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Local Anesthesia in Dental Hygiene Education

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THESIS

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DEDICATION

I dedicate this thesis to:

First and foremost my parents, David and Romona Barnaby, who always challenged me to continue further in my educational goals, and supported me through their love and prayers.

My husband Matthew, for his continued support, encouragement, and love. You and only you, forever and ever, promise promise.

and

To my first employer L. Paul Balderamos, DDS MS for his willingness to teach me and mold me into a healthcare provider that is always striving to improve myself and my skills and for fully supporting and promoting my desire to continue in my dental hygiene education.

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ABSTRACT

Purpose: The purpose of this study was to determine the following: 1. What is the level of education in local anesthesia/pain control courses for dental hygiene programs in the United States. 2. Does the level of local anesthesia/pain control education have a direct correlation to the level of degree offered at its respective program? 3. Is there a need to develop a nationally recognized standard for local anesthesia/pain control courses in dental hygiene programs? **Methods:** A survey was sent via an online survey distributor to dental hygiene programs in the United States. The participants in this survey were either the main instructor for their program's local anesthesia/ pain control course, or for those whose program did not offer such a course in their curriculum the director of the program was the participant. **Results:** The results of this study suggest that the vast majority of instructors of local anesthesia/pain control courses, as well as the directors of dental hygiene programs of schools who do not offer such programs, both agree that the education of dental hygiene students in local anesthesia/pain control is very important. When comparing the percent of competency an injection is taught to in the

clinical portion of a local anesthesia/ pain control course vs. the level of education the respective program offered, a direct correlation was not found. In fact, both associate and bachelor programs alike rated that the most common percentage that their courses require a student to reach was a 75-79% competency level. **Discussion:** It is the researcher's opinion, that the requirements for local anesthesia/ pain control education across the board should be standardized, as well increased, to a stricter level. This not only would help to increase the level of knowledge a dental hygiene student possesses upon licensure, but also raises the bar for dental hygiene as an established discipline.

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Chapter I

Introduction

In the United States the dental hygiene practice is governed by state law and the level of education required regarding local anesthesia varies greatly. Because of this division among states the reciprocity of local anesthesia training and licensure varies and can sometimes make practicing in another state from which you originated difficult. A dental hygienist who wishes to practice in another state, may require re-testing, continued local anesthesia education, or in the case where it is not currently legal to perform local anesthesia as a dental hygienist in a specific state, then the acknowledgement of previous local anesthesia training is null and void. This research is intended to identify how diverse the spectrum of educational requirements is among states and possibly identify educational needs and national reciprocity solutions.

Statement of the Problem

1. What is the level of education in local anesthesia/pain control courses for dental hygiene programs in the United States?
2. Does the level of local anesthesia/pain control education have a direct correlation to the level of degree offered at its respective program?
3. Is there a need to develop a nationally recognized standard for local anesthesia/pain control courses in dental hygiene programs?

Significance of the Problem

Many in the healthcare community consider dental hygiene to be the oral counterpart to the medical nurse. This concept originated when Dr. Alfred C. Fones developed the dental hygiene model to serve as an adjunct provider rendering preventive services to the community, where the term dental nurse became associated. However, Dr. Fones did not care for this term since nurses were generally associated with caring for those with disease, and dental hygienists were intended to be associated with treatment intended for disease prevention. It was at this time that he coined the term "Dental Hygienist," which has continued as the identifier for the past century. [1]

Since its inception, dental hygiene has grown and evolved into a multifaceted profession. Not only do dental hygienists provide preventive services to their patients, they also educate about various disease processes, as well as provide therapeutic methods when disease has already occurred. The roles of a dental hygienist include: clinician, educator, oral health promoter, researcher, change agent, manager, and client advocate. [1]

Currently dental hygiene is not considered to be a discipline like its medical counterpart, but rather a field of study. Many dental hygienists, and dental hygiene advocates have worked diligently over the years for the profession to achieve greater skill sets, respect, and autonomy. Though it has been a slow journey, and one that is not near its end, dental hygiene has achieved great strides in becoming a more respected profession, and this will hopefully result in dental hygiene ultimately becoming a distinct discipline. Research indicates that although dental hygiene has achieved great strides in becoming a discipline, for example developing a metaparadigm, it has yet to build a substantial research body of knowledge built upon conceptual and theoretical models. [2]

Though dental hygiene as a collective often disagrees with this statement, it will not be until the profession can prove itself worthy of the title that it will be able to elevate itself as a recognized discipline.

Dental hygiene as a field of study has gone through many obstacles since its birth in the early 1900's to bring about greater recognition among its fellow healthcare counterparts. Since then over 100 years of practice has passed and with it many new laws and regulations which have broadened a dental hygienists' skill set and scope of practice. [3] Included in this was the administration of local anesthesia which was introduced into the field of dental hygiene in the early 1970's in the state of Washington, followed shortly thereafter by New Mexico.

Local anesthesia is a very complex subject requiring students to have an in- depth understanding of head and neck anatomy, physiology, pharmacology, technical skills, and a good chair side manner. Because of potential side effects, the risk of administering local anesthesia to the patient is much higher than other dental hygiene procedures, which makes the level of competency when administering local anesthesia crucial to protecting the patient's health and safety. [4] These factors naturally result in a need for the highest level of education to be attained in an educational setting, and a continual reevaluation of current standards.

Although the information regarding local anesthesia in dental hygiene education is accessible to the public through course outlines, curriculum descriptions, and state regulations, there is currently not any comprehensive data compilation on this subject. By gathering all of this data into one place, the goal is to better understand what the nationally accepted standard of education is on the subject. Also, if the standard is

lacking, perhaps this can encourage programs to raise their standards, and bring about a national awareness on the importance and need for exemplary educational practices; thereby continually improving this field of practice.

Operational Definitions

CODA: Commission on Dental Accreditation, which is part of the American Dental Association, is responsible for accrediting all dental and associated programs in the US. This organization is nationally recognized by the United States Department of Education. The mission of CODA is "to serve the public by establishing, maintain, and applying standards that ensure the quality and continuous improvement of dental and dental-related education and reflect the evolving practice of dentistry."

Direct Supervision: The supervising dentist must be available for consultation regarding approved procedures in accordance with the diagnosis and treatment plan and must remain physically present throughout the performance of the procedure.

General Supervision: The supervising dentist must be available for consultation regarding approved procedures in accordance with the diagnosis and treatment plan, but is not required to be on the premises during the execution of the procedure.

Indirect Supervision: The supervising dentist must be available for consultation regarding approved procedures in accordance with the diagnosis and treatment plan and must remain on the premises throughout the procedure. However, the supervising dentist is not required to be physically present.

Local Anesthesia: Loss of sensation in a circumscribed area of the body as a result of the depression of excitation in nerve endings or the inhibition of the conduction process in peripheral nerves.

Metaparadigm: A set of concepts and propositions that form the basis for the development of a discipline. A metaparadigm is the most general statement of a discipline and functions as a framework in which the more restricted structures of conceptual models develop.

NERB: North East Regional Board of Dental Examiners was founded in 1969 to facilitate the licensure process for candidates and eliminate the need for repetition of state board clinical examinations. NERB is comprised of 16 state dental boards.

Nitrous Oxide-Oxygen Analgesia: Nitrous Oxide delivered in combination with Oxygen is an inhalation method of conscious sedation. This process relaxes individuals who are mildly apprehensive about dental experiences and provides pain control for procedures that are slightly or moderately painful.

NSPT: Non- surgical periodontal therapy, also known as scaling and root planing, involves the careful cleaning of the root surfaces to remove plaque and calculus from deep periodontal pockets and to smooth the tooth root to remove bacterial toxins. This is followed by adjunctive therapy such as local delivery antimicrobials and host modulation, as needed on a case-by-case basis.

RDH: Registered Dental Hygienist. A licensed oral healthcare professional who integrates the roles of clinician, educator, consumer advocate, manager, change agent, and researcher to prevent oral disease and to promote health.

WREB: Western Regional Examining Board. Developer and administrator of reliable competency assessments for dental health care providers and state agencies which license dental professionals. WREB is comprised of 16 member states and 16 affiliate/ non member states accepting WREB results.

Assumptions

It is assumed that the participants surveyed in this study are all employed at an accredited dental hygiene program within the United States and are the head instructors for their program's local anesthesia/pain control courses, or in the case where a local anesthesia/pain control course is not offered then the program director was the person who completed the survey. It is also assumed that each participant answered the questions presented in the survey fully and honestly to the best of their abilities.

Limitations

The number of accredited dental hygiene programs located in the United States is roughly 300 in number. Though each state may be represented in this study, each level of education may not be, depending on the amount of participants and responses received back. This limits the study in that not all opinions may be accurately represented as it would be should all of the schools participated.

During the collection of emails for each program from the ADHA's list of schools, some schools did not have a contact email listed, therefore they were excluded from this study. The amount of literature published on this subject is very minimal. This was a driving factor in conducting this research; however it made gathering sufficient data for the literature review difficult.

Methodology

The methodology regarding this study involved the development of a survey including multiple choice and fill in the blank test items. These items were based on educational regulations and requirements for local anesthesia in dental hygiene education. Upon approval by the thesis committee and the Human Research Protection Office, it was loaded onto Survey Monkey, an online and interactive survey distributor. It was then sent via email to the head instructors of the local anesthesia/ pain control courses at each dental hygiene school in the country. Once the data were received, a statistician analyzed the information into a quantifiable and qualitative data set.

Chapter II

Literature Review

History of Local Anesthetics

The discovery of local anesthetics occurred around 1850 with the use of cocaine by way of the coca leaf. The first recorded operation using local anesthetics was in 1884, with the use of cocaine on the eye of a glaucoma patient. Soon after discovering the beneficial properties of local anesthetics, their use in surgeries spread quickly in Europe and America. [5]

Interestingly, the first successful documentation of a nerve block with the use of local anesthesia was achieved in a dental setting by a dentist from New York named Dr. Nash. Nash used 0.5 ml of 4% cocaine hydrochloride to block the infraorbital plexus in order to obturate a maxillary incisor, which involves the filling of a root canal. The second successful documentation was by Dr. Halsted who completed a block on the inferior alveolar nerve of his dental student. Dr. Halsted and his colleague Dr. Hall, whom published the original article on Dr. Nash, went on to develop nerve and regional blocking techniques.[6]

However, through trial and error the toxic effects of cocaine became apparent resulting in many deaths and addictions. In a 7 year span, starting with the use of cocaine in the first ophthalmic surgery in 1884, 13 deaths were reported and over 200 cases of systemic intoxication. It was not until 1891 that the pure synthesized form was created, and thus the administration and enhancement of local anesthetics began.[6] Between 1891 and 1930 many ester anesthetics were synthesized including benzocaine, and from 1898 to 1972 most amide anesthetics were created. Since then only one other amide has been

introduced into the market, ropivacaine. Because of the extensive research that went into creating this new anesthetic, ropivicaine has very low side effect rates.[7]

Physiology and Pharmacology of Local Anesthetics

Local anesthetics are often used to suppress pain in a circumscribed area of the body. This suppression occurs when the depolarization within the nerve conduction process is restricted. Depolarization results when there is a rapid influx of sodium ions into the nerve membrane, causing the transmission of a nerve impulse, thus resulting in a pain response. However, local anesthetics inhibit this pain response by effectively competing for, and binding to the specific sodium receptor sites along the nerve membrane.[8]

Local anesthetics are produced in two chemical forms, esters and amides. Esters are metabolized in the blood through plasmacholinesterase, whereas amides are metabolized in the liver; with the exception of prilocaine which is metabolized primarily in the lungs with only a small portion being metabolized in the liver and articaine which is metabolized primarily in the blood, much like an ester, and a small portion in the liver. Esters and amides differ in that esters do not contain a nitrogen ion in their intermediate chain, whereas amides do. Ester local anesthetics are also more likely to cause acute allergic reactions do to the fact that they are derived from PABA, *para* -aminobenzoic acid. Amides are not derived from this compound and are therefore less likely to cause an allergic reaction. Due to the high rate of acute allergic reactions associated with PABA derivatives, injectable ester local anesthetics, such as procaine, are no longer used in the United States.[9]

Vasoconstrictors and Local Anesthesia

Vasoconstrictors are used to constrict blood flow by binding to both the $alpha_1$ and $alpha_2$ adrenergic receptor sites of the sympathetic nervous system. When vasoconstrictors are added to local anesthetics they counteract the vasodilatory properties of the local anesthetic and produce many favorable effects, including increased hemostasis and duration of the local anesthetic, as well as decreased toxicity rates and dosage levels.[10] However, these effects also come with increased vasopressor effects, as well as prolonged anesthesia past the duration of the procedure they were intended for.[11]

Vasoconstrictors that are used with each local anesthetic vary by concentration as well as type. Vasoconstrictors used in local anesthetics come in concentrations of 1:20,000 levonordefrin and 1:50,000, 1:100,000, and 1:200,000 for epinephrine.[12] However, more concentrated dosages are used in emergency situations outside the realm of local anesthetics for things such as anaphylaxis, and generally come in concentrations of 1:1,000, or 1:10,000 epinephrine.[8]

Types of Local Anesthetics Used in Dentistry

Around 1904, Dr. Alfred Einhorn synthesized the first local anesthetic used in dentistry. This anesthetic was an ester derivative and was called procaine, or more commonly known to patients at novacaine. Its use in dentistry continued for the first part of the 20th century. By 1943, lidocaine had been discovered and proved to have much greater analgesic qualities than procaine, but was contrastingly much safer in its effect.[8] From that point on, the field of dentistry adopted lidocaine as its primary anesthetic of

choice; however there are still many other anesthetic choices available to use depending on what is best for the patient's treatment needs.

