rubber or synthetic probe cover needed

Slide 19

Sonoanatomy Descriptors

- **Echogenicity:** Capacity of an anatomical structure to reflect back sound waves
- **Hyperechoic:** Structures that appear brighter than surrounding tissue, reflects more sounds waves
- **Hypoechoic:** Structures appearing darker than surrounding tissue, reflects less sound waves
- **Anechoic**: Absence of echoes, appearing black
- **Heterogeneous:** Variations of echogenicity
- **Homogeneous:** Lack of variation in echogenicity
- **Artifact:** False image, aberration, or distortion of the visualized anatomy
- **Interface:** Boundary of two mediums which transmit sound at different velocities

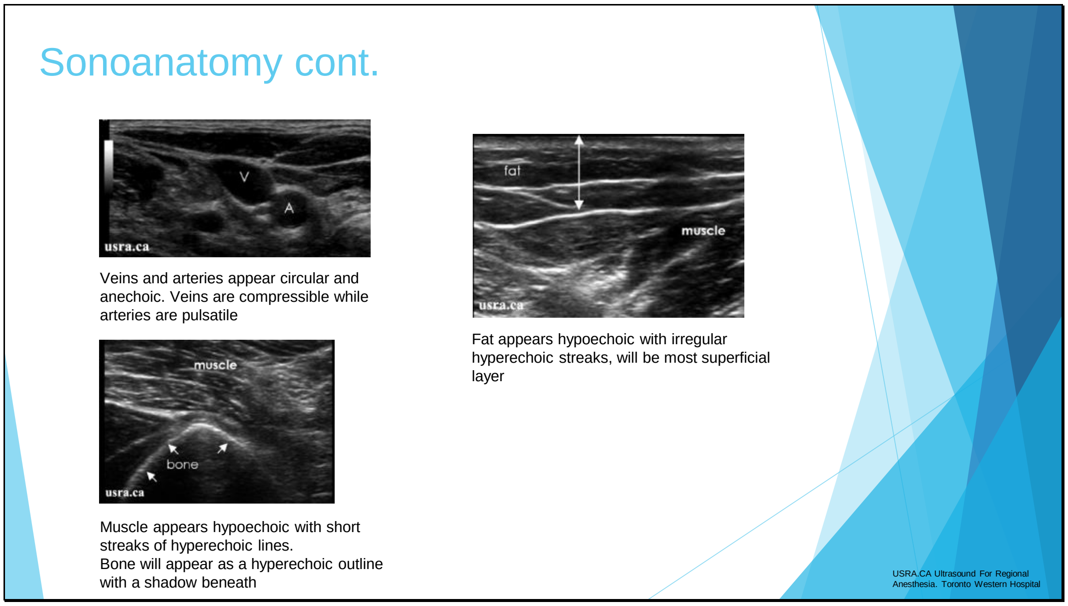
Slide 20

Sonoanatomy cont.

Tissue	Ultrasound Image For Regional Anesthesia
Veins	anechoic (compressible)
Arteries	anechoic (pulsatile)
Fat	hypoechoic with irregular hyperechoic lines
Muscles	heterogeneous (mixture of hyperechoic lines within a hypoechoic tissue background)
Tendons	predominantly hyperechoic technical artifact (hypoechoic)
Bone	++ hyperechoic lines with a hypoechoic shadow
Nerves	hyperechoic / hypoechoic technical artifact (hypoechoic)

