8-2008

Teaching Regional Anesthesia to Nurse Anesthesia Students

Garre! C. Kinzler

TEACHING REGIONAL ANESTHESIA TO NURSE ANESTHESIA STUDENTS

by

Garrel C. Kinzler
Bachelor of Arts, Jamestown College, 1993

An Independent Study

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Master of Science

Grand Forks, North Dakota
August
2008

PERMISSION

Title Teaching Regional Anesthesia to Nurse Anesthesia Students

Department Nursing

Degree Master of Science

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TABLE OF CONTENTS

Abstract

Teaching regional anesthesia to students who have no experience is a difficult task because there is no common frame of reference, and there are many variables to the provision of this specialized care. The purpose of this independent study was to review three of the most commonly performed blocks then prepare and deliver lessons to nurse anesthesia students which will promote their confidence and competency as anesthesia providers.

The method used was a review of literature utilizing PubMed, CINAHL, and SCOPUS databases. Current thought on preparing students for learning and performing regional methods was organized according to Malcolm Knowles' Adult Learning Theory and Andragogical Model. The principles of regional anesthesia were presented in lecture and power point format, accompanied by video review of anatomy, and then reviewed with demonstration in human anatomy lab on cadavers. The students participated in the demonstration by applying the regional principles on the cadavers to assimilate learned theory and grow in practical application.

CHAPTER I

Introduction

Nursing practice is growing more complex as time passes. Daily developments in research and technology have lead to a wealth of knowledge so vast that it has created specialties and subspecialties within each nursing field. So it is with anesthesia and regional anesthesia.

Each year nurse anesthesia students are expected to consume the knowledge foundation of the discipline, integrate this with personal professional experience and begin the clinical experience in a competent and safe manner. It is a daunting and difficult task with much at stake. Students must be of exceptional caliber and motivated. Instructors must be even more so. Their task is to instill the foundation of the discipline in students and produce able practitioners at the end of each two year cycle.

Teaching practical aspects of regional anesthesia can be especially challenging. Konrad, Schupfer, Wietlisbach, and Gerber (1998) maintain that regional skills are much more difficult to learn then those required for general anesthesia. Acquiring the skills to provide regional anesthesia takes manual dexterity, practice, repetition, knowledge of pharmacokinetics and pharmacodynamics, expert knowledge of anatomy, risks and benefits for each individual patient. How to teach regional anesthesia practically and effectively is one of the least studied areas in anesthesia education (Konrad et al., 1998).

Purpose of the Study

The purpose of this study was to examine current methods of teaching regional anesthesia and then apply them to teach basic regional anesthesia concepts to nurse anesthesia students in their first year of nurse anesthesia education. A careful review of the principles of pharmacology, instrumentation, landmarks and anatomy orientation on cadavers/models will give nurse anesthesia students a better grasp of the practical application of regional anesthesia theory prior to the beginning of their clinical experience during which they are expected to provide regional anesthesia to patients undergoing surgery. Repetition of concepts and demonstration of technical skills will better prepare students for facing the challenges of clinical practice and produce a more confident anesthesia practitioner. Ultimately, this will result in a safer, more satisfying anesthetic experience for patients.

Significance of the Study

Graduate Registered Nurse Anesthesia students are expected, under the supervision of a Certified Registered Nurse Anesthetist, to provide safe anesthesia care to patients undergoing difficult and painful procedures. As with learning any new skill, a learning curve exists that is dependent on many variables, including the practice and teaching styles of the educator and the past experiences of the student. Patient safety and comfort are of paramount importance, and for this reason alone, nurse anesthesia students must be as well prepared as possible.

Assumptions and Limitations

It is assumed that the patient's best interests are observed at all times and that safety, comfort and reaching the desired procedural goal is what the student and patient wants. In this day and age the anesthetic consumers are well informed of risks and benefits prior to any anesthesia delivery, so it stands to reason that they are competent to make their own healthcare decisions or delegate it to a well informed family member. It is assumed that the anesthesia student wants to learn and provide safe, competent care. It is also assumed that the surgeon wants a safe, comfortable and successful procedure. Limitations are imposed on anesthesia practice by the fast paced schedules of the operating room, costs, personal comfort levels and abilities of each anesthesia practitioner, and the current standards of practice. Furthermore, each student learns at a different rate and has different manual skills.