Many different types of local anesthetics are used in dentistry, and their use is dependent on their duration of action, metabolization route, and what kind of affect they might have on a patient's health status. Local anesthetics can come in short, intermediate, and long acting duration and may or may not contain a vasoconstrictor. The following groups are broken down into their respective lengths of duration: short acting-prilocaine 4%, lidocaine 2%, and mepivacaine 3%; all without vasoconstrictors. Intermediate acting- lidocaine 2%, articaine 4%, prilocaine 4%, and mepivacaine 2%, all containing vasoconstrictors. Long acting-bupivicaine 0.5%. However, prilocaine 4% plain can also be an intermediate acting local anesthetic when it is given in a block injection. It can provide up to 60 minutes of pulpal anesthesia, whereas when given in an infiltration it will be short acting at around 30-40 minutes.[13] Topical anesthetics are also used and come in both amide and ester forms. The most common forms used are lidocaine 5% which is an amide, and benzocaine 20% which is an ester. Because benzocaine is in topical form and not being injected into the soft tissue, there is a lesser chance of it causing an acute allergic reaction as may be experienced with the injectable form.[8] This is because topical benzocaine remains primarily in it's base form making absorption into the cardiovascular system very slow, and therefore toxicity is unlikely in therapeutic doses. However, acute allergic reactions can still occur for those who have a sensitivity to esters, in which case an amide topical anesthetic would be the preferred choice.[13]

Complications Associated with the Administration of Local Anesthesia

With each new clinical skill learned come associated risks to both the patient and clinician. In regards to local anesthesia these risks are particularly more hazardous than many other procedures performed in a dental setting. These risks are as follows: Pain on injection, burning on injection, needle breakage, trauma to the soft tissue, trismus, hematoma, infection, edema, tissue sloughing, postanesthetic intra oral lesions, persistent anesthesia or paresthesia, and facial nerve paralysis.[13] Some of the previously mentioned complications would be considered more of an inconvenience by most, but others are more serious, such as persistent paresthesia, infection, or nerve paralysis. By following protocol and using proper techniques most of these complications can be avoided. Yet, if these situations do arise, it is imperative that the administrator is prepared and capable of handling such occurrences.[14]

Local Anesthetics in Dental Hygiene

In the early 1970's, dental hygienists first became able to administer local anesthesia in the state of Washington, followed shortly thereafter by New Mexico. Since then, 44 states have made this skill a part of a dental hygienist's scope of practice.[3] Though the rules and regulations under which hygienists are allowed to practice local anesthesia vary from state to state, this addition to their skill set has become an invaluable part of the dental practice.

Since the addition of local anesthetics to the dental hygiene practice, dental hygienists have gained a greater amount of independence in their own practice and treatment of patients. This differs from past circumstances in which dental hygienists

required a dentist to perform local anesthesia on their patient when treatment dictated. With a certification in local anesthesia the dental hygienist is able to perform necessary pain control measures without the time constraints previously placed on them while waiting for a dentist to complete the task.[15]

When a dental hygienist administers local anesthesia, the type of supervision required varies by each state. Dentists must provide either direct supervision, indirect supervision, or general supervision; also known as unsupervised practice in the state of Oregon. The most ridged of these levels is direct supervision; however indirect supervision is the most common among the states. According to the ADHA, as of 2012 there are currently only 7 states that allow the use of general supervision.[16]

The administration of local anesthesia can be beneficial for a combination of reasons. For example, a patient who is in need of non-surgical periodontal therapy will in most cases require the use of local anesthesia to reduce discomfort, as well as provide homeostasis.[13] In combination, this allows the dental hygienist to perform the procedure without hesitation of causing the patient further discomfort, and the homeostasis provides a clearer field of vision while performing the procedure itself.

Many patients have an aversion to local anesthetic injections. These fears tend to concern pain during the injection, as well as pain during the dental procedure to follow if there is a lack of profound anesthesia [17]. These apprehensions can be reduced, if not completely eliminated, with the use of proper technique. The previously mentioned conditions are most likely to occur when the injection is given too quickly or the correct dosage is not administered. These instances of poor technique generally arise when the administrator does not have sufficient time to complete the injection or tailor the dosage

and injection to the patient's specific needs.[18] By maintaining proper technique and adhering to the protocols given for minimal discomfort to the patient, the administrator will be able to provide a much more pleasant dental experience; thereby decreasing neglected treatment needs by the patient.[17]

Regulations Governing the Administration of Local Anesthesia in Dental Hygiene

In the United States, local anesthesia administration by the dental hygienist is regulated by various agencies. These agencies are located on both a regional and state level. According to the *Local Anesthesia Administration by Dental Hygienists State Chart*, (Appendix D) provided and compiled by the American Dental Hygienist's Association, only the regional agencies NERB and WREB require local anesthesia board exams for their members. However, NERB requires a written exam, whereas WREB requires both a written and clinical exam. Each state determines which boards, if any, they are members of, as well as how many. Furthermore, they may also be affiliates of boards, in addition to non-members that accept credentialing from other boards.[19]

Beyond regional testing each individual state is able to require its own examination, either through the original local anesthesia course, or by approved state exam. Yet still, many states do not require any formal testing beyond the classroom to practice local anesthesia. This is because each individual state determines their own practice acts for licensed dental hygienists within their state. For example, if two states are members of the same regional board, their individual regulations are unique to their own state. These regulations are implemented through rules or statutes. Statutes are a part of the legislation practice act and are not easily changed. Rules have the same power of

the law, but are easily modified and can be delegated to a board to oversee their authority.[20] For more information regarding each state's specific local anesthesia requirements please refer to Appendix D labeled *Local Anesthesia Administration by Dental Hygienists State Chart*.

Aside from the legal regulations, CODA is the agency responsible for the accreditation of all dental and dental related programs in the country. This agency governs the educational standards of each program. In order to obtain licensure in local anesthesia one must have graduated from an accredited dental hygiene program and successfully completed an approved local anesthesia course. However, it is not required that the local anesthesia course be taken at the program from which the dental hygienist graduated. Some programs do not offer a local anesthesia course within their program itself and therefore must either bring in an auxiliary instructor to come and teach an accelerated course, or the student must travel to an approved course; this course may be located out of state. [21]

Licensure requirements for local anesthesia vary by regional board and state requirements. The most intensive not only require the successful completion of an approved local anesthesia course prior to testing, but also require a successful written and clinical board examination before application for licensure is accepted. Other options include a combination of successful completions of a local anesthesia course, and/or clinical or written exam. Some states do not require any state or regional examination before licensure is granted; however all states that do grant licensure require successful completed of an approved local anesthesia course.

The Importance of Dental Hygienists Having an in Depth Knowledge of Local Anesthesia

Although not all states have the same standards for local anesthesia courses, or even allow licensure for dental hygienists, it is important that dental hygienists still maintain an in depth knowledge of local anesthesia. The reasons for this are multiple. In most scenarios a dental hygienist practices alongside a dentist. Whether or not a dental hygienist is licensed to practice local anesthesia does not mean they will not encounter patients who have had local anesthesia, or who will in the future; in fact, it is a certainty that they will. Due to this inevitably, it is important for the dental hygienist to be prepared to handle any situation that may arise alongside the administration of local anesthesia, as well as be well versed in the subject so as to answer any pre-procedural questions the patient may have.[22]

Many times in a dental practice it is the dental hygienist who first treats the patient. Typically they will complete all charting, exams, and prophylactic work needed and then review treatment needs with the dentist. In many cases it is the dental hygienist's role to follow up and present the treatment plan to the patient that was developed by the dentist during their comprehensive exam. It is inevitable that patients will have questions regarding treatments proposed, specifically details of the procedure. In many instances this includes the discussion of local anesthesia injections regarding patient apprehension, possible allergic reactions, and any past adverse side effects.[23] The dental hygienist must take on multiple roles in this situation. Not only are they the patient's clinician, but they are an educator, counselor, collaborator, and patient advocate as well. They must educate the patient on the risks and benefits of using local anesthesia, try to calm any fears or apprehension the patient may be having, collaborate with the

dental staff in order to get recommended treatment scheduled and completed, and also continually advocate for the patient when recommended treatment may need to be modified, in order to meet a patient's specific needs.[1]

Local anesthesia is considered an expanded function in the realm of a dental hygienist's scope of practice. Since the addition of local anesthesia in the 1970's, there have been multiple functions that have become available to dental hygienist in the past 40 years. Included in these is the administration of nitrous oxide, carving and finishing of restorations, placement and removal of temporary fillings, crowns, and periodontal dressings, suture removal, and approval of sealant placements; with more expanded functions going under consideration and added yearly.[24] The addition of local anesthesia helped to pave the way for dental hygienists to become more educated and independent in their practices. They are able to utilize their extensive knowledge and education in a broader way, all while maintaining a collaborative relationship with dentists. This helps to meet the needs of the underserved populations in a way far greater than ever before in the history of dental hygiene practice.[25]

Chapter III

Methods and Materials

Research Design and Procedures

A research study was developed using a survey to evaluate the educational standards of local anesthesia in dental hygiene education. The survey was developed using multiple choice questions as well as fill in the blank. Once the survey was completed it was sent to UNM's Human Research Protection Office for "exempt" status approval on November 13th, 2012. On November 19th, 2012 the submitted survey was granted "exempt" approval. The survey was then entered into Survey Monkey, an online and interactive survey distributor, on November 26th, 2012. A total of 319 potential participants received an email invitation containing a consent form cover letter and a link to access the survey at Survey Monkey's direct site. The participant's email addresses were obtained through the American Dental Hygienist Association's PDF list of current dental hygiene programs in the US. Those schools who did not list a contact email were excluded from this study.

The inclusion criteria for completing this survey was that the potential participants be the main instructor for their dental hygiene program's local anesthesia/ pain control course, or if their program did not offer such course then their program's director was to answer any applicable questions in the survey. A reminder email was sent out to the potential participants one month after the opening of the survey, and then again at the two weeks, and one week mark before the closing of the survey. Once the data was collected through survey monkey and the survey was closed to any further participants on the deadline of January 31st, 2013, it was then sent to Dr. Rick Ott, PhD, a statistician at

Colorado Mesa University to review and analyze. The data that was extracted was analyzed using univariate analyses and was described by frequency distributions in the form of histograms and pie charts.

Chapter IV

Results

A total of 161 participants responded and started the survey, with 142 completing in full; which is 50.5% of the original potential participants. The following graphs represent the participant's actual responses to the questions posed in the online survey. In *Figure 1*, 86% of the 142 respondents answered, "Yes," to the question, "According to the dental hygiene practice act in your state, can dental hygienists administer local anesthesia?" whereas only 14% answered "No." There are only 6 states that as of yet do not allow the practice of local anesthesia by a dental hygienist. They are listed as follows: Alabama, Delaware, Georgia, Mississippi, North Carolina, and Texas.

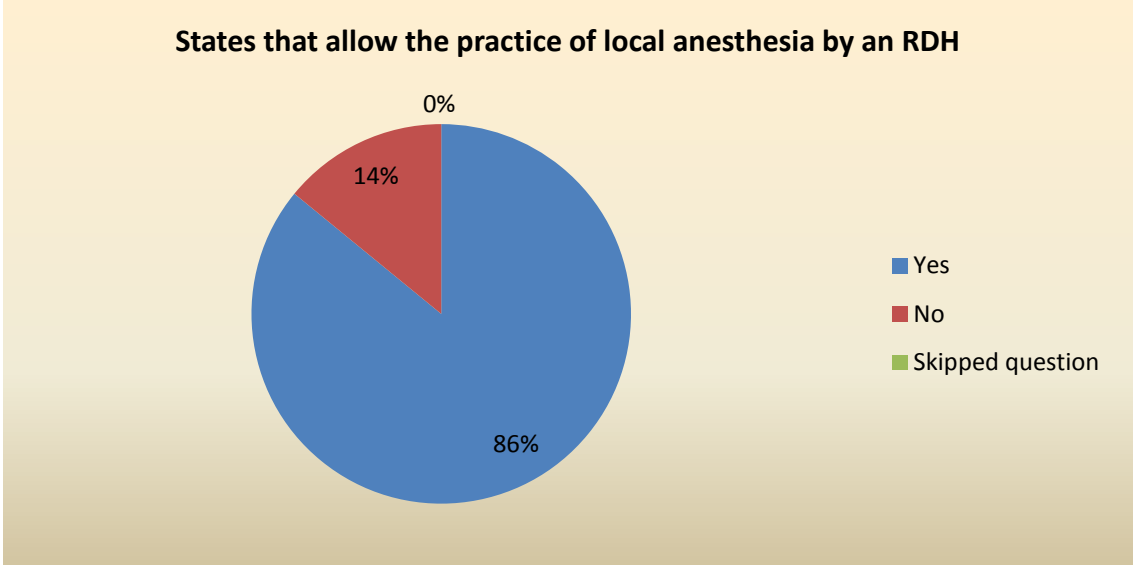

Figure 1

In *Figure 2*, the participants were posed the following question, "Q2. (A) If you selected "Yes" to question #1, what is in the scope of practice for a dental hygienist with local anesthesia licensure/certification in your state? Please check all that apply." 122 respondents answered this question, where 20 skipped it. Most likely those who skipped the question were participants whose state did not allow for local anesthesia to be

practiced by a dental hygienist. Of the total respondents 97.5% of them answered that "Blocks and infiltrations" were in their state's scope of practice for a dental hygienist, with the "Administer and monitor nitrous oxide" coming in 2nd at 62.3%.

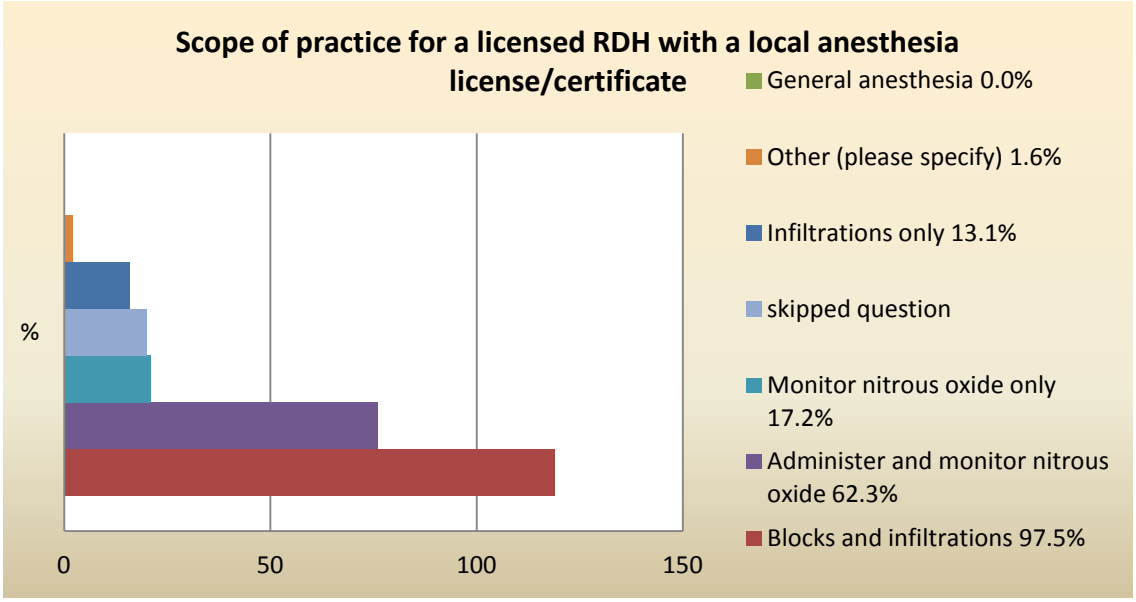

Figure 2

In *Figure 3*, 141 respondents answered the question, "Q3. Do you offer a pain management course that does not include the administration of local anesthesia?" Only 27 or 19% answered "Yes," where the majority answered "No," at 80%.