USRA.CA Ultrasound For Regional Anesthesia. Toronto Western Hospital

Slide 21



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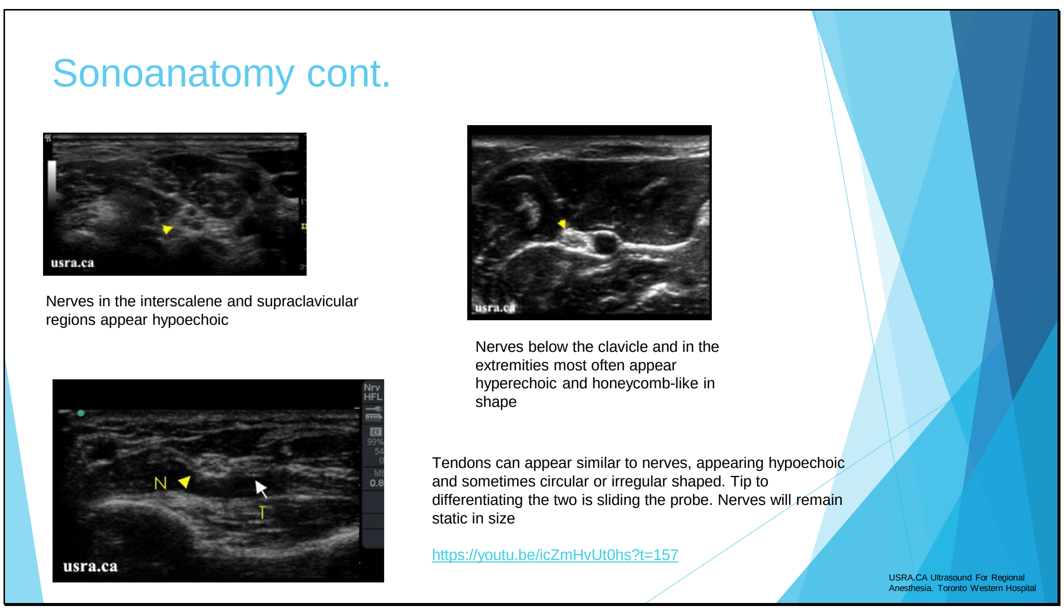


Slide 23

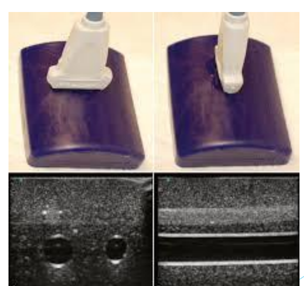
Scanning Techniques

- **Positioning-** Majority of blocks practitioner is on side of patient where block is performed. Position ultrasound display directly opposite to this position
- **Ergonomics-** Hold transducer with a relaxed grip, low on the probe and close to scanning lens. If anatomy and positioning allow, relax hand or forearm on patient for stability.
- **Pressure**- Maintain adequate pressure throughout scanning and needling to ensure proper contact between probe and patient. Utilize different degrees of pressure to assess vasculature.
  - Most common failure in novice ultrasonographers

Slide 24

Probe Orientation

- Utilize probe markings to assess orientation of ultrasound transducer to digital screen
  - If ultrasound system does not contain markings, assess orientation by tapping on transducer
- To maintain an anatomically correct position
  - Scanning in Sagittal Plane
    - Orient marking to cephalad side
  - Scanning in transverse plane
    - Orient marking to patients right
- Long-axis vs short-axis
  - Long-axis produces a longitudinal view
  - Short-axis produces a cross-sectional view

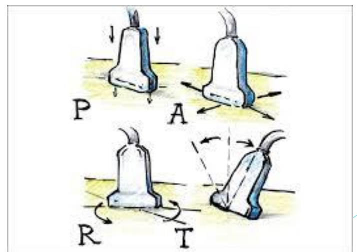


Short-axis view Long-axis view

Slide 25

Scanning Movements

- **Sliding**- Probe movement in distal and proximal fashion while maintaining angle, tilt and rotation.
- **Angling**- Movement of the probe in a tipping fashion to identify structure that do not run parallel to the skin.
- **Rotating**- Turning the probe along its long axis, utilized to assess the cross-section of anatomy and to maintain alignment with needle.
- **Tilting**- Increasing the pressure at the distal portion of the probe to improve the angle of incidence.



Slide 26

Six Essential Steps of Ultrasound Guided Regional Anesthesia

- **Preparation**
  - Positioning, equipment, monitor location, probe cover application
- **Visualization**
  - Scanning techniques allowing for optimal images of target anatomy
- **Approximation**
  - Establish puncture site and needle trajectory
    - (ie. In-plane vs. Out-of-plane)

Slide 27

Six Essential Steps of Ultrasound Guided Regional Anesthesia

- **Interrogation**
  - Utilizing nerve stimulation to determine anatomic structures
  - Inability to distinguish neural tissue
  - Poor image quality
  - Profound educational value, allows novice practitioners to visualize the motor response of targeted neural tissue
- **Deposition**
  - Placement of local anesthetic around neural tissue
  - Circumferential spread
    - "Donut sign"
- **Evaluation**
  - Assessing the onset and density of block
    - Quick deployment of "Rescue" techniques
  - Vigilance for complication