Theoretical Framework

This study is based on Malcolm Knowles (1990) adult learning theory and Andragogical model. Knowles (1990) proposes that adult learning (andragogy) is much different from the passive learning of childhood (pedagogy) and therefore should be conducted in a discrete manner. An adult is defined as a person who is responsible for their own lives and is capable of being self directing (Knowles, 1990). Adults have a need to know and more direction in their learning methods then children do. As such, Knowles follows with six assumptions that define the motivation and nature of adult learning. Each point will be developed individually.

Adult Need to Know

Adults have a reason to learn. There is a motivating purpose to learn and they will invest time and energy to accomplish the learning. Nurse anesthesia students expect to work hard to become safe, competent healthcare providers upon graduation and beyond.

Adult Self-Concept

Adults are responsible for themselves and enjoy the prestige of being seen as a responsible person. Nurse anesthesia students enjoy the challenges of a difficult and frequently changing job. The praise of being seen as someone who can "get the job done" is strong positive feedback.

Adult Experience

Adults have lived longer and had more unique experiences. Nurse anesthesia students have had common critical care and educational backgrounds, but some have worked in different nursing specialty areas or have worked and lived longer than others. The uniqueness of each individual and their experiences insures that we all bring vastly different perspectives to learning new material.

Adult Preparedness

Adults are motivated to learn by a sense of improving the quality and accomplishments of their lives. Many nurse anesthesia students see graduate school as an advancement or promotion into autonomous practice, with greater remuneration and sense of job satisfaction.

Adult Orientation

Adults approach learning from a unique perspective. Most adults pursue learning from a task-oriented perspective. Nurse anesthesia students study theory and methods to help them perform a high level of competent anesthesia care for their patients.

Adult Motivation

Adults are motivated to achieve their learning objectives by a sense of satisfaction and increased self-esteem. Nurse anesthesia students derive a sense of satisfaction from helping others, and working hard at doing their jobs well.

Definitions

For the purpose of this study the following definitions are provided:

1. General anesthesia: Using volatile agents or intravenous drugs to produce unconsciousness and anesthesia for surgery (Moore, 1965).
2. Regional anesthesia: Injecting local anesthetic agents on nerves to provide analgesia and muscle relaxation or paralysis for surgery. This anesthesia does not include loss of consciousness (Moore, 1965).
3. Peripheral nerve block: Injecting local anesthetic agents directly on peripheral nerves to anesthetize the distal nerve distribution, thereby providing analgesia and muscle relaxation. Examples would be Femoral Nerve Block to anesthetize the anterior thigh to distal knee, and Axillary Nerve Block to anesthetize the forearm and hand.

4. Local anesthetic: Injecting local anesthetic agents into surgical sites to provide analgesia (Moore, 1965). Similar to field blocks.

5. Field block: Injecting local anesthetics around a surgical site to provide analgesia (Moore, 1965). Similar to local anesthetics.

6. Local anesthetic agent: Drugs such as Lidocaine, Bupivicaine, or Ropivicaine. These drugs act on the sodium channels of nerves causing dysfunction at the motor, sensory and sympathetic levels. Used for analgesia and muscle relaxation or paralysis during surgery (Katzung, 2004).