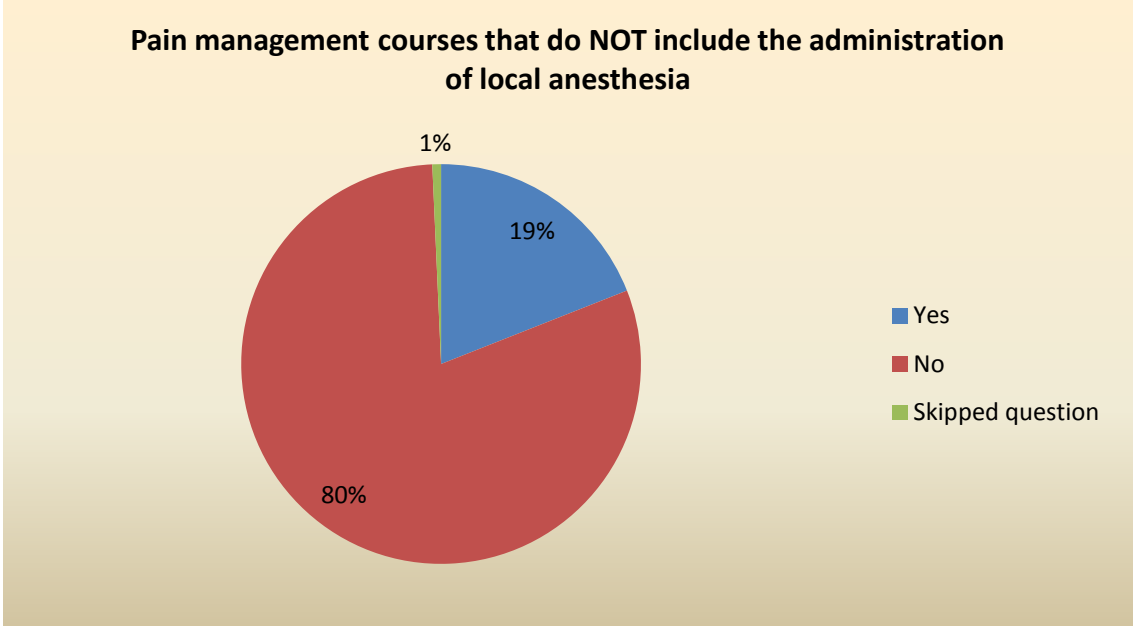

Figure 3

Figure 4 illustrates that of 141 respondents, 119 at 84% answered "Yes," that they do offer a local anesthesia course in their curriculum, and only 22 at 15% answered "No," they did not offer such a course.

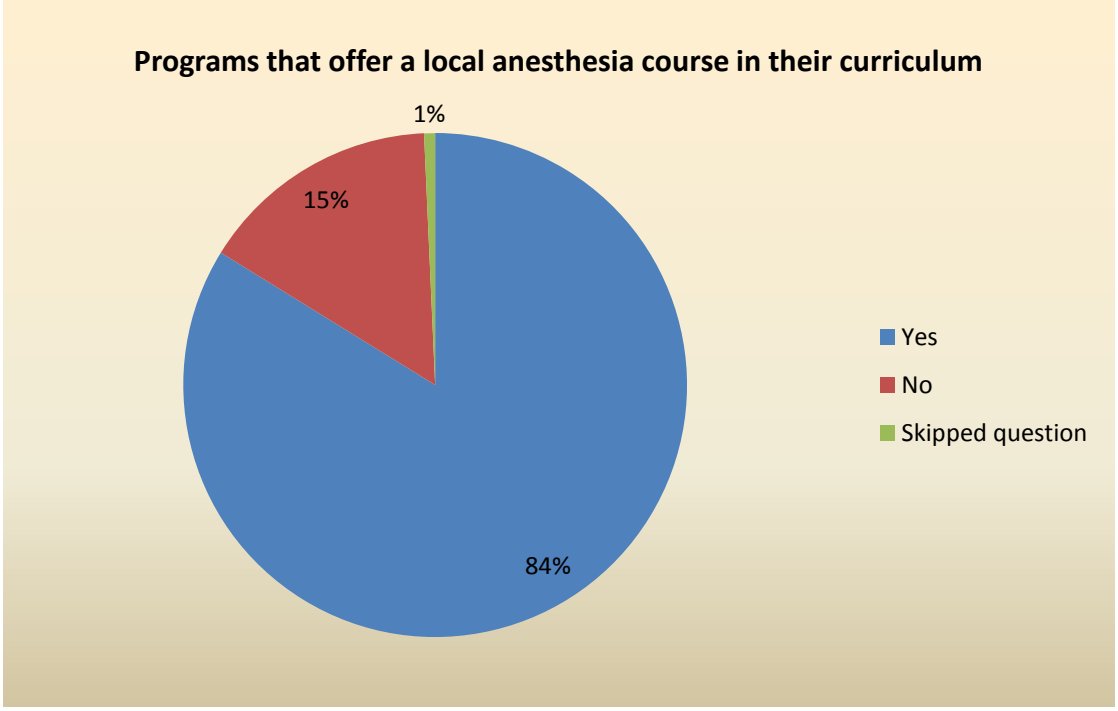

Figure 4

The state requirements for local anesthesia licensure are given in *Figure 5*. This chart reveals that the largest state requirement is a "Written regional board" at 45.4% followed closely with "Number of hours" at 43.7%. "Display clinical competence in LA" was 3rd at 37%, but surprisingly a "clinical regional board" came in 4th at only 29.4%.

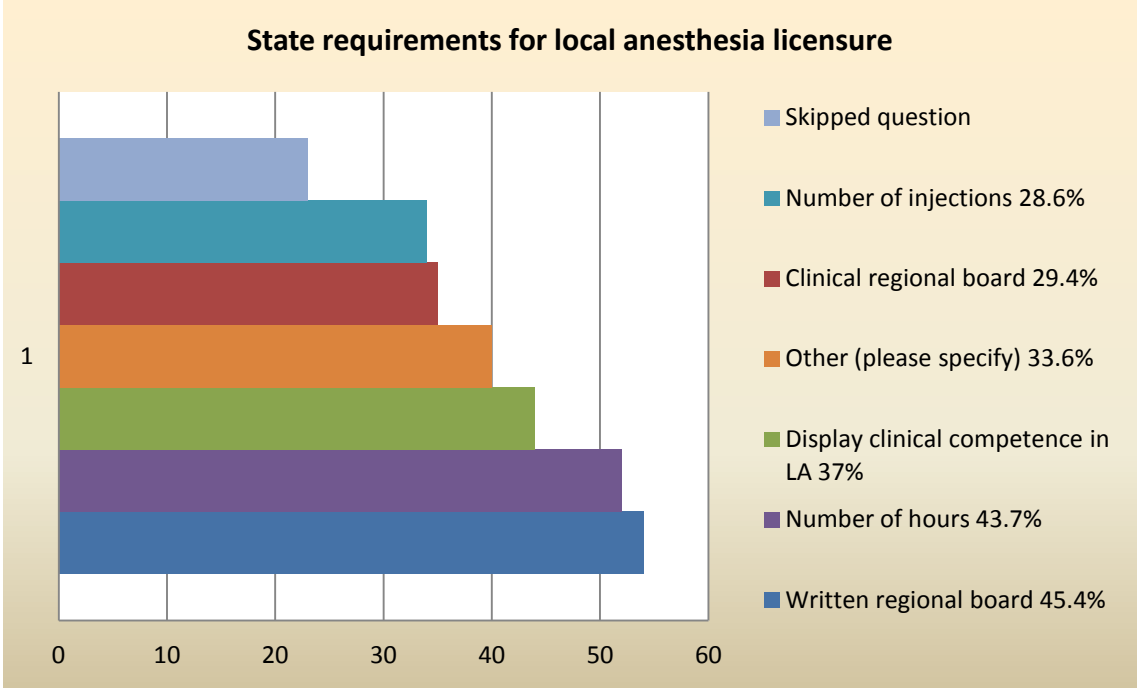

Figure 5

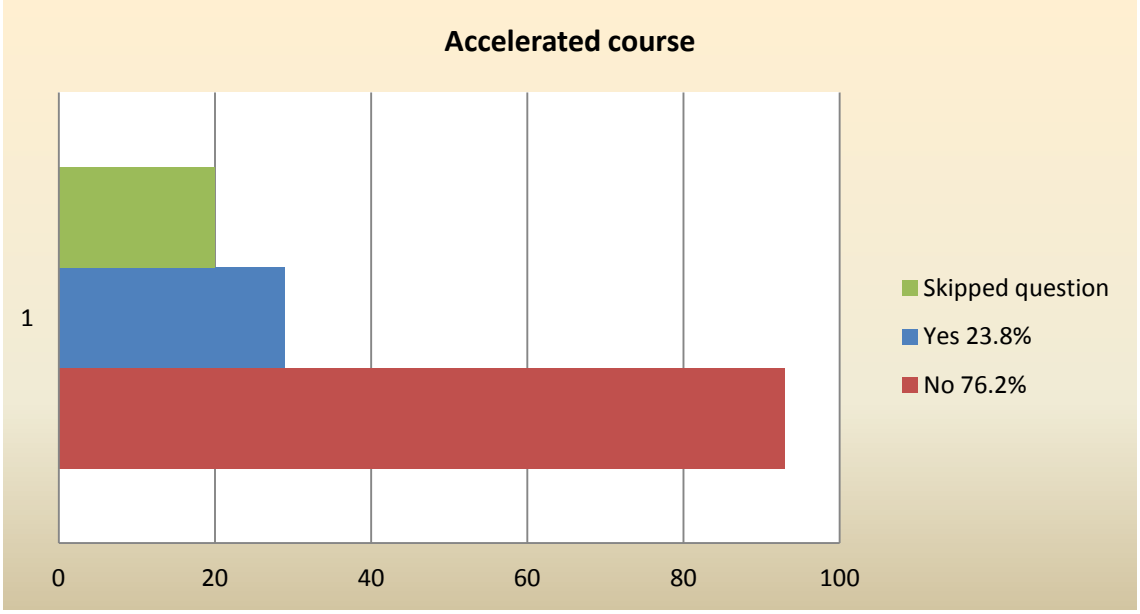

Figure 6

Figure 6 shows that 76.2% of the 122 respondents answered that their local anesthesia course is not accelerated, with 23.8% answering "Yes," their program is accelerated. Similarly, *Figure 7* shows that a vast 98.4% of these courses are not taught by a contracted educator, with only 1.6% responding "Yes" they were.

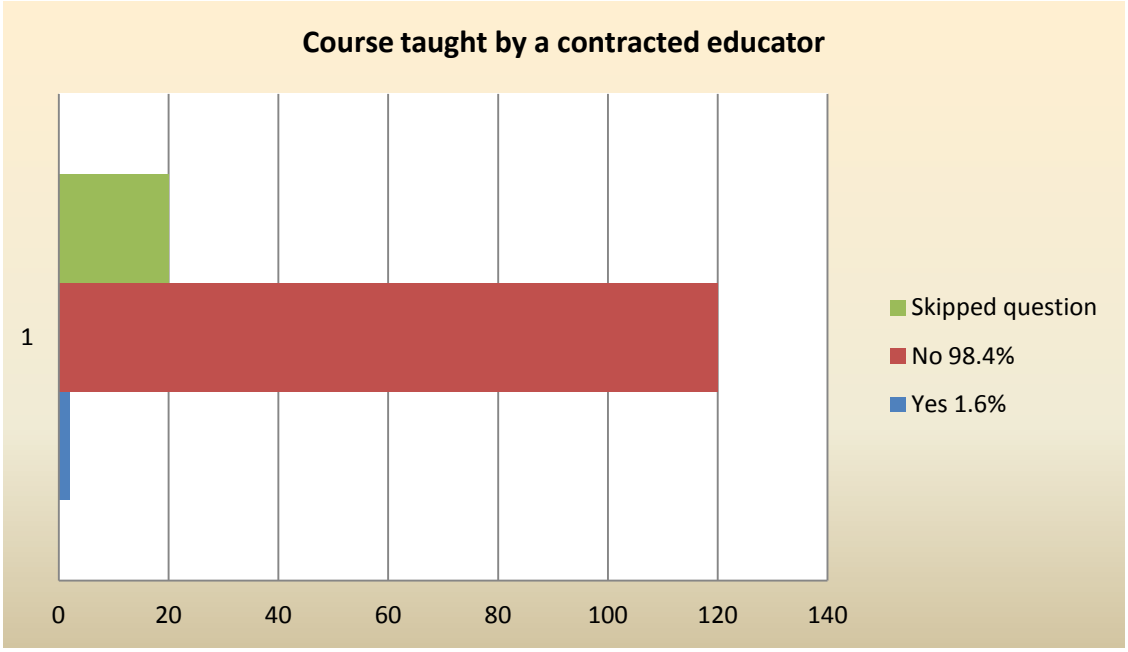

Figure 7

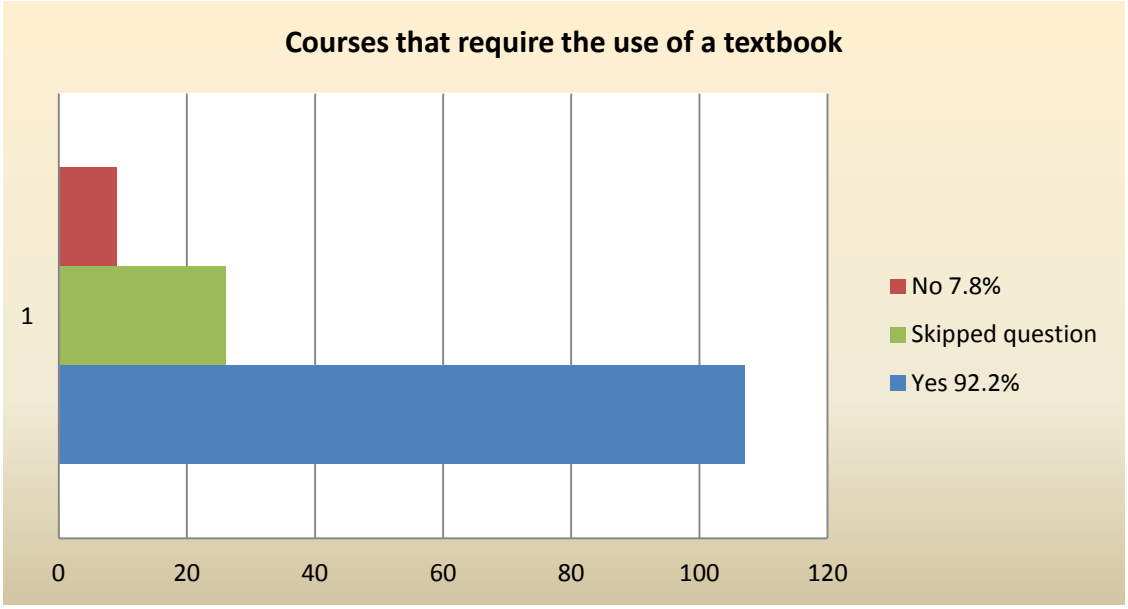

Figure 8

Figures 8 and 9 show that over 92.2% of local anesthesia/pain control courses require a textbook and that Malamed is the most commonly used at 62.2% with Bassett coming in second at 22.8%. This large difference is most likely due to the original publishing dates and continuing editions of each textbook. For example Malamed was originally published in 1980 and is now in its 6th edition, whereas Bassettt was published in 2009 and Logothetis in 2012 and are both still in their 1st additions. The quality of each textbook's material was not a topic evaluated in this study.