Slide 28

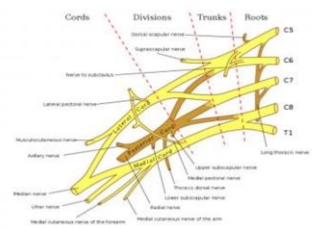
Needling

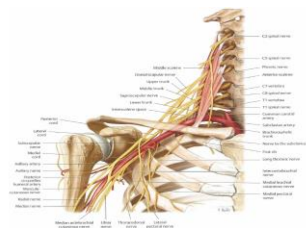
- In-plane vs out-of-plane (Approach)
  - Determines the needle path in accordance to the visualized anatomy
  - In-plane needle is parallel to transducer and ultrasound beams
  - Out-of-plane needle is perpendicular to transducer
- Regional anesthesia is commonly accomplished utilizing a in-plane view
  - Longitudinal view
  - Out-of plane view commonly used for vascular access procedures
- Obtain correct sonoanatomy and positioning of probe
- Visualize needle puncture in-line with ultrasound probe
  - Maintain probe contact during insertion
    - Important to brace hand holding probe
- Direct attention to ultrasound screen and visualize tip of needle
  - Advance needle only when visualized by ultrasonopgraphy
- Maintain visualization of entire needle and its trajectory with the intended target
  - Realign probe with needle insertion site as necessary, do not advance needle

Slide 29

Supraclavicular Block

- Provides anesthesia to the upper arm, elbow, forearm and hand
  - Due to variations in anatomy of the cervical plexus and brachial plexus, the block may provide inadequate coverage of the shoulder
  - The intercostobrachial nerve which innervates the skin of the medial side of the upper arm is not blocked
- Anatomy:
  - The block is performed at the level of the divisions of the brachial plexus
  - The trunks of the brachial plexus travel along the neck towards the clavicle where they divide into divisions, located posterior and lateral to the subclavian artery passing between the clavicle and the first rib

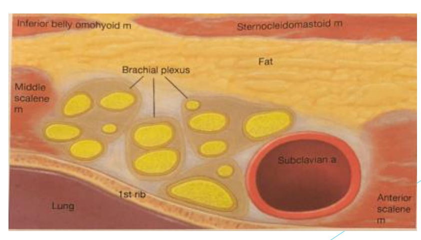




Slide 30

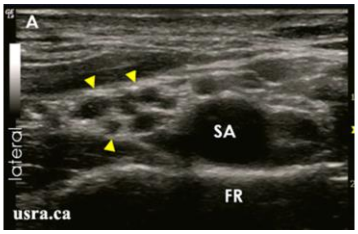
Supraclavicular Block

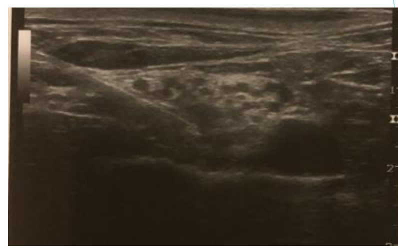
- Technique:
  - Patient is placed in a supine position with the head facing away from the side being blocked
  - The ultrasound transducer is placed in the supraclavicular fossa parallel to the clavicle and adjacent to the posterior border of the sternocleidomastoid muscle
- The brachial plexus should be identifiable slightly superior and lateral to the subclavian artery



Slide 31

Supraclavicular Block

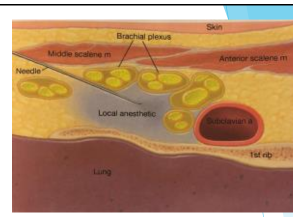




- The block needle is placed immediately lateral to the transducer and is advanced slowly using an in-plane approach (lateral to medial direction)
- The needle is advanced until the tip is adjacent to the brachial plexus. After a negative aspiration, inject 1-2mL of local anesthetic and confirm spread. Continue incremental doses up to a total volume of 20mL
  - The needle tip may need to be redirected several times in order to ensure all divisions are bathed in local anesthetic for a complete block