7. Nurse anesthesia student: Registered nurses studying anesthesia at the graduate level prior to board certification.

CHAPTER II

REVIEW OF THE LITERATURE

Advantages of Regional Anesthesia

Regional anesthesia can offer many benefits over general anesthesia. According to Carpdevila and Dadure (2004) seventy percent of surgeries done in the United States are done on an outpatient basis each year, and ambulatory surgery is one area most amenable to the use of regional anesthesia. Advantages to the patients are an improved quality of recovery with less pain, less nausea and vomiting, and overall fewer hospital admissions which translates into decreased costs. Patients are able to observe the procedure and communicate with the surgeon during the procedure, choose whether they have any sedation, and mobilize sooner after surgery (Carpdevila et al., 2004). There are advantages to the surgeon and staff as well. The surgeon is able to assess function during surgery and discuss treatment options with the patient. The patient is able to by-pass phase one recovery and has a shorter recovery time. This leads to less staff requirements in the recovery room and fewer unplanned admissions (Carpdevila et al., 2004). Disadvantages of regional anesthesia would include potential nerve injury, and a reorganization of patient preparation prior to surgery. The regional block usually has to be placed ahead of time and adequate time allowed to exert its effect. There also has to be active cooperation between anesthetists, surgeons, and patients (Carpdevila et al., 2004).

As time progresses, more and more clinically complex cases are being done on an outpatient basis (Carpdevila & Dadure, 2004). Most postoperative hospital admissions occur due to pain control issues, or problems with nausea and vomiting (Chung & Ritchie, 1997; Rawal, Hylander, & Nydahl, 1997). General anesthetics involve the use of volatile agents and intravenous narcotics that can stimulate the nausea centers of the fourth ventricle of the brain and cause postoperative nausea and vomiting (PONV), often necessitating hospital admission for treatment (Hanson, 1998; Katzung, 2004). Hadzic et al (2005) reported significantly fewer regional anesthesia recipients had PONV then general anesthesia recipients who had received an antiemetic. Wiliams and colleagues (2003) reported that patients who have knee surgery were ten times more likely to be admitted for pain control if a Femoral Nerve Block was not used. A similar study by Klein and associates (2000) showed that patients who had an Interscalene Block prior to shoulder surgery rated their pain ten, on a scale of one to one hundred (no narcotic involved) versus thirty out of one hundred for those who did not have the block and were on narcotics. Guay (2006) even found that use of a femoral block during knee replacement surgery significantly reduced blood loss when compared to general anesthesia for total knee replacement. General anesthesia contributes to cognitive impairment and prolonged time to discharge for day surgeries (Hadzic et al., 2005). Cost issues are important in health care. Schuster and associates (2005) conducted a study that demonstrated regional anesthesia costs thirteen to nineteen percent less than general anesthesia for procedures less than an hour in duration. It should be noted that the longer the procedure, the less significant the cost difference. Regional anesthetics bypass all of this adversity with many advantages, and lead to a more pleasant surgical experience for the patient. Unfortunately, regional anesthesia is only used in about eight percent of ambulatory surgeries (Dexter & Marcario, 2000). As anesthesia providers it is our responsibility to zealously advocate the best anesthesia plan for each of our patients. To do this, we must focus on teaching beginning anesthesia practitioners regional anesthesia skills and techniques that will allow them to provide safe and competent patient care.

Teaching Regional Anesthesia

Bearing all of this in mind, how are we teaching our students? Konrad and associates (1998) reported that there are few studies on standards or methods for teaching regional anesthesia, and that his research showed that regional anesthesia skills differed significantly from general anesthesia skills, and were much harder to learn. This may demonstrate that the old teaching method of, "see one, do one, teach one" may not suffice anymore as there are over forty distinct regional blocks to learn and a limited amount of time and resources in educational programs and training facilities with which to practice (McDonald & Thompson, 2002; Hadzic, Vloka, & Koenigsamen, 2002). Hadzic and associates (2002) recommend continuous, repetitive exposure with consistent technique, and that all graduates should master the most commonly used nerve blocks. Students should be exposed to a variety of learning methods to include cadaver workshops, video instruction, and other methods available to facilitate learning regional skills (Broking & Waurick, 2006).

Of the many types of blocks, the following three were chosen as the most commonly used and those that offer the beginning anesthesia practitioner the most utility. The Interscalene Brachial Plexus Block is placed on the brachial plexus between neck and shoulder and is often used for shoulder surgeries and surgeries of the upper arm. It is reputed to be the most commonly used block in the world (Bollini, 2006). The Axillary Brachial Plexus Block is applied to the same nerve plexus that originates in the neck and innervates the arm, but the lower injection site in the axilla is more suitable to anesthetizing the nerve distributions of the forearm and hand, and it is used for surgeries on those areas. The Femoral Nerve Block is the most common nerve block for the leg, covering nerve distributions of the anterior thigh and knee. This block is frequently used in knee surgeries, including arthroscopy and total knee arthroplasties and will be used often by the anesthesia practitioner for analgesia postoperatively.