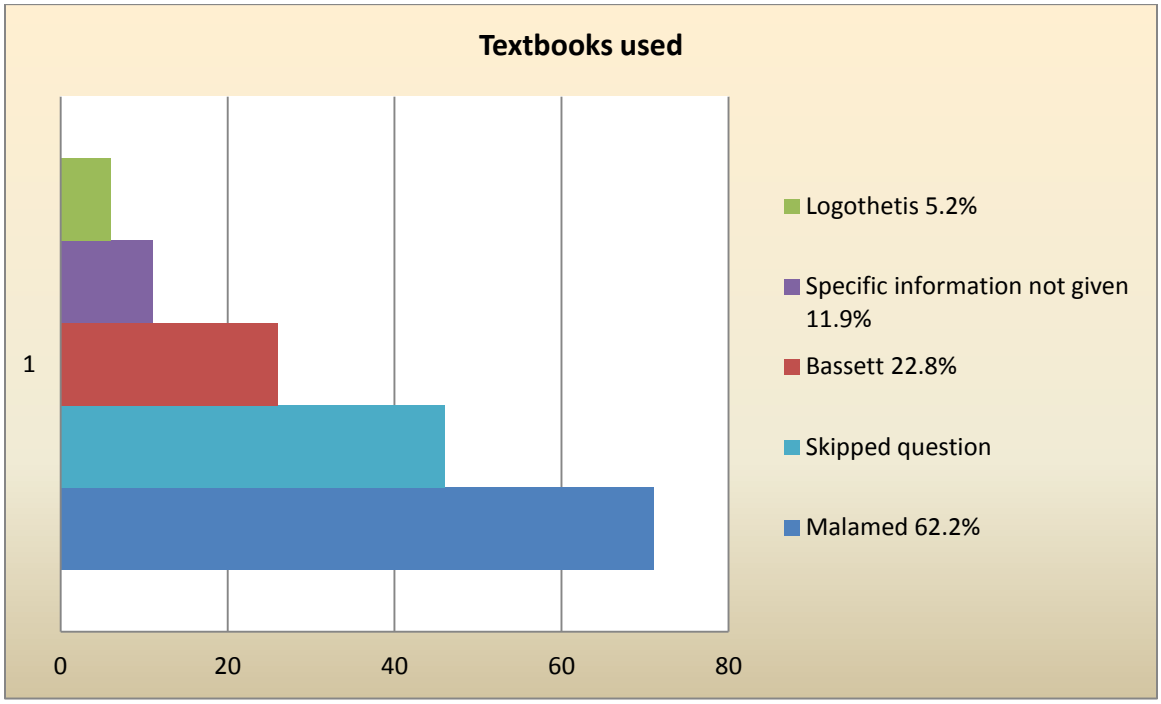

Figure 9

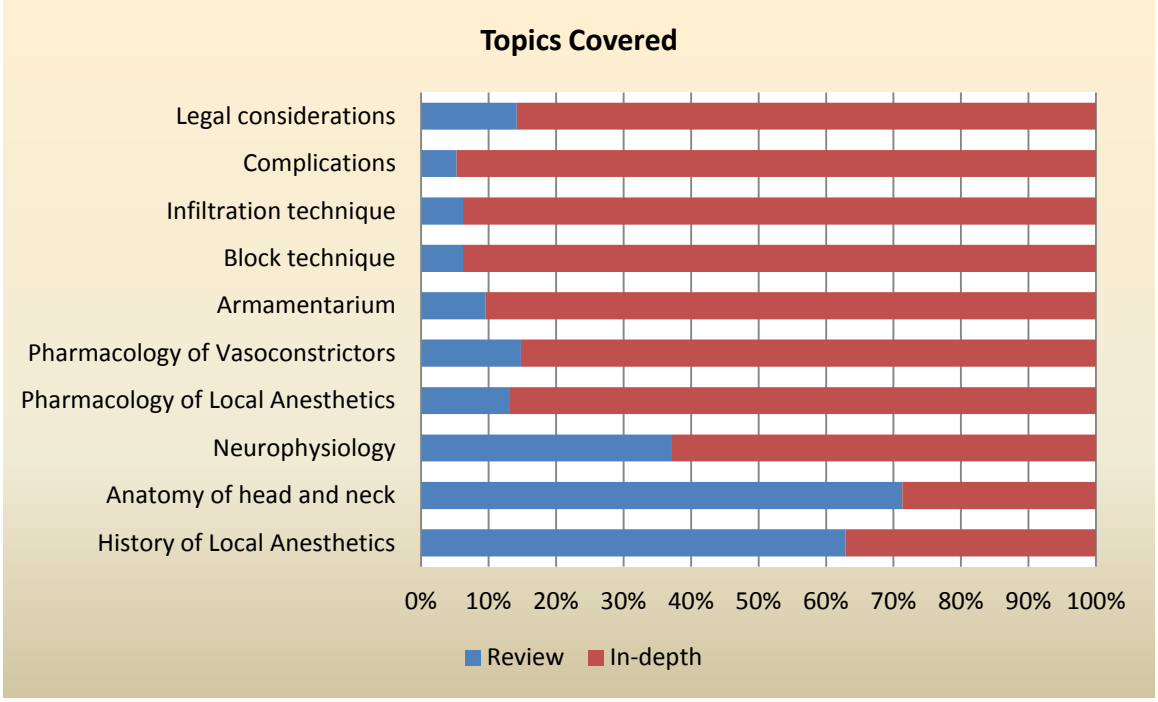

Figure 10

The topics taught in the courses are generally covered in-depth with only "Anatomy of head and neck" and "History of local anesthetics" being covered in review at 70% and 60% respectively, shown in *Figure 10*. *Figures 11, 12, and 13* depict what the average amount of class time is spent in the local anesthesia/pain control courses and how those hours are broken down in the semester. The most common answers to these questions were 3 hours of class, 1 time per week, during a 16 week semester.

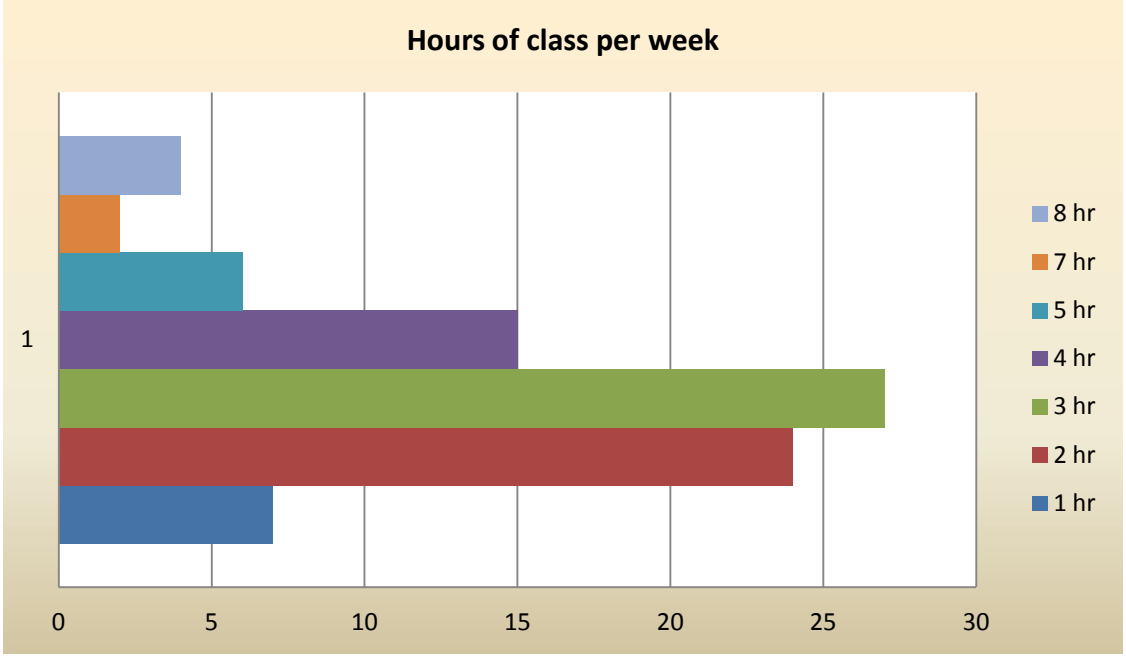

Figure 11

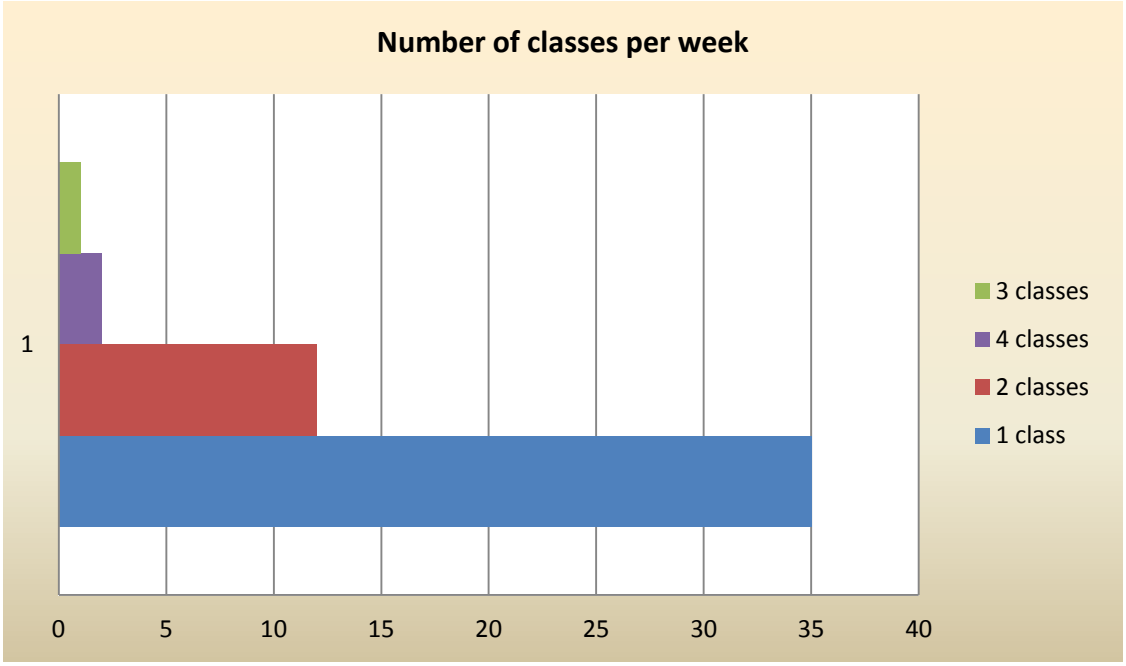

Figure 12

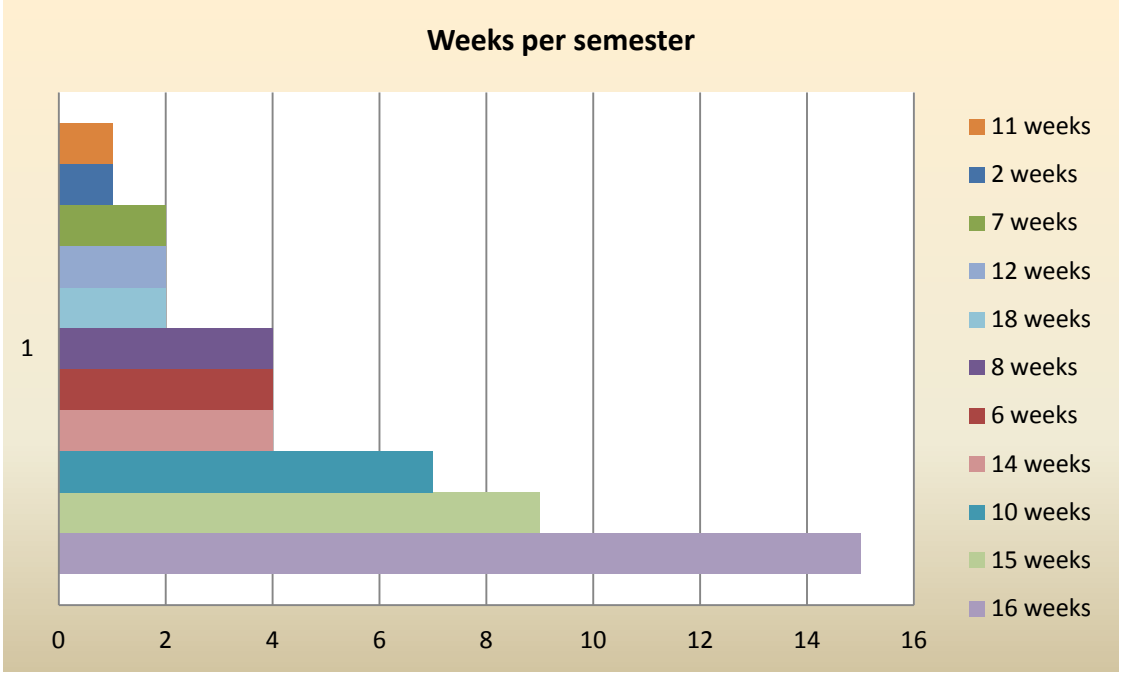

Figure 13

The anesthesia/ pain control courses show that almost 100% contain a clinic/laboratory portion, and in those clinic/laboratory sessions it was very similar regarding the responses between the didactic portion being taught prior the clinical vs. the didactic being taught at the same time as the clinical. The "didactic prior to clinical" won at 51.3% with the latter coming in behind at only 47.8%. This data is shown in *Figures 14 and 15.*