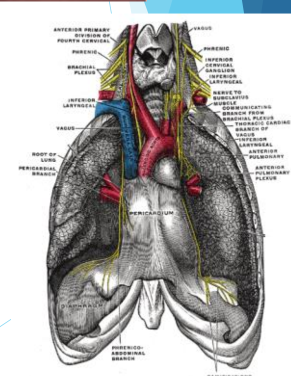
Slide 32

Supraclavicular Block



- Potential complications:
  - Phrenic nerve blockade resulting in hemi diaphragmatic paralysis
  - Sympathetic nerve blockade resulting in Horner syndrome

    (ipsilateral eye ptosis, miosis, and anhidrosis)
  - Pneumothorax
- By maintaining continuous visualization of the needle, limiting needle redirection, and keeping the needle tip above the level of the clavicle, it can help reduce the risk of a pneumothorax



Slide 33

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Appendix D

RUTGERS
School of Nursing

Pre-survey

Instructions: Please answer the following questions related to your demographic profile and previous nursing history.

Gender?

Male

Female

Age? (Circle One)

[20-24] [25-29] [30-34] [35-39] [40-44] [45-49] [50-54] [Older than 55]

Nursing unit experience? (Circle one)

MICU

SICU

CTICU

CCU

Neurosurgical ICU

PICU

NICU

Other: ___________________

As a bedside nurse, did you have experience with the use of ultrasonography?

Yes

No

As an SRNA how many times have you used ultrasound in clinical practice?

Never

Once

Two to five

Greater than five

RUTGERS
School of Nursing

Pre-survey

Instructions: Answer the following questions using a 5-point likert scale to assess your self-confidence level regarding ultrasound principals after the completion of the ultrasound workshop.

Do you feel confident using ultrasound in a clinical setting?

1. Very unconfident	2. Unconfident	3. Neutral	4. Confident	5. Very Confident

How confident do you feel at performing peripheral nerve blocks?

1. Very unconfident	2. Unconfident	3. Neutral	4. Confident	5. Very Confident

How confident do you feel in identifying vascular anatomy on ultrasound?

1. Very unconfident	2. Unconfident	3. Neutral	4. Confident	5. Very Confident

How confident do you feel in identifying nerve bundles on ultrasound?

1. Very unconfident	2. Unconfident	3. Neutral	4. Confident	5. Very Confident

How confident are you at needling under ultrasound visualization?

1. Very unconfident	2. Unconfident	3. Neutral	4. Confident	5. Very Confident

Appendix E

Rutgers School of Nursing

Post-survey

Instructions: Answer the following questions using a 5-point likert scale to assess your self-confidence level regarding ultrasound principals after the completion of the ultrasound workshop.

Do you feel confident using ultrasound in a clinical setting?

1. Very unconfident	2. Unconfident	3. Neutral	4. Confident	5. Very Confident

How confident do you feel at performing peripheral nerve blocks?

1. Very unconfident	2. Unconfident	3. Neutral	4. Confident	5. Very Confident

How confident do you feel in identifying vascular anatomy on ultrasound?

1. Very unconfident	2. Unconfident	3. Neutral	4. Confident	5. Very Confident

How confident do you feel in identifying nerve bundles on ultrasound?

1. Very unconfident	2. Unconfident	3. Neutral	4. Confident	5. Very Confident

How confident are you at needling under ultrasound visualization?

1. Very unconfident	2. Unconfident	3. Neutral	4. Confident	5. Very Confident

Appendix F

RUTGERS

Learn the basics of ultrasound!

Ultrasound Workshop: By the SRNA for the SRNA

Research participants needed!

Rutgers University School of Health Related Professions
65 Bergen Street, 10th floor
Newark, NJ 07107

This research is a quasi-experiment designed to examine the efficacy of an ultrasound education seminar including hands-on simulation on Rutgers' student registered nurse anesthetists' knowledge and confidence in ultrasound application.

- Free crash course on the use of ultrasound including hands on simulation on manakins
- Must have successfully completed Rutgers reginal anesthesia course ANST 6006
- Participants must complete both 1-hour ultrasound seminar and 2-hour hands on simulation, minimum 3 hours required

For more information call or email:
Kyle Beuttenmuller (Principal investigator)
(631) 456-0875
Kyle.Beuttenmuller@gmail.com

Or
Joseph Lam
(347) 967-6682
Jllam17@gmail.com

Appendix G

RUTGERS
School of Nursing

CONSENT TO TAKE PART IN A RESEARCH STUDY

TITLE OF STUDY: Ultrasound Workshop: By the SRNA for the SRNA

Principal Investigator: Kyle Beuttenmuller

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 to taking part 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?