The Interscalene Brachial Plexus Block

The brachial plexus arises from the spinal cord at the levels of C5, C6, C7, C8, T1 and has accessory nerves from C4 and T2 that contribute to it (Morgan, Mikhail, & Murray, 2006). It comprises the entire nerve distribution for the arms including sensory and motor functions. This plexus runs down the neck under the scalene muscles in the same sheathe as the subclavian artery and vein, under the clavicle and out the ventral axilla under the pectoral muscles (Netter, 1989). The Interscalene Block, first described by Winnie in 1970, anesthetizes this nerve distribution at trunk level on the lateral neck between the anterior and middle scalene muscles, between the level of C6 (cricoid cartilage) and just proximal to the clavicle. The plexus is very superficial here, and lies just below the skin at about three centimeters above the clavicle (Hadzic, & Vloka, 2004; Bollini, 2006).

Identification of landmarks is vital in proper placement of any regional anesthesia block. Proper positioning prior to landmark identification makes identification much easier. For an interscalene block, the patient should be supine, on a bed without a pillow, head turned away from the operative side. The scalene muscles are accessory respiratory muscles with incepts on the the upper neck and ribs, and lie between the sternocleidomastoid and the trapezius muscles. Further neck muscle identification is facilitated by having the patient inhale or sniff forcefully in the nostrils, or lift the head off the bed. These maneuvers make the scalene muscles more visually identifiable and easier to palpate (Miller, 2005). Once proper landmarks are identified, the b-bevel needle is placed perpendicular, and slightly caudad through the skin. A nerve stimulator is used to elicit a muscle twitch and if it occurs anywhere from the deltoid on down to the fingers, placement is correct. Aspiration is performed to prevent systemic injection of toxic doses of local anesthetic agent into the vascular system, and a two milliliter test dose is injected, which should abolish the twitch. Injection of thirty milliliters of Ropivicaine 0.5% five milliliters at a time, with aspiration before each injection, will affect the block. Recently Ropivicaine has become more popular then Bupivicaine as it is less cardiotoxic (Karaca, Hadzic, & Vloka, 2000). Correct placement of the local anesthetic can be evaluated by several signs. Interscalene tumor after injection forming a triangle is an encouraging sign, as is vasodilation in the affected extremity. A transient wince upon initial injection indicates the nerve is being injected on, and is an encouraging sign. When switching syringes a pulsation in the needle tubing that follows the heart beat is also encouraging, demonstrating proper placement in the nerve sheathe in proximity to the pulsating artery (Bollini, 2006). After a few minutes the patient should not be able to lift the arm from the bed at the shoulder. This movement should be assessed prior to the block to be sure the patient can do this prior to injection.

There are many details that contribute to a successful nerve block. Use of b-bevel needles which have a shorter bevel help avoid piercing the nerves during needle placement. Knowing surrounding anatomy also contributes to the success of the block. Placing the needle too far anterior elicits a hiccup type diaphragmatic contraction, too far posterior stimulates the trapezius muscles causing a shoulder shrug type movement. The needle should never be inserted at a cephalad angle, as the risks for intrathecal injection in the root sheathe are greater and could cause a high spinal block in the patient, including seizures, cardiovascular collapse and death. Use of mild sedatives, but not heavy sedation, prior to placing the block allows the patient to relax. Heavy sedation is to be avoided as it could mask direct nerve paresthesias caused by placing the needle in the nerve itself. Small doses of Versed and Fentanyl facilitate patient comfort, positioning, and block placement (Vries, 2007).