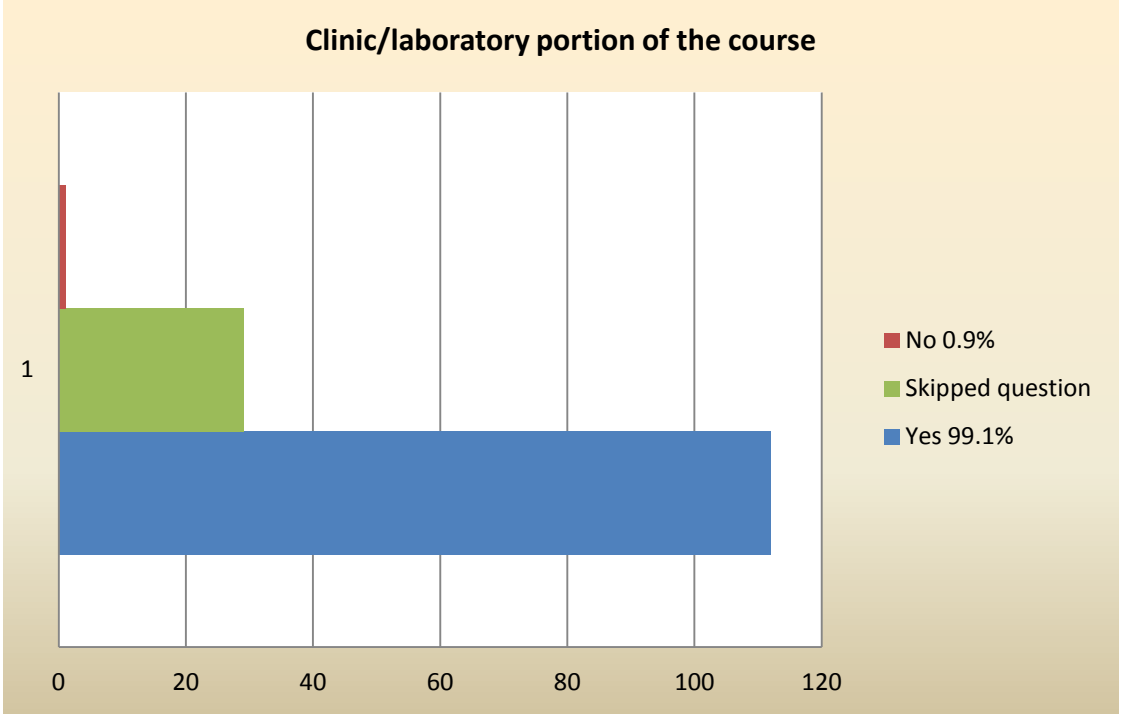

Figure 14

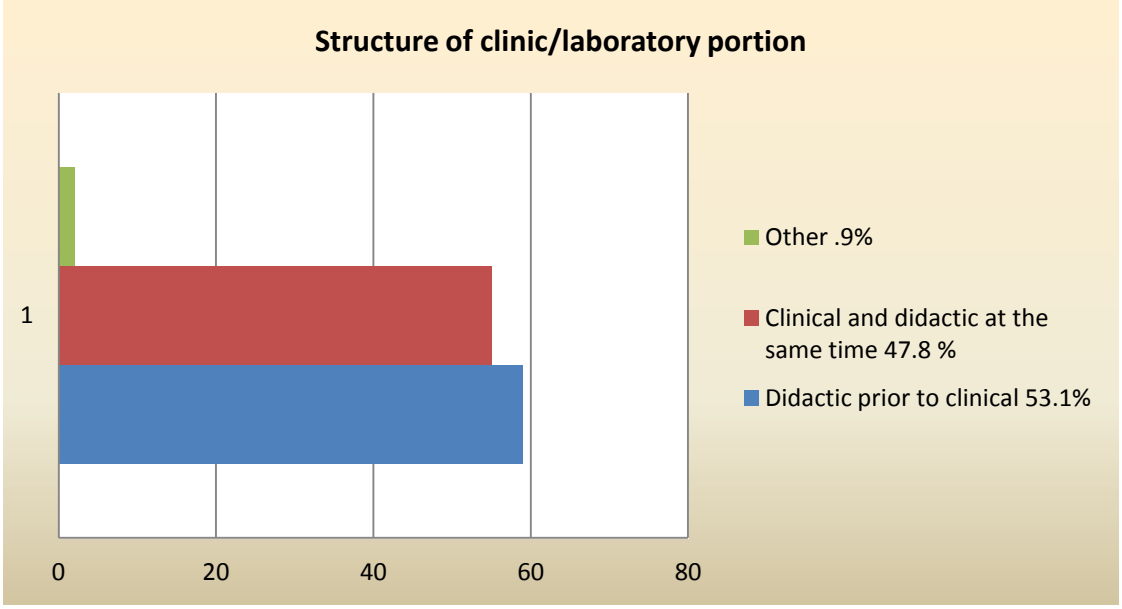

Figure 15

The requirements for a student to administer local anesthesia on a human subject was by passing an exam, this ranked at 63.2% amongst those who responded in *Figure 16.*

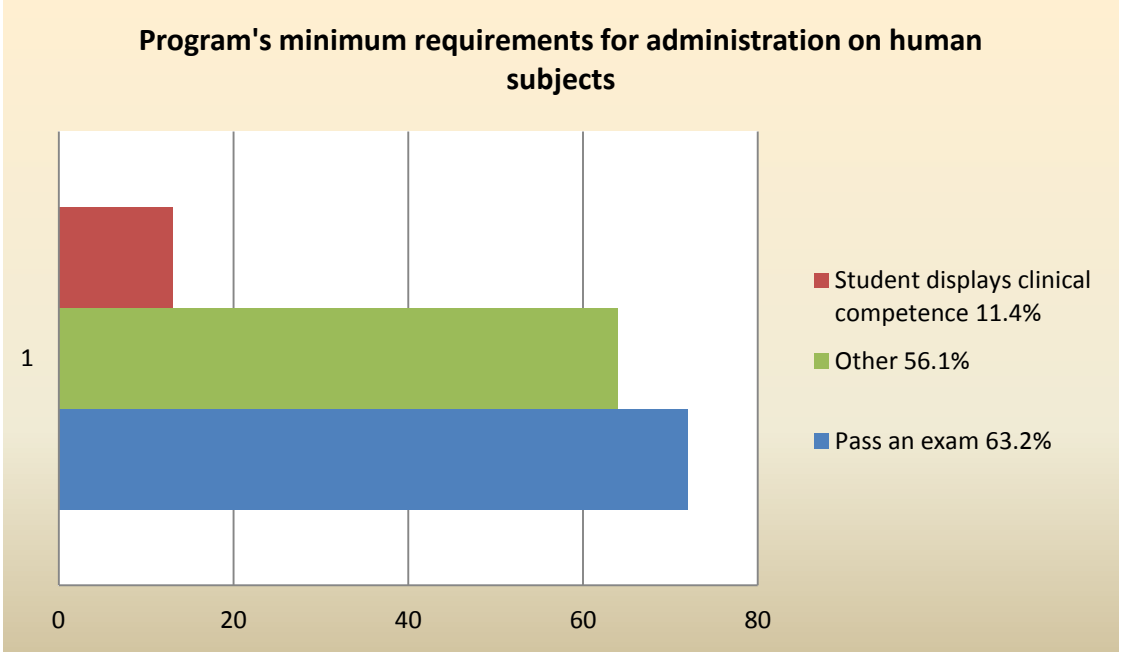

Figure 16

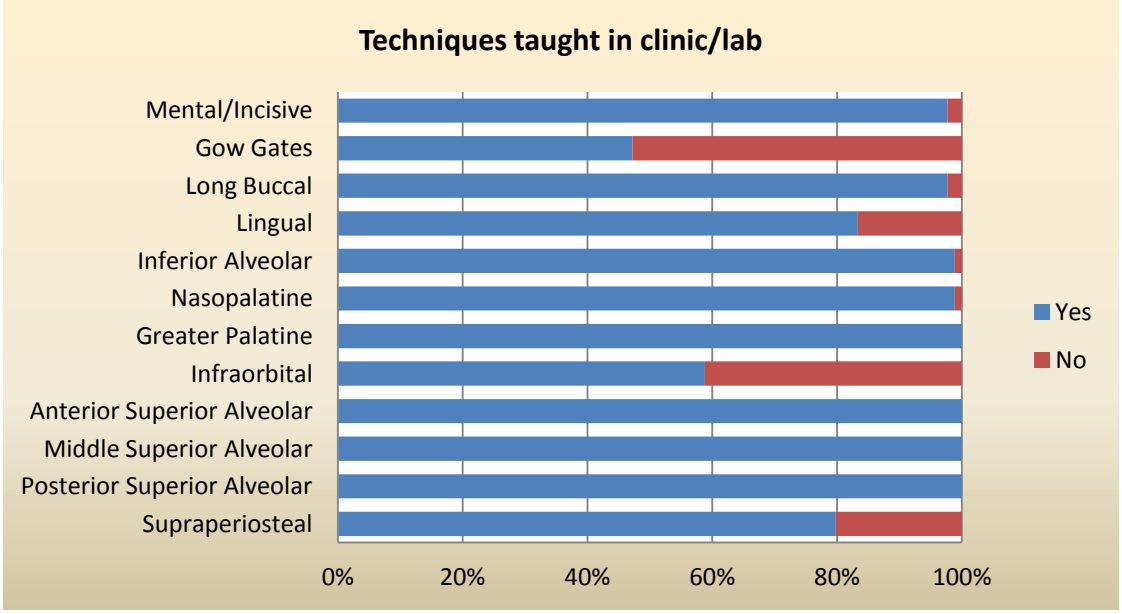

Figure 17

Figure 17, 18, and 19 describe the techniques taught in the clinic/lab including which specific injections are taught, to competency, and to what level of competency. *Figure 19* shows that the most common level of competency required to be attained by a student in order to pass is a 75-79%. This was followed next by the 90-95 and the 100%

range, however with a fairly large margin between them and the leading range of 75-79%.