Kyle Beuttenmuller is the Principal Investigator of this research study. A Principal Investigator has the overall responsibility for the conduct of the research. Other members part of this research team include Joseph Lam, Dr. Maureen McCartney, and Dr. Michael McLaughlin.

Kyle Beuttenmuller may be reached at kbb81@sn.rutgers.edu.

Kyle Beuttenmuller 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 conducted to assess the use of an ultrasound workshop and its effect on the student registered nurse anesthetist's (SRNA) confidence in clinical ultrasound use.

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

Rutgers university nurse anesthesia students who have successfully completed the regional anesthesia course ANST 6006 as well as one semester of clinical experience.

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

You have been asked to take part in this study to assess the effectiveness of ultrasound education through the implementation of a workshop and the result of ultrasound clinical confidence in the SRNA.

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

The study consisting of an ultrasound technology educational lecture and workshop will take approximately three hours to complete.

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

Participation in the study will include the active participation in an hour long didactic ultrasound lecture as well as the active participation in a hands on ultrasound simulation for peripheral nerve blocks.

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

There are no risk or discomforts that participants will experience from the participation in this study.

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:

Additional ultrasound education for the clinical application of peripheral nerve blocks.

Hands-on ultrasound use for the benefit of understanding needling techniques while performing peripheral nerve blocks.

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 alternative education experiences 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?

During the course of the study, you will be updated about any new information that may affect whether you are willing to continue taking part in the study. If new information is learned that may affect you after the study or your follow-up is completed, you will be contacted.

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

There will be no cost to take part in this study. The implementation of this study will take place during regularly scheduled classes of the Rutgers Nurse Anesthesia Program.

Will I be paid to take part in this study?

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

Who might benefit financially from this research?

There are no financially benefits from this research. This research is intended to assist the Rutgers Nurse Anesthesia Program's educational practices.

How will information about me be kept private or confidential?

There are no personal identifiers on any of the surveys. All participants will remain anonymous. All efforts will be made to keep your personal information in your research record confidential, but total confidentiality cannot be guaranteed.

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.

If you do not want to enter the study or decide to stop taking part, your relationship with the study staff will not change, and you may do so without penalty and without loss of benefits to which you are otherwise entitled.

You may also withdraw your consent for the use of data already collected about you, but you must do this in writing to Kyle Beuttenmuller.

Who can I call if I have questions?

If you have questions you can call Kyle Beuttenmuller the principal investigator at 631-456-0875

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:

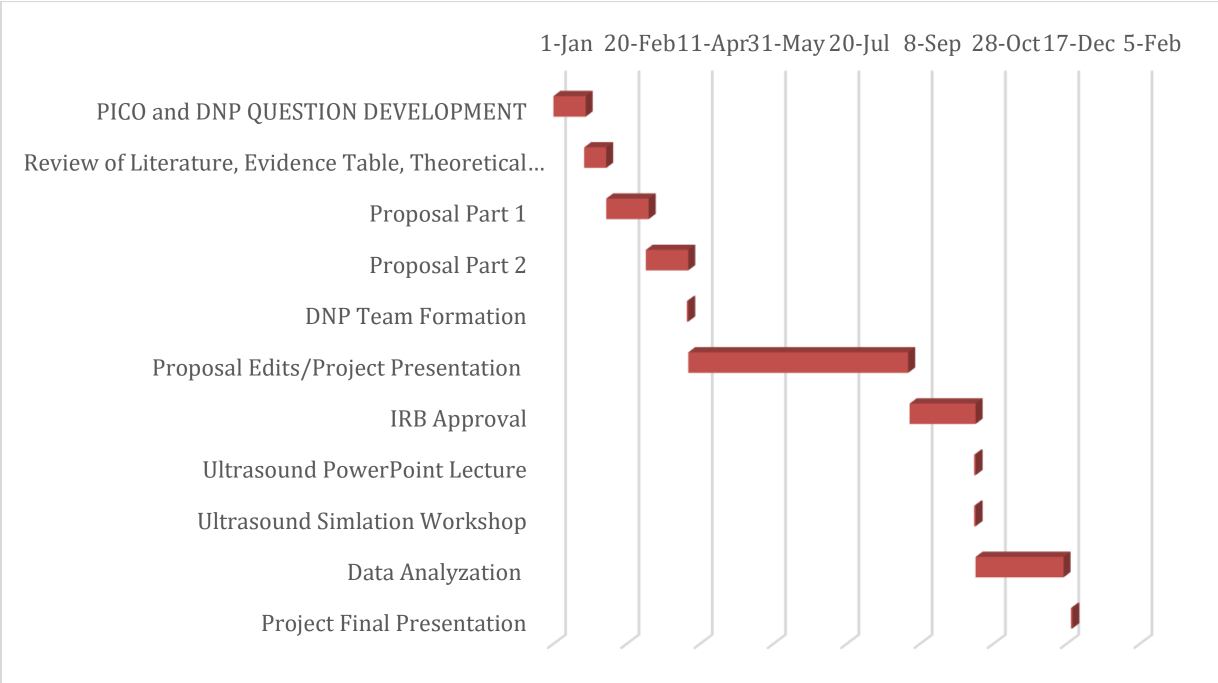
To the best of my ability, I have explained and discussed all the important details about the study including all of the information contained in this consent form.

