

University of the Incarnate Word

The Athenaeum

Theses & Dissertations

12-2015

Duty Hour Limitations and Educational Outcomes: Perspectives From a Community Hospital-Based Family Medicine Residency Program

Maria Eliza Marquise

University of the Incarnate Word, marquise@uiwtx.edu

Follow this and additional works at: https://athenaeum.uiw.edu/uiw_etds



Part of the [Health and Medical Administration Commons](#), and the [Higher Education Commons](#)

Recommended Citation

Marquise, Maria Eliza, "Duty Hour Limitations and Educational Outcomes: Perspectives From a Community Hospital-Based Family Medicine Residency Program" (2015). *Theses & Dissertations*. 31. https://athenaeum.uiw.edu/uiw_etds/31

This Dissertation is brought to you for free and open access by The Athenaeum. It has been accepted for inclusion in Theses & Dissertations by an authorized administrator of The Athenaeum. For more information, please contact athenaeum@uiwtx.edu.

DUTY HOUR LIMITATIONS AND EDUCATIONAL OUTCOMES: PERSPECTIVES FROM
A COMMUNITY HOSPITAL-BASED FAMILY MEDICINE RESIDENCY PROGRAM

by

MARIA ELIZA MARQUISE

A DISSERTATION

Presented to the Faculty of the University of the Incarnate Word
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

UNIVERSITY OF THE INCARNATE WORD

December 2015

© 2015 Maria Eliza Marquise

ACKNOWLEDGEMENTS

I am truly indebted to my dissertation committee for their guidance and support throughout this journey. I am especially grateful to Dr. Noah Kasraie who met with me and provided his critical, but constructive, feedback. He set the expectations high and I worked very hard to meet them. My thanks to Dr. Jose Hinojosa, for his professional input and guidance regarding my dissertation topic. He was my content expert and I greatly appreciate his support. To my chair, Dr. Norman St. Clair, I extend my appreciation first of all for agreeing to be my chair when I needed a replacement. He sparked my interest in research when I took his research methods class in fall 2008 while pursuing my master's degree. By asking me to work with a group of students on a literature review assignment, Dr. St. Clair made me feel like I really was capable of pursuing a postgraduate education. For that gesture, I am forever grateful.

Two other professors have not only contributed to my scholarly goals, but also became part of my personal life. Dr. Jessica Kimmel and Dr. Sharon Herbers were there for our family; I am genuinely grateful for all of their support and guidance. A further acknowledgement goes to a group of colleagues who assisted me most through this process, the Cosmic Cultural Collaborators (CCC)—Solomon Nfor, Abisola Santos, and Howard Marquise. As I reflect on our time together over the past few years developing our research projects, studying for qualifying written and oral examinations, and meeting to discuss the status of our dissertation topics, I am so very thankful to them all. Their constant support inspired me to complete this journey; I look forward to working with the CCC on future collaborations and to making essential contributions.

ACKNOWLEDGEMENTS—Continued

Finally, my deepest thanks go to my husband, Howard, for believing in me and sharing this experience, which will always hold a special place in my heart as a testimony to our love. I look forward to our future in research together. To our daughters, Olivia, Andrea, and Emily, whom I love unconditionally, I hope that sharing this educational journey provides you with the courage to accomplish your own life goals. *¡Si se puede!*

Maria Eliza Marquise

DEDICATION

I dedicate this work to my husband, Howard Marquise. Even when I was at my most obstinate, your confidence in me never wavered. You see in me what I can't see in myself.

I would also like to recognize my late mother, Belia Silva, and my father, Ramiro Silva, and share this accomplishment with them. Mom and Dad, watching you work hard all of your lives to provide for my four siblings and me instilled in me a strong work ethic, which allowed me to achieve this goal. Mom, I miss you so much but know you'll watch from heaven as I walk the stage. Dad, I love you and know that, in your own quiet way, you're proud of me.

Finally, I dedicate this accomplishment to my family medicine residents. As a program coordinator, I am often called the "Mom" of the program and I do cherish each of you as my own. I am so happy to have you all in my life!

DUTY HOUR LIMITATIONS AND EDUCATIONAL OUTCOMES: PERSPECTIVES FROM A COMMUNITY HOSPITAL-BASED FAMILY MEDICINE RESIDENCY PROGRAM

Maria Eliza Marquise

University of the Incarnate Word, 2015

In 2003, the Accreditation Council for Graduate Medical Education and the American Osteopathic Association introduced new models that established limits on residents' duty hours in training programs across the United States (Miulli & Valcore, 2010; Philibert & Taradejna, 2011); more stringent limitations were implemented in 2011. If these physician training programs decreased the time residents' spent in a formal learning environment and utilized experiential learning as one teaching method, did the duty hour limitations affect the residents' learning outcomes?