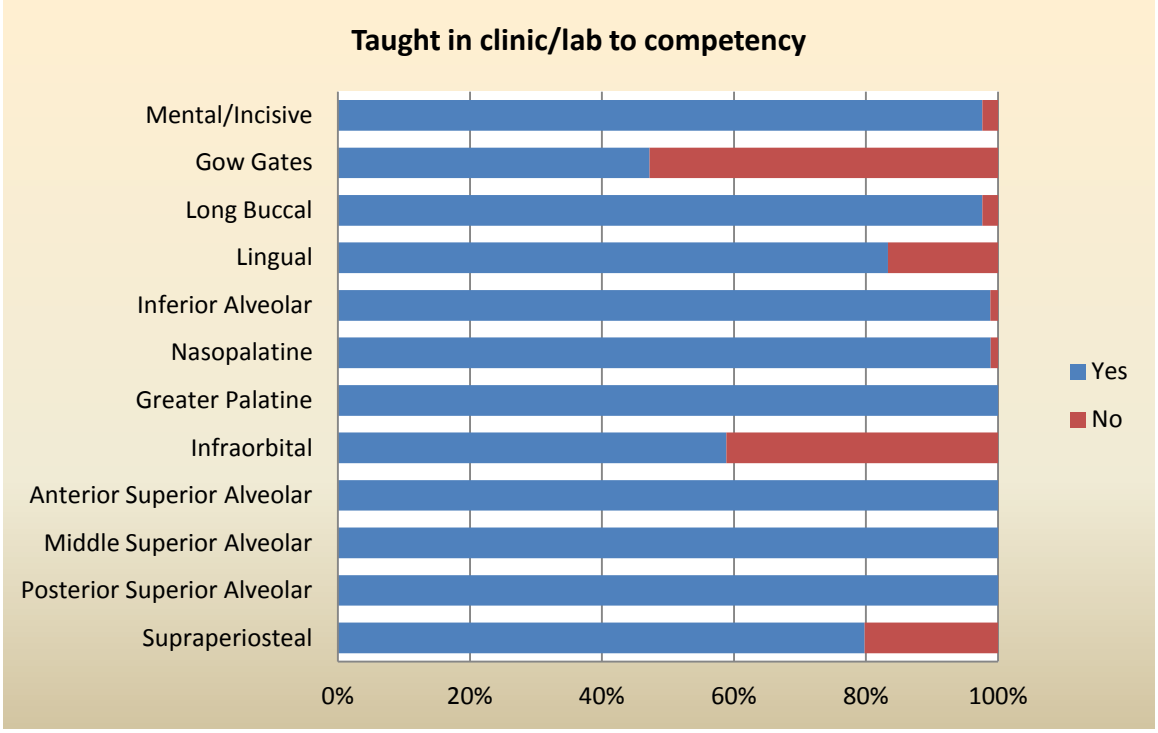

Figure 18

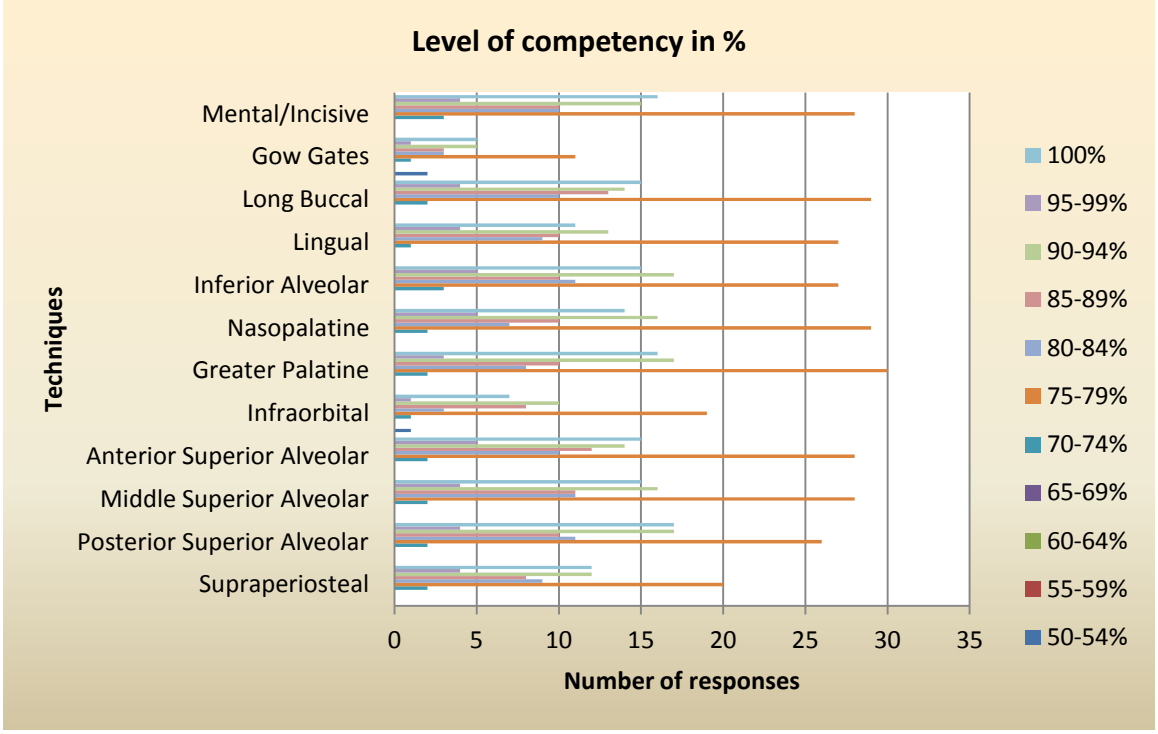

Figure 19

In *Figure 20* the requirements to pass the clinical portion of the course are represented. Completing the didactic portion with a passing grade and completing a set number of injections came as the top two requirements at 91.2% and 92.1% respectively. Successfully completing a final exam came in at 77.9%.

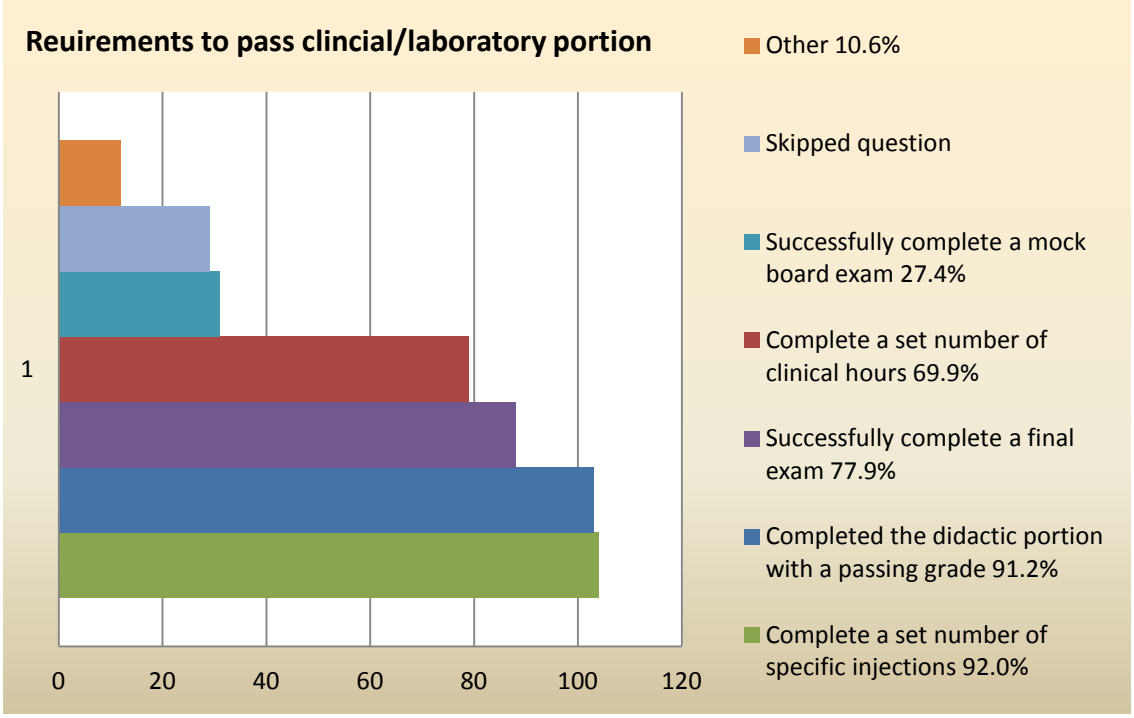

Figure 20

Figure 21 is a graph in response to the question posed to school's whose programs do not offer a local anesthesia/ pain control course. The question was as follows, "Although dental hygienists cannot legally administer local anesthesia in your state, do you feel that it is still important for a registered dental hygienist to be knowledgeable in this subject?" The response to that question was a resounding "Yes" at 100%. *Figure 21* asks to what extent should students should be knowledgeable when it comes to handling situations regarding local anesthesia.

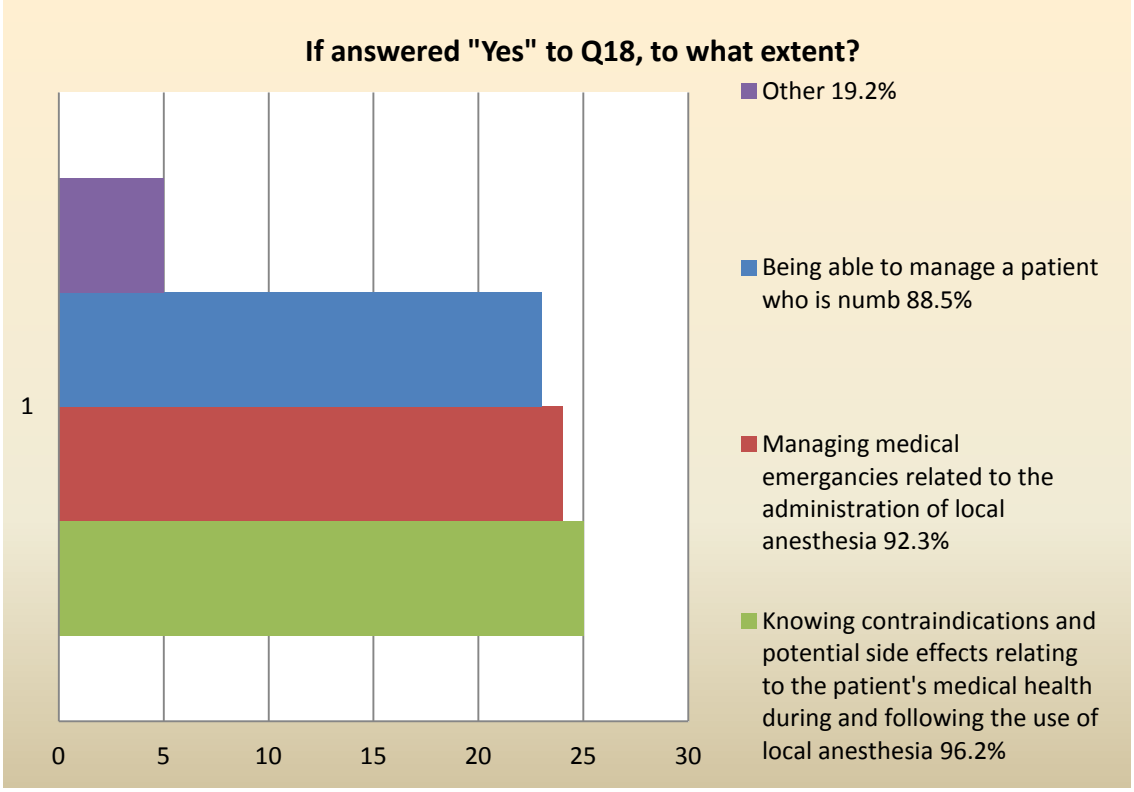

Figure 21

Figures 22, 23, 24, and 25 are all in response to demographic questions pertaining to the participant themselves.