Investigator/Person Obtaining Consent (printed name):____________________________

Signature:____ Date: ______________________

Appendix H

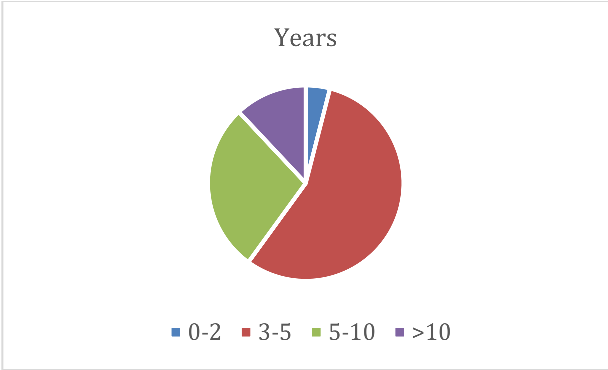
Gant Chart



Appendix I

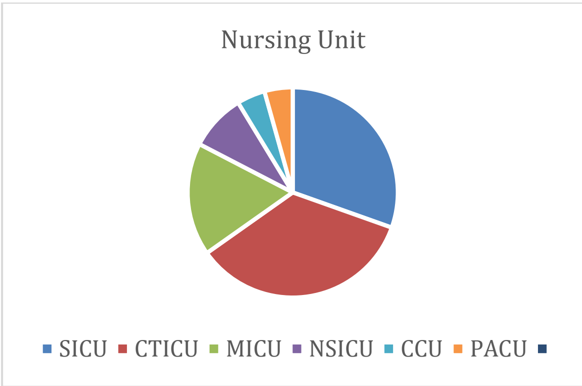
Years of Nursing Experience

		Frequency	Percent
Years	0-2	1	4.0
	3-5	14	56.0
	5-10	7	28.0
	>10	3	12.0
	Total	25	100.0



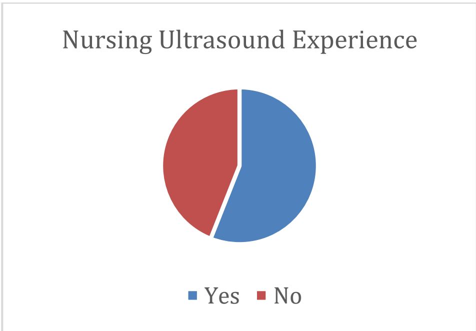
Nursing Unit

	Frequency	Percent
SICU	7	28.0
CTICU	8	32.0
MICU	4	16.0
NSICU	2	8.0
CCU	1	4.0
PACU	1	4.0
PICU	2	8.0
Total	25	100.0