The purpose of this ex post facto, quantitative study was to determine if there were differences in ITE (In-Training Examination) scores of family medicine graduates the year before and the year after duty hour limitations, 2003, as well as the year of duty hour limitations updates, 2011, at a community-based hospital residency program in South Central Texas.

The study analyzed, for a span of 17 years, yearly ITE scores of residents who completed training in a community-based family medicine residency program ($n = 355$). Scores were divided into 3 groups. The first group included examination scores for the period 1997–2002 (109 residency graduates), when duty hour limitations did not exist. The post-implementation groups included examination scores for 2003–2010 (165 residency graduates) and 2011–2014 (81 current residents).

The ITE consists of 240 questions covering a wide range of content categories. To analyze the ex post facto data from the ITE, a quantitative approach was used to determine if there were differences in scores of family medicine residency graduates before and after the year of duty hour limitations (2003) and from scores of current residents after duty hour limitations updates (2011). Univariate analysis provided descriptive statistics (gender, ethnicity, age). Inferential analysis determined if there were differences between the mean scores of the residents within the three groups of duty hour limitation periods.

Analysis of this data indicated significant differences in the means of the ITE scores in 2 of the 3 duty hour periods. In addition, significant results were reported in the means of the adult medicine subcategory scores over 2 of the 3 duty hour periods, with no significant difference reported in the means of the maternity care subcategory scores.

Based on the population for this study, results showed a significant difference in ITE scores after the duty hour limitation updates in 2011. These duty hour limitation standards are now a permanent fixture of postgraduate medical training. Researchers should continue to study educational outcomes related to resident work hours. Reporting on best practices would encourage duty hour limitations within individual institutions, be they university-based or community hospital-based residency programs.

TABLE OF CONTENTS

LIST OF TABLES	xi
LIST OF FIGURES	xii
CHAPTER ONE: DUTY HOUR LIMITATIONS IN GRADUATE MEDICAL EDUCATION ..	1
Background	1
The Problem	4
The Purpose	6
Theoretical Background	7
Adult learning	7
Experiential learning	9
Significance of the Study	12
Limitations of the Study	13
CHAPTER TWO: REVIEW OF THE LITERATURE	14
History of Medical Residency Training	14
History of Duty Hours Reform	15
Implementation of 2003 duty hour limitations	17
Institute of Medicine report	17
Implementation of 2011 duty hour limitations	20
Duty Hour Limitations Perspectives in Graduate Medical Education	23
Pre-duty hour limitations period (before 2003)	24

Table of Contents—Continued

CHAPTER TWO: REVIEW OF THE LITERATURE

Implementation of duty hour limitations (2003–2010).....25

Updates to duty hour limitations (2011–2014)27

CHAPTER THREE: METHODOLOGY33

Purpose of Research Study33

Research Questions33

Study Design34

Population34

Data Collection34

Data Analysis36

Protection of Human Subjects36

CHAPTER FOUR: FINDINGS37

Purpose of Research.....37

Descriptive Analysis of Data37

Inferential Analysis of Data43

Research Question One.....44

Research Question Two46

Research Question Three49

Gender Variable50

Age Variable52

Ethnicity Variable54

Summary57

Table of Contents—Continued

CHAPTER FIVE: DISCUSSION.....	58
Purpose of Research.....	58
Summary of Results	58
Theoretical Inferences.....	58
ACGME General Competencies.....	61
Patient care.....	61
Medical knowledge	62
Practice-based learning and improvement	62
Interpersonal and communication skills	63
Professionalism	64
Systems-based practice	64
First-Year Resident Study Participants’ Scores Versus National Averages	65
Recommendations for Future Research	65
Conclusion	68
REFERENCES	70
APPENDICES	75
Appendix A Block Rotation Schedule	75
Appendix B Code Book	76
Appendix C University of the Incarnate Work IRB Document.....	77
Appendix D CHRISTUS Santa Rosa IRB Document	78
Appendix E CITI Training Certificate	82