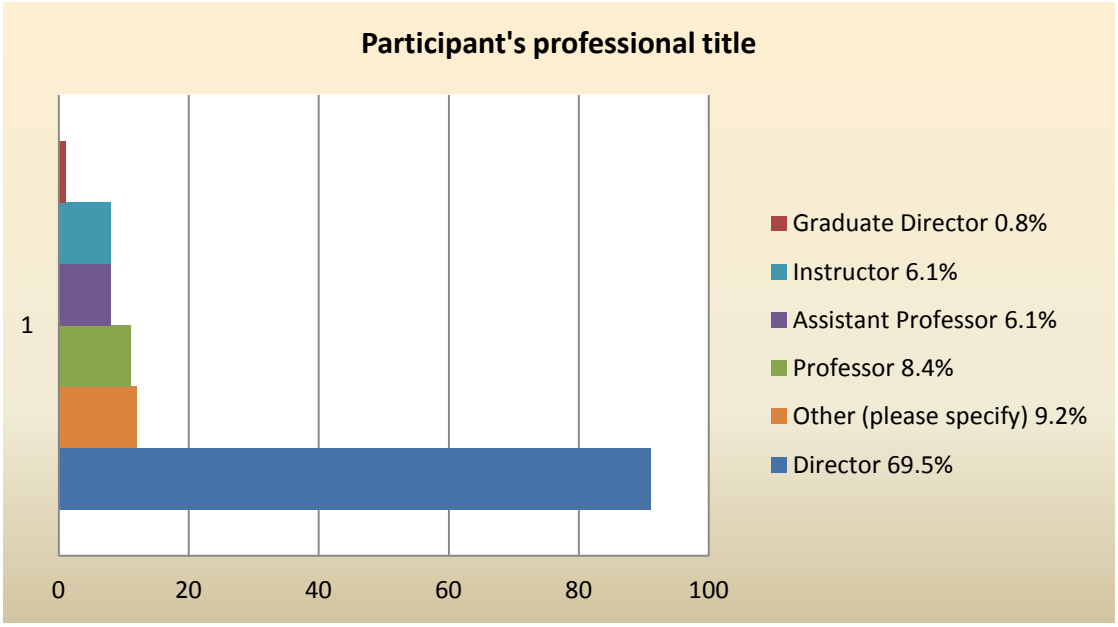

Figure 22

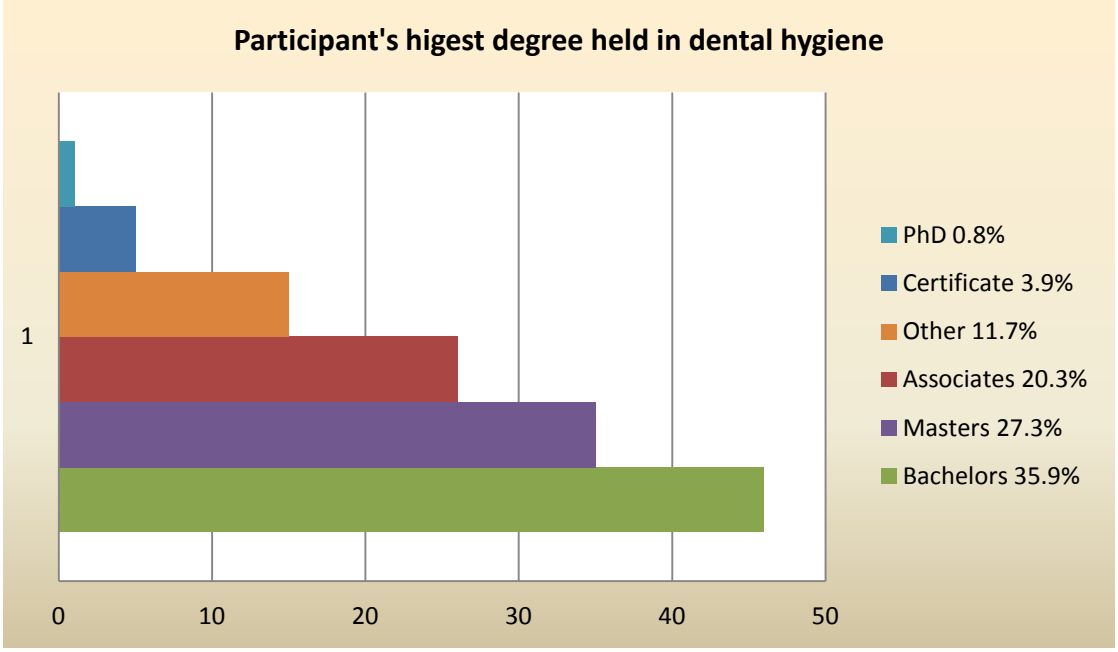

Figure 23

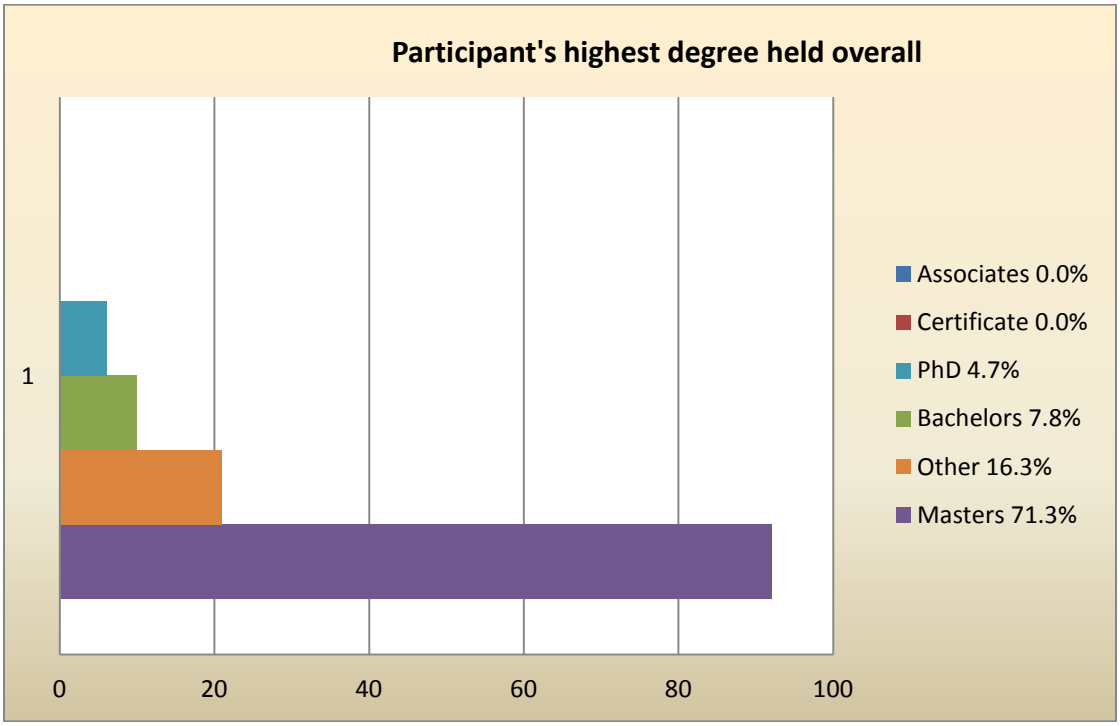

Figure 24

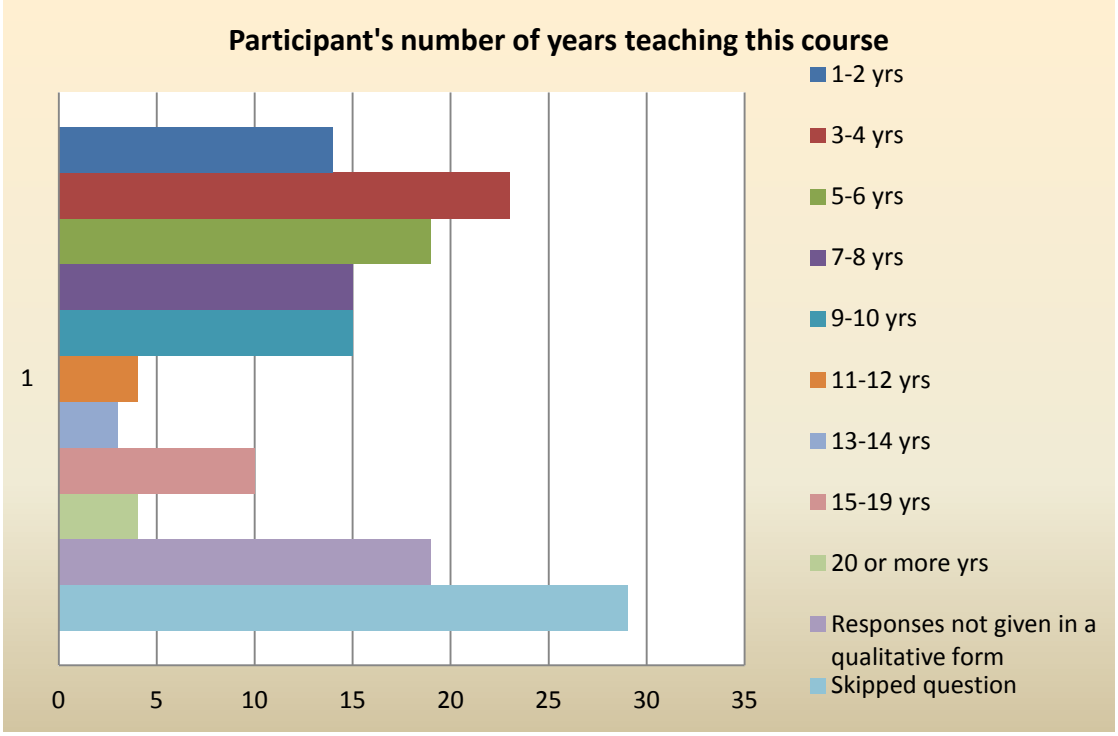

Figure 25

Figures 26 and 27 pertain to each school's own demographics including class size and highest level of dental hygiene education offered to the students.

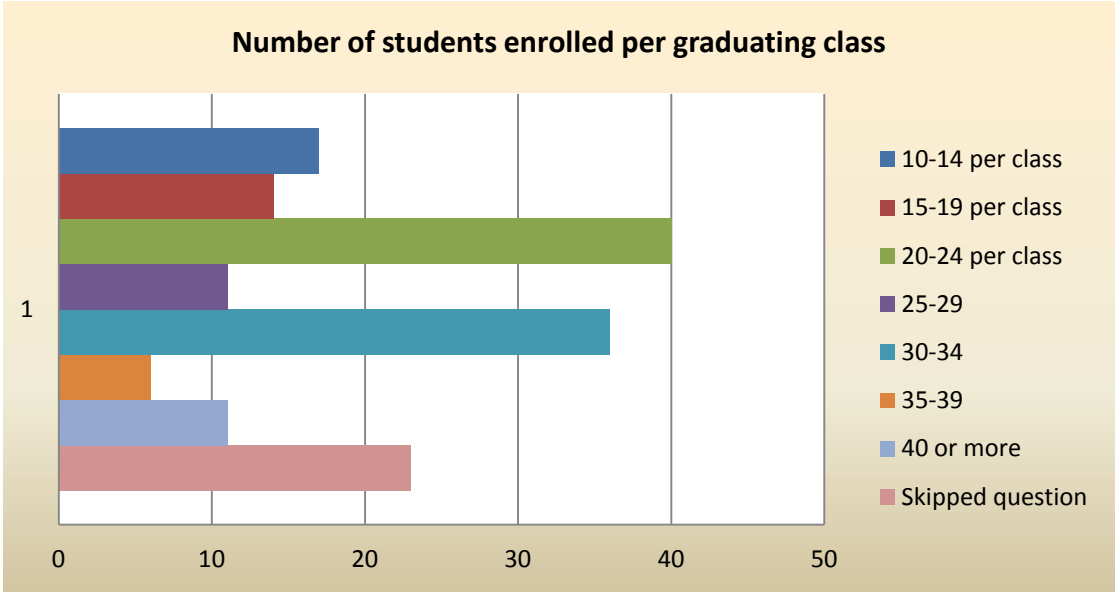

Figure 26

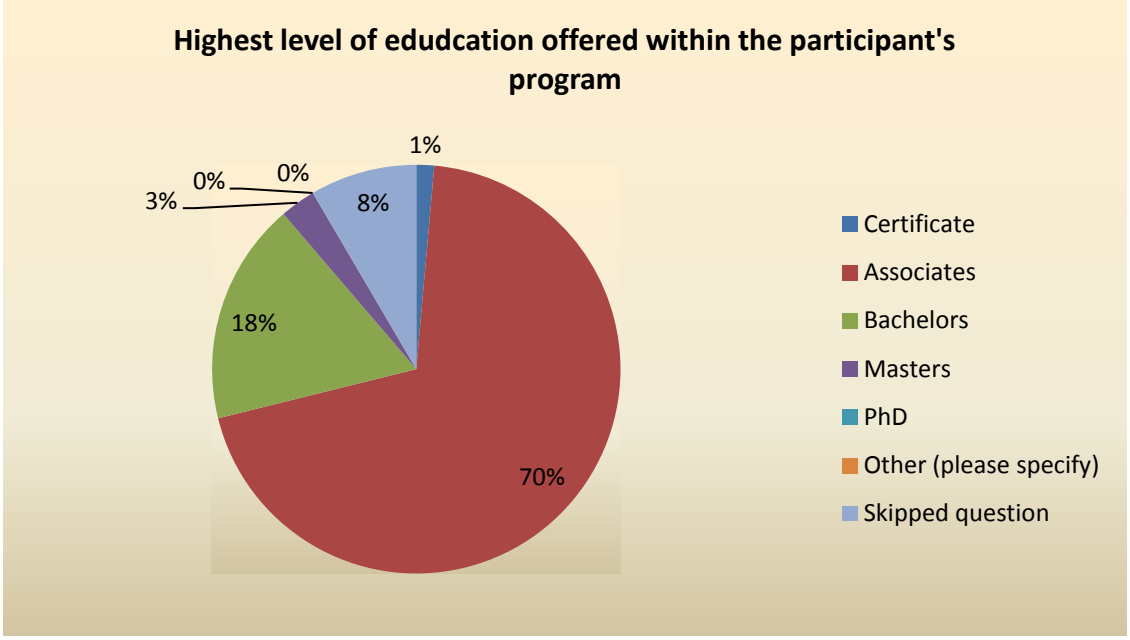

Figure 27

Figure 28 shows the comparison between the level an injection is taught to competency vs. the level of education offered at that program. The chart shows that 75-79% is the most common level required to be reached by students.

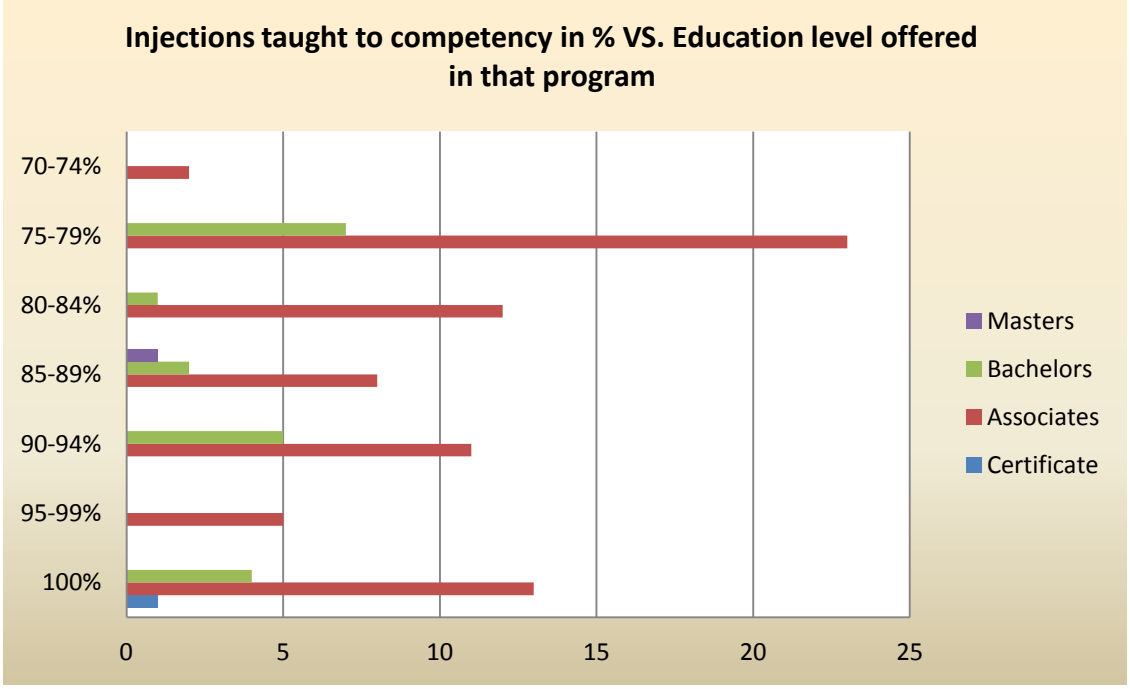

Figure 28

Chapter V

Discussion

The goal of this study was to better understand the level of local anesthesia education in dental hygiene schools in the US, as well as to answer the following questions: What is the level of education in local anesthesia/pain control courses for dental hygiene programs in the United States? Does the level of local anesthesia/pain control education have a direct correlation to the level of degree offered at its respective program? Is there a need to develop a nationally recognized standard for local anesthesia/pain control courses in dental hygiene programs?

The results of this study suggest that the vast majority of instructors of local anesthesia/pain control courses, as well as the directors of dental hygiene programs of schools who do not offer such programs, both agree that the education of dental hygiene students in local anesthesia/pain control is very important. When comparing the percent of competency an injection is taught to in the clinical portion of a local anesthesia/ pain control course vs. the level of education the respective program offered, a direct correlation was not found. In fact, both associate and bachelor programs alike rated that the most common percentage that their courses require a student to reach was a 75-79% competency level. One masters and one certificate program answered these questions in the survey and although their answers were both above the 85% mark, there were not enough responses from each respective population group to effectively make a generalization regarding those programs.

In regards to the question posed "Is there a need to develop a nationally recognized standard for local anesthesia/pain control courses in dental hygiene programs?" seems to remain up for debate. As the data shows, the majority of dental

hygiene programs who offer local anesthesia/pain control courses only require a 75-79% competency level for passing injections. While this level may be above most standard grading systems on the collegiate level, dental hygiene programs tend to hold a higher standard for themselves and their students. Also, when it comes to state licensure requirements less than 50% of those who responded indicated that their state required a written regional board, and less than 30% required a clinical regional board. It has already been established that local anesthesia holds one of the highest potential risks of all the clinical skills a dental hygienist can possess without proper training and technique. By minimizing educational standards in any way, one only increases these potential risks.

After reviewing the data received in response to the research survey, the following questions may have been beneficial to finding a more definitive answer to the question, "Is there a need to develop a nationally recognized standard for local anesthesia/pain control courses in dental hygiene programs?" Examples of such questions are: 1.What level do you feel your program's standards are at? 2. Do you think your program should raise its standards? 3. Do you think dental hygiene programs located in the United States as a whole should raise their standards?

It is the researcher's opinion that in order for states who are still concerned or on the fence about whether or not to add local anesthesia to the scope of practice of dental hygienists in their state, the requirements across the board should be standardized, as well increased, to a stricter level. This not only would help to increase the level of knowledge a dental hygiene student possesses upon licensure, but also raises the bar for dental hygiene as an established discipline.