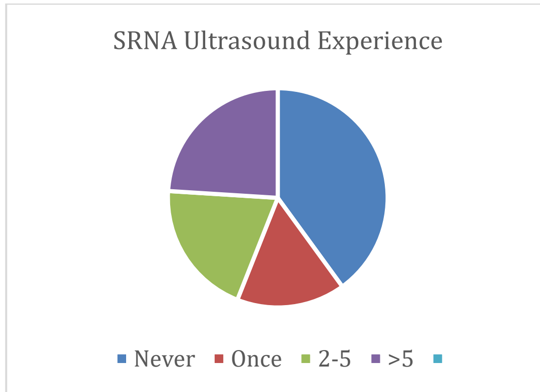
Nursing Ultrasound Experience

	Frequency	Percent
Yes	14	56.0
No	11	44.0
Total	25	100.0



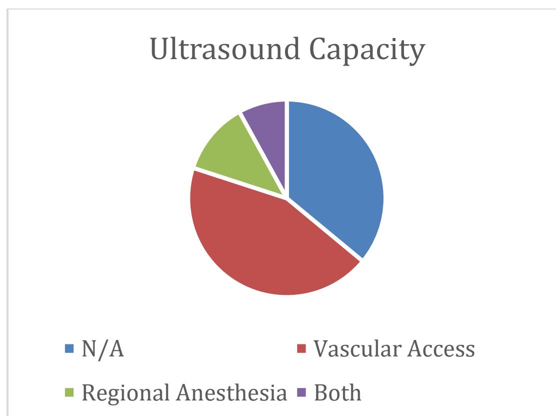
SRNA Ultrasound Experience

	Frequency	Percent
Never	10	40.0
Once	4	16.0
2-5	5	20.0
>5	6	24.0
Total	25	100.0



Ultrasound Capacity

	Frequency	Percent
N/A	9	36.0
Vascular access	11	44.0
Regional Anesthesia	3	12.0
Both	2	8.0
Total	25	100.0



Appendix J

Pre-survey Post-survey Analysis

	Q1	Q2	Q3	Q4	Q5
Z	-4.193[b]	-4.280[b]	-3.988[b]	-4.337[b]	-4.283[b]
Asymp. Sig. (2-tailed)	.000	.000	.000	.000	.000

a. Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
Posttest Q1 – Pretest Q2	Negative Ranks	0[a]	.00	.00
	Positive Ranks	22[b]	11.50	253.00
	Ties	3[c]		
	Total	25		
Posttest Q2 – Pretest Q2	Negative Ranks	0[d]	.00	.00
	Positive Ranks	23[e]	12.00	276.00
	Ties	2[f]		
	Total	25		
Posttest Q3 – Pretest Q3	Negative Ranks	0[g]	.00	.00
	Positive Ranks	20[h]	10.50	210.00
	Ties	5[i]		
	Total	25		
Posttest Q4 – Pretest Q4	Negative Ranks	0[j]	.00	.00
	Positive Ranks	24[k]	12.50	300.00
	Ties	1[l]		
	Total	25		
Posttest Q5 – Pretest Q5	Negative Ranks	0[m]	.00	.00
	Positive Ranks	23[n]	12.00	276.00
	Ties	2[o]		

	Total	25		
a. PosttestA < PretestA				
b. PosttestA > PretestA				
c. PosttestA = PretestA				
d. PosttestB < PretestB				
e. PosttestB > PretestB				
f. PosttestB = PretestB				
g. PosttestC < PretestC				
h. PosttestC > PretestC				
i. PosttestC = PretestC				
j. PosttestD < PretestD				
k. PosttestD > PretestD				
l. PosttestD = PretestD				
m. PosttestE < PretestE				
n. PosttestE > PretestE				
o. PosttestE = PretestE				

Appendix K

		Pretest Q1	Pretest Q2	Pretest Q3	Pretest Q4	Pretest Q5
Years of nursing experience	Correlation Coefficient	-.239	.101	-.236	-.091	-.065
	Sig. (1-tailed)	.125	.315	.128	.333	.378
	N	25	25	25	25	25
Ultrasound experience as a nurse	Correlation Coefficient	-.322	.274	-.271	.012	**-.402**
	Sig. (1-tailed)	.058	.092	.095	.477	**.023**
	N	25	25	25	25	25
Ultrasound experience as a SRNA	Correlation Coefficient	**.431**	-.138	**.508**	.072	**.555**
	Sig. (1-tailed)	**.016**	.255	**.005**	.367	**.002**
	N	25	25	25	25	25

Spearman’s Rho correlation