The use of a nerve stimulator is preferred today over the use of paresthesia techniques from the past. The risks of permanent nerve damage by piercing are minimized with the use of nerve stimulators (Hadzic, & Vloka, 2004). The initial setting should be at one milliampere, and after the desired twitch is located, the amperage should be decreased below four tenths of a milliampere to insure proper placement in the sheathe next to the nerve. If the twitch continues below two tenths of a milliampere, the needle should be withdrawn one millimeter and the amperage checked again until the desired twitch is elicited to prevent intraneural injection and subsequent nerve damage (Miller, 2005). Addition of epinephrine 1:1000, one tenth of a milliliter per twenty milliliters of local anesthetic agent produces the desired 1:200,000 strength desired to keep the agent from systemic absorption (Moore, 1965).

This approach to the brachial plexus tends to miss the some of the superficial cervical branches that arise above the brachial plexus, so a subcutaneous ten milliliter field block is often done v-shaped along the clavicle and extending posteriorly to properly anesthetize these cutaneous nerves for surgery (Vries, 2007). The interscalene approach also misses some of the C8, T1 innervation due to the vertical distribution of the nerves in this area, thus it oftens fails on the ulnar side of the arm (Vries, 2007).

Other blocks that can be used to anesthetize the brachial plexus nerve distribution include the paravertebral cervical block and the intersternocleidomastoid supraclavicular block. The risks of pneumothorax and increased degree of technical difficulty of these blocks has led to the interscalene approach being the most popular (Tran, Clemente, Doan, & Finlayson, 2007).

Potential side effects of this block include phrenic nerve involvement which can be dangerous in compromised patients such as those with lung disease, as it limits diaphragmatic excursion. Additionally, Horner's Syndrome presents with ipsalateral facial droop, diaphoresis, and rubor, and Bezhold-Jarrid reflex, a response to the epinephrine that causes bradycardia in response to increased inotropy may occur. Overall this approach to the brachial plexus is safe and effective. Bishop and colleagues (2005) reported a 97% success rate with no occurrences of pneumothorax or nerve damage.

The Axillary Brachial Plexus Block

First used in 1884 by Halstead, the Axillary Block focuses on injecting local anesthetic agent into the nerve sheathe in the axilla and is used to anesthetize the forearm and hand for surgery. This block also anesthetizes the brachial plexus, but exerts its effects further down the nerve distribution at the level where the nerves divide into terminal branches. (Monkowski, & Larese, 2006; Turkan, Baykal, & Ozisik, 2002). The level of the injection on the brachial plexus determines the pattern of the block, and each individual nerve can also be blocked distally as an adjunct to the brachial plexus block or as a sole regional technique (Vries, 2007). The axillary block has become more popular because it carries less risk of complications as compared to the other brachial plexus approaches (Monkowski, & Larese, 2006). The axillary block has been widely studied with comparisons made between approach techniques, the number of injections made, and the volume needed to complete the block (Perris, & Watt, 2003; Turkan et al., 2002; Handoll, & Koscielniak-Nielsen, 2006) . The current consensus is that the most effective axillary blocks are done using nerve stimulators and multiple injection techniques. Karaca and colleagues (2000) have found that the transarterial injections can have a failure rate as high as twenty percent in some instances. Tran and associate's (2007) recent study showed that blocks using the fascial click method failed thirteen percent of the time versus zero percent for the nerve stimulator method. Individual variation and the effects of fascial septa influence the success or failure of this block. The median, ulnar, and medial antebrachial cutaneous nerves all course through the nerve sheathe where this block is placed.