APPENDIX A

THE UNIVERSITY OF NEW MEXICO
HEALTH SCIENCES CENTER

Human Research Review Committee
MSC 08 4560 BMSB Room B71
1 University of New Mexico-Albuquerque, NM 87131-0001
(505) 272-1129 Facsimile (505) 272-0803
http://hsc.unm.edu/som/research/hrrc/

19-Nov-2012

Logothetis, Demetra
Dental Hygiene

SUBJECT: HRRC Determination of Exempt Status
HRRC#: 12-621
Study Title: Local Anesthesia in Dental Hygiene Education
Approved: 19-Nov-2012

Dear Dr. Logothetis:

The Human Research Review Committee (HRRC) has reviewed the above-mentioned research protocol and determined that this research is *exempt* from the requirements of Department of Health and Human Services (DHHS) regulations for the protection of human subjects as defined in 45CFR46.101(b)under category 1, based on the following:

1. Study Application submitted 11-13-12.

2. Survey Informed Consent submitted 11-13-12.

3. Local Anesthesia in Dental Hygiene Education questionnaire submitted 11-13-12.

4. Study protocol submitted 11-13-12

Because it has been granted exemption, this research project is not subject to continuing review. Also note that the Food and Drug Administration (FDA) regulations as defined in 21CFR50.1 and 21CFR56.101 do not apply to this research.

Changes to the Research: It is the responsibility of the Principal Investigator to inform the HRRC of any changes to this research. A change in the research may disqualify this project from exempt status. Reference the HRRC# and title in all documents related to this protocol.

Sincerely,

Mark Holdsworth, PharmD
Executive Chair
Human Research Review Committee

APPENDIX B

University of New Mexico Health Sciences Center
Informed Consent Cover Letter for Anonymous Surveys

STUDY TITLE
Local Anesthesia in Dental Hygiene Education

Professor Demetra Logothetis from the Division of Dental Hygiene is conducting a research study. The purpose of the study is to gather data regarding the instructional methods and materials of local anesthesia/pain control classes in dental hygiene programs located in the United States. You are being asked to participate in this study because you are the main instructor for your dental hygiene school's local anesthesia/pain control class, or are the director of the program should your program not offer such a class.

Your participation will involve completing an online survey located on www.surveymonkey.com. The survey should take about 10-20 minutes to complete. Your involvement in the study is voluntary, and you may choose not to participate. There are no names or identifying information associated with this survey. The survey includes questions such as "Is it legal for local anesthesia to be practiced by dental hygienists in your state?" or "Is there a clinical or laboratory portion to your local anesthesia class?"

You can refuse to answer any of the questions at any time. There are no known risks in this study, but some individuals may experience discomfort when answering questions. All data will be kept for 2 years in a locked file in Professor Logothetis office and then destroyed.

The findings from this project will provide information on what the average level of education on local anesthesia/pain control is in dental hygiene programs in the United States. If published, results will be presented in summary form only.

If you have any questions about this research project, please feel free to call Aleisha Matern at (505) 382-3550. If you have questions regarding your legal rights as a research subject, you may call the UNMHSC Office of Human Research Protections at (505) 272-1129.

By completing the online survey at the link provided, you will be agreeing to participate in the above described research study.

Thank you for your consideration.

Sincerely,

Researcher's Name
Aleisha Matern, RDH BS
Researcher's Title
Graduate student

APPENDIX C

Local Anesthesia in Dental Hygiene Education

1. Local Anesthesia in Dental Hygiene Education Survey

Intent of questionnaire: To understand the extent of local anesthesia education provided in dental hygiene schools in the US.

Please have the following brief questionnaire completed by the instructor of your dental hygiene program's local anesthesia and /or pain control management class.

Please check all of the boxes that apply to your program.

Local Anesthesia in Dental Hygiene Education

2.

1. According to the dental hygiene practice act in your state, can dental hygienists administer local anesthesia?

- ◯ Yes
- ◯ No

2. (A) If you selected "Yes" to question #1, what is in the scope of practice for a dental hygienist with local anesthesia licensure/certification in your state? Please check all that apply.

- ☐ Infiltrations only
- ☐ Blocks and infiltrations
- ☐ General anesthesia
- ☐ Administer and monitor nitrous oxide
- ☐ Monitor nitrous oxide only
- ☐ Other (please specify)

3. Do you offer a pain management course that does not include the administration of local anesthesia?

- ◯ Yes
- ◯ No

4. Do you offer a local anesthesia course in your curriculum?

- ◯ Yes
- ◯ No (If no, please skip down to question #18)

Local Anesthesia in Dental Hygiene Education

5. (A) If you selected "Yes" in question #4, after completion of your course, what are the state requirements in order for a student to become licensed in local anesthesia? Please check all that apply.

- [ ] Written regional board
- [ ] Clinical regional board
- [ ] Display clinical competence in LA
- [ ] Number of hours
- [ ] Number of injections
- [ ] Other (please specify)

6. Is the course your program offers accelerated? (less than 8 weeks)

- ◯ Yes
- ◯ No

7. Is your course taught by a contracted educator? (Meaning a licensed local anesthesia instructor is brought in specifically to teach only local anesthesia. This is usually a traveling instructor.)

- ◯ Yes
- ◯ No

Local Anesthesia in Dental Hygiene Education

3.

* If you selected "Yes" in question #7, but do not know specific information about the course due to the instructor not being present, please skip down to question #18.

8. Is a textbook required for the local anesthesia course?

- ◯ Yes
- ◯ No

9. *If you selected "Yes" in question #8, please enter the textbook that is required for your course in the space below.

10. What topics are covered in your class? Please check all that apply.

Review: Student not learning the material for the first time.
In depth: Student learning the material for the first time.

	Review	In-depth
History of Local Anesthetics	◯	◯
Anatomy of head and neck	◯	◯
Neurophysiology	◯	◯
Pharmacology of Local Anesthetics	◯	◯
Pharmacology of Vasoconstrictors	◯	◯
Armamentarium	◯	◯
Block technique	◯	◯
Infiltration technique	◯	◯
Complications	◯	◯
Legal considerations	◯	◯

Other (please specify)

Local Anesthesia in Dental Hygiene Education

11. How many hours of your curriculum are dedicated toward your local anesthesia course?

Fill in the blanks below:

(Please explain in terms of class time for example, one 3 hour class per week in a 16 week semester, or three 1 hour classes per week in a 8 week semester etc.)

Hour class

Times a week

Weeks in the semester

12. *If the template in question #11 does not fit your curriculum please explain what your program offers is the space below.

13. Is there a clinical or laboratory portion to your local anesthesia class?

- ◯ Yes
- ◯ No

14. (A). If you selected "Yes" to question #13, what is the structure of the clinical/laboratory portion?

- ☐ Didactic prior to clinical
- ☐ Clinical and didactic at the same time
- ☐ Other (please explain)
- ☐ Other (please specify)

15. What are your school's minimum requirements for a student to be able to administer local anesthesia on a human subject (whether it be a classmate or patient).

- ☐ Pass and exam
- ☐ Student displays competence on a typodont
- ☐ Other (please specify)

Local Anesthesia in Dental Hygiene Education

16. What technique(s)/ injection(s) are taught in your clinical/laboratory portion? Please check all that apply.

	Taught in clinic/laboratory	Taught in clinic/laboratory to competency	Level of Competency (Percentage)
Supraperiosteal			
Posterior Superior Alveolar			
Middle Superior Alveolar			
Anterior Superior Alveolar			
Infraorbital			
Greater Palatine			
Nasopalatine			
Inferior Alveolar			
Lingual			
Long Buccal			
Gow Gates			
Mental/Incisive			

Other (please specify)

17. What are your program's requirements for a student to pass the clinical/laboratory portion of the course? Please check all that apply.

- ☐ Complete the didactic portion with a passing grade
- ☐ Complete a set number of clinical hours.
- ☐ Complete a set number of specific injections.
- ☐ Successfully complete a final exam
- ☐ Successfully complete a mock board exam
- ☐ Other (please specify)

Local Anesthesia in Dental Hygiene Education

4. ATTENTION: Please read the following before moving on in the survey

*Please only answer questions #18 and #19 if your program is located in a state in which local anesthesia is NOT legal to be practiced by a dental hygienist.

18. Although dental hygienists cannot legally administer local anesthesia in your state, do you feel that it is still important for a registered dental hygienist to be knowledgeable in this subject?

- ◯ Yes
- ◯ No

19. If yes, to what extent? Please select all that apply

- ☐ Being able to manage a patient that is numb
- ☐ Managing medical emergencies related to local anesthesia
- ☐ Knowing contraindications and potential side effects relating to the patient's medical health during and following the use of local anesthetics
- ☐ Other (please specify)

20. What is your professional title at your dental hygiene program. Please select the one that applies most.

- ◯ Director
- ◯ Graduate Director
- ◯ Professor
- ◯ Assistant Professor
- ◯ Instructor
- ◯ Other (please specify)

Local Anesthesia in Dental Hygiene Education

21. What is your highest degree held in dental hygiene?

- ◯ Certificate
- ◯ Associates
- ◯ Bachelors
- ◯ Masters
- ◯ PhD
- ◯ Other (please specify)

22. What is your higesth degree overall?

- ◯ Certificate
- ◯ Associates
- ◯ Bachelors
- ◯ Masters
- ◯ PhD
- ◯ Other (please specify)

23. How many years have you taught this course?

24. How many students take this course per graduating class?

25. What is the highest level of education offered within your dental hygiene program?

- ◯ Certificate
- ◯ Associates
- ◯ Bachelors
- ◯ Masters
- ◯ PhD
- ◯ Other (please specify)

Local Anesthesia in Dental Hygiene Education

5.

Thank you for your participation!

APPENDIX D

Local Anesthesia Administration By Dental Hygienists State Chart

State & Year Implement	Supervision Required	Block and/or Infiltration	Education Required	Exam Required	Implement Language in Statute or Rules	Legal Requirements for Local Anesthesia Courses?
AK 1981	General	Both	Specific	Yes – WREB and local anesthetic exam	Statute	16 didactic 8 clinical 8 lab
AZ 1976	Direct	Both	Approved	Yes-WREB and local anesthetic exam	Statute	36 hrs for local and N20
AR 1995	Direct	Both	Approved And Accredited	No	Statute	16 didactic 12 clinical
CA 1976	Direct	Both	Approved	Yes	Rules	No
CO 1977	General	Both	Accredited	No	Statute	12 didactic 12 clinical
CT 2005	Direct	Both	Accredited	No	Statute	20 didactic 8 clinical
DC 2004	Direct	Both	Board Approved	Yes	Rules	32 hours total
HI 1987	Direct	Both	Accredited	Yes – Exam given by course	Statute	39 didactic and clinical
ID 1975	General	Both	Accredited	Yes –Clinical	Statute	No
IA 1998	Direct	Both	Accredited	No	Rules	Must be conducted by an accredited RDH or DDS school
IL 2000	Direct	Both	Accredited	No	Statute	24 didactic 8 clinical
IN 2008	Direct				Rules Pending	
KS 1993	Direct	Both	Accredited	No	Statute	12 hrs total
KY 2002	Direct	Both	Specific	Yes –Written exam given by course	Statute	32 hour didactic 12 hours clinical
LA 1998	Direct	Both	Accredited	Yes	Rules	72 total hours
MA 2004	Direct	Both	Accredited	Yes	Statute	35 Total; No Less than 12 hours clinical

Local Anesthesia Administration By Dental Hygienists State Chart

State & Year Implement	Supervision Required	Block and/or Infiltration	Education Required	Exam Required for Certificate?	Implement Language in Statute or Rules	Legal Requirements for Local Anesthesia Courses?
ME 1997	Direct	Both	Accredited	Yes	Rules	60 hrs total
MD 2009	Direct	Infiltration	Pending	Pending	Pending	Pending
MN 1995	General	Both	Accredited	No	Rules	No
MO 1973	Direct	Both	Accredited/ Board approved	Yes	Rules	No
MI 2002	Direct	Both	Accredited and Specific	Yes –State or regional board-administered written exam (NERB)	Statute	15 didactic 14 clinical
MT 1985	Direct	Both	Accredited	Yes – WREB local anesthetic exam or successful completion of clinical & written LA regional or state board exam	Statute	No
ND 2003	Direct	Both	Accredited	No	Rules	Course must include clinical and didactic components, but there are no specific hourly requirements.
NE 1995	Direct	Both	Approved	No	Statute	12 didactic 12 clinical
NH 2002	Direct	Both	Accredited	Yes – NERB local anesthesia exam	Statute	20 didactic 12 clinical
NV 1982	Direct/General	Both	Approved	No	Rules	No
NM 1972	Direct	Both	Accredited	Yes – WREB local anesthesia exam	Statute	24 didactic 10 clinical
NJ 2008	Direct	Both	Accredited/Board Approved	Yes – NERB local anesthesia	Rules Pending	20 didactic 12 clinical Including a minimum of 20 hours monitored administration of local anesthesia
NY 2001	Direct	Infiltration	Accredited	No	Statute	30 didactic 15 clinical & lab
OH 2006	Direct	Both	Accredited	Yes – Written regional or state exam.	Statute	15 didactic 14 clinical

Local Anesthesia Administration By Dental Hygienists State Chart

State & Year Implement	Supervision Required	Block and/or Infiltration	Education Required	Exam Required for Certificate?	Implement Language in Statute or Rules	Legal Requirements for Local Anesthesia Courses?
OK 1980	Direct	Both	Approved	No – Exam given by course	Rules	20 ½ hours
OR 1975	General	Both	Accredited	No	Rules	No
RI 2005	Direct	Both	Accredited	Yes-NERB	Statute	20 didactic 12 clinical
SC 1995	Direct	Infiltration	Approved	Yes	Statute	Information not available
SD 1992	Direct	Both	Accredited Approved	No	Statute	No
TN 2004	Direct	Both	Accredited Approved	Yes	Rules	24 Didactic 8 Clinical
UT 1983	Direct	Both	Approved	Yes – WREB exam in anesthesiology (local)	Statute	No
VT 1993	Direct	Both	Accredited	Yes – Board administered	Statute	24 hrs total
VA 2006	Direct	Both *Only on patients over age 18	Accredited	Yes-accredited program Board of another jurisdiction accepted	Statute	36 didactic-clinical
WA 1971	Direct	Both	Approved	No	Statute	No
WI 1998	Direct	Both	Accredited	No	Statute	10 didactic 11 clinical
WV 2003	Direct	Both	Pending	NERB local anesthesia exam or equivalent state or regional exam	Statute	12 didactic 15 clinical
WY 1991	Direct	Both	Approved	Yes = in state. No= out of state DH certified in local	Rules	No

Accredited----Course must be provided within a CODA accredited DH program or an institution housing a CODA program
Approved-----Course must be approved by the state licensing agency
Specific-------Course is specified in law. Data complied from 51 practice acts/rules
Direct Supervision --- means the dentist must be present.
General Supervision – means dentist need not be present.

adha American Dental Hygienists' Association

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