To begin an axillary brachial plexus block, the patient is placed supine with the operative arm extended perpendicular to the body, elbow flexed ninety degrees. The axilla should not be extended greater than ninety degrees as this causes the nerve sheathe to pinch and prevents cephalad spread of the anesthetic after injection (Miller, 2005). The most important landmark sought is the axillary artery in the fold of the axilla. To ensure proper palpation, an oximeter is placed on the patient's finger on the operative side, and proper palpation should produce a blunting of the oximeter waveform (Okuda, Kitajima, & Asai, 1997). The nerve stimulator should be set for one milliampere, and injection should be made at the upper margin of the axillary artery with the intention of piercing the sheathe, but not the artery. Probing, in a single plane, fanwise pattern, is done until a stimulus is produced on the hand and maintained down to four tenths of a milliamp on the stimulator. If the stimulus persists down to two tenths of a milliamp, the needle is probably in the nerve and should be withdrawn and the muscle response reassessed. Once the stimulus is found, careful aspiration must be performed to insure the needle is not intravascular, then a two milliliter test dose given. If placement is proper the stimulus will be abolished. Injection of twenty milliliters of 0.5% ropivicaine with 1:200,000 epinephrine is done five milliliters at a time with aspiration between injections to prevent vascular placement. After injection is completed, a second injection is quickly done at the lower margin of the axillary artery and probing is done downward in a single plane, fanwise fashion in an attempt to elicit a second nerve stimulus whereupon ten milliliters of 0.5% ropivicaine with 1:200,000 epinephrine is injected after careful aspiration.

The musculocutaneous nerve exits the sheathe early, often above the axilla, so it is necessary to inject an additional five milliliters of 0.5% ropivicaine with 1:200,000 epinephrine into the middle of the proximal bicep or under the body of the bicep at the middle of the upper arm. This will provide a block for the dorsal aspect of the forearm and hand. Tourniquets are often used for distal arm surgeries, and a field block on the medial and dorsal upper arm with ten milliliters of 0.5% ropivicaine with 1:200,000 epinephrine will cover the T2 nerve distribution that transmits tourniquet pain. Perris and Watt (2003) maintain that it is difficult to reach the ulnar distribution with this block, and it does not constitute a failed block. A "touch up" injection of five milliliters of 0.5% ropivicaine with 1:200,000 epinephrine just proximal to, but not in, the ulnar sulcus at the elbow will cover the remainder of this distribution.

Generally five to ten milliliters of local anesthetic is used per nerve in performing an effective block to this highly sensitive area. Surgeons are big proponents of this block, especially when work is done on bony tissue, which is more painful then soft tissue (Perris, & Watt, 2003). The major adverse effect is arterial or venous puncture. The remedy for this is to hold direct pressure for five minutes to prevent hematoma formation.

The Femoral Nerve Block

The Femoral Nerve Block is a simple and effective block for procedures on the anterior thigh and knee. Today, with the high incidence of obesity and joint replacements, it is a useful block for the older and high risk populations as both the anesthetic plan of care, and as postoperative pain control. It is also effective for reduction of PONV, and for reduction of blood loss (Kendrick, Weis, & Perry, 2003; Duarte, Fallis, Slonowsky, Kwarteng, & Yeung, 2006; Guay, 2006).

The femoral nerve lies in the same sheathe as the femoral artery and the femoral vein at the level of the inguinal fold. They are arranged, medial to lateral, in the order of vein, artery, and nerve. The major landmarks for this block are the inguinal fold and the artery itself. The femoral nerve lays one to two centimeters lateral to the artery. The pitfall of this block is the sartorius nerve branch that arises from the femoral nerve and innervates the medial leg muscles. After locating and identifying the insertion site, the needle is angled forty-five degrees in an attempt to pass over the sartorius branch and reach the underlying femoral nerve. A nerve stimulator is used, with settings again at one milliamp, to elicit the contraction of the quadriceps that crosses the knee cap. Once this response is found and sustained down to four tenths of a milliamp, aspiration is checked, and a two milliliter dose given which should abolish the response. Twenty or thirty milliliters of 0.5% ropivicaine with 1:200,000 epinephrine are injected in the five milliliter incremental fashion.

The most common adverse effect associated with this block is femoral artery puncture. The remedy is direct pressure over the puncture for five minutes.

CHAPTER III

METHODOLOGY

Arrangements were made between the College of Nursing and Anatomy & Cell Biology staff to teach a lesson on brachial plexus anesthesia using handouts, power point presentation, and cadavers to simulate placing an Interscalene and Axillary block in a realistic manner. Anesthesia students were given lesson objectives, lecture, video material to view, handouts to read, then taken into the cadaver lab. Demonstration of the blocks was done by the author, with emphasis on landmarks, technique, equipment, and possible adverse effects. Each student was then asked to simulate the blocks on the cadaver.

The obstacles encountered were schedule conflicts among instructors and technical problems with computerized remote testing equipment. Flexible scheduling of class and instruction on the test remotes resolved the problems.

Successes were evident. The students enjoyed the hands on application of skills they had only read about in the past. Staff being present to demonstrate on cadavers and answer questions boosted learning. The demonstration of skills facilitated the application of theory to practice and cemented the rudimentary regional skills for the students. The students were interested and highly motivated to achieve the lesson objectives. Most expressed the confidence to perform these blocks in the clinical setting after the experience.

CHAPTER IV

FUTURE ANESTHESIA CONSIDERATIONS

Anesthesia educators should organize and plan regional anesthesia education utilizing the recommendations for repeated exposure and minimum block requirements for all students. This plan should be specific regarding the number and type of block to be performed and the degree of difficulty of these blocks. Hadzic, Vloka, and Koenigsamen (2002) have compiled many blocks in three groups according to level of technical difficulty. Basic blocks include axillary blocks, intravenous regional blocks, digital blocks, lumbar spinal and epidural blocks. Intermediate blocks include the interscalene block, posterior sciatic block, and femoral block. The advanced blocks include continuous blocks, lumbar plexus blocks, anterior sciatic blocks, and cervical epidural blocks. There should be a determined minimum number of blocks from each category, with emphasis on a minimum number of each of the Interscalene, Axillary and Femoral blocks. Students should be coached by an experienced mentor until they achieve consistent success in block application, and the mentor approves of their technique (Hadzic et al., 2002) Following this, lesson plans and clinical rotations should be planned accordingly.

Summary

Twelve students (*n=12*) were evaluated with the same test given at the beginning of the semester and repeated after the lesson. Questions included anatomy, pharmacology, technique and adverse effects. Results were reviewed using the paired t test and showed significant learning had occurred (P=<0.001). Pretest mean scores were 6.583 out of 20 questions with standard deviation of 3.059. Posttest mean scores were 16.833 with a standard deviation of 0.389. Normality was established with the Kolmogorov-Smirnov normality test P=0.151.

This independent study reviewed the current consensus on teaching regional anesthesia. The consensus believes there is a lack of research and standardization in teaching our students basic and advanced regional anesthesia. The literature supports an effort at standardizing the numbers and types of each block to be completed during the anesthesia clinical, and all agree that a consistent approach by an experienced provider will be the most beneficial to training competent anesthesia practitioners. The method most recommended was repeated exposure to regional methods in a multiformat approach with as much hands-on experience as possible.

Final Recommendations

Recommendations are suggested that each student be required to perform a minimum number of successful regional blocks under the tutelage of an experienced anesthesia practitioner. The most effective method of teaching regional anesthesia is a repetitive and consistent approach, using lecture, visual aids, demonstration, and practice in cadaver labs.

Nursing Practice, Research, and Policy

Nurse anesthetists should endeavor to maintain the high standards of quality practice that has defined the profession. New research should be reviewed periodically to stay abreast of new changes in technology and drug development in this rapidly changing clinical environment. Those anesthesia practitioners who have expertise in the field of regional anesthesia need to step forward and assume teaching and leadership responsibility for students and peers in the profession. In the same manner that peer reviewed practice serves to maintain standards, peer teaching can also maintain practice standards.

Recommendations for research would include determination of minimum numbers of each type of block students should perform to gain consistent competency, and what should define consistent competency. Would a ninety percent successful block rate suffice? Knowles theory states adults are intrinsically motivated to learn and achieve as part of their personal concepts. With this in mind, nurse anesthetists always strive for the best possible result.

There should be a concerted effort at developing graduate and post-graduate elective courses in regional anesthesia and a formal doctoral degree for nurse anesthesia programs that would facilitate heuristic research in the distinct field of nurse anesthesia. Once the education structure has been established the momentum of the educational field will provide research to guide practice, and practice to suggest directions for further research. This will add to the profession's identity, power base, and credibility.

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