LIST OF TABLES

1. Resident Duty Hours: Work per Week, Moonlighting, Time Free of Duty	20
2. Resident Duty Hours: Maximum Duty Period Length	21
3. Resident Duty Hours: Minimum Time Off Between Scheduled Duty Periods	22
4. Resident Duty Hours: Frequency of In-House Night Float, In-House On-Call Frequency.....	23
5. Resident Duty Hours: At-Home Call.....	23
6. Statistics for Ages of Resident Examinees	38
7. Statistics for Scaled Score: Pre-Duty Hour Limitations Group	40
8. Statistics for Scaled Score: After 2003 Duty Hour Limitations Group	41
9. Statistics for Scaled Score: After 2011 Updated Duty Hour Limitations Group.....	42
10. Statistics and ANOVA Results by Duty Hour Limitations Period	45
11. Statistics and ANOVA Results for Adult Medicine and Maternity Care ITE Scores	47
12. Gender Ranks: Pre-Duty Hour Limitations	51
13. Gender Ranks: After 2003 Duty Hour Limitations.....	51
14. Gender Ranks: After 2011 Updated Duty Hour Limitations	52
15. Statistics and ANOVA Results for Examinees' Ages and Duty Hour Limitations Periods....	53
16. Examinees' Ethnicity and ITE Scores: After Pre-Duty Hour Limitations Period.....	55
17. Examinees' Ethnicity and ITE Scores: After 2003 Duty Hour Limitations Period.....	56
18. Examinees' Ethnicity and ITE Scores: After 2011 Updated Duty Hour Limitations Period..	56

LIST OF FIGURES

1. Duty Hour Mandates and Family Medicine Residents ITE Scores	6
2. Malcolm Knowles's Six Assumptions for Adult Learners.....	8
3. John Dewey's Effective Experiential Learning Theory.....	11
4. David Kolb's Experiential Learning Model Showing Four Learning Styles	12
5. Gender Comparison of Resident Examinees	38
6. Percentages of Ethnicities of Resident Examinees	39
7. Total Examination Scores per Mandate Period	39
8. Q-Q Plot of Scaled Score: Pre-Duty Hour Limitations Group	40
9. Q-Q Plot of Scaled Score: After 2003 Duty Hour Limitations Group	41
10. Q-Q Plot of Scaled Score: After 2011 Updated Duty Hour Limitations Group	42
11. Histogram of Normality of Scaled Score.....	43
12. Mean Plots Graph: ITE Scores Over Three Duty Hour Periods	45
13. Mean Plots Graph: Adult Medicine ITE Scores	48
14. Mean Plots Graph: Maternity Care ITE Scores	49
15. Mean Plots Graph: Examinees' Ages Over Three Duty Hour Periods.....	58
16. First-Year Resident Study Participants' ITE Scores Versus National Averages.....	66

Chapter One: Duty Hour Limitations in Graduate Medical Education

Background

How do medical doctors begin their careers? Students must graduate from a medical school accredited by the Liaison Committee on Medical Education or the American Osteopathic Association before they can place the Medical Doctor (MD) or Doctor of Osteopathy (DO) credentials following their names. However, their medical education does not conclude on graduation day. During their final year of medical school, students apply to medical residency training programs and wait for interview invitations. Interviews are generally scheduled between October and January. Once the interview season concludes, students submit a list of their top choices of the locations where they want to complete their training to the Electronic Residency Application Service in February. The Association of American Medical Colleges provides this service. The medical residency training programs submit a rank list of their top choices of candidates, based on the student interviews. In mid-March of their final year of medical school, students learn where they will continue the training phase of their medical education on Match Day.

Postgraduate medical training can take anywhere from 3 years in primary care specialties (family medicine, pediatrics, obstetrics/gynecology, and internal medicine) to up to five years for surgical training. For those trainees who desire training in more focused areas within each specialty, subspecialty fellowships are available. The research described in this dissertation examined a program that trains graduates in one of the primary care specialty areas: a Family Medicine Residency Program located at a community-based hospital in South Central Texas.

Family medicine residency programs offer two training rotation options. Training rotations are distributed over three years consisting of either 13 four-week rotations or 12 one-

month rotations per year. The FMRP participating in this study employs the 13 four-week rotation schedule for its residents (Appendix A). During the first year of residency training, the trainee's status is that of an intern. Throughout the second and third years of training, the intern's status is elevated to that of a resident.

Rotations are completed in areas essential to the specialty such as adult inpatient medicine, obstetrics (maternity care), gynecology, pediatrics, adult & pediatric emergency medicine, surgery, intensive care medicine, cardiology, psychiatry, public health, sports medicine, orthopaedic surgery, and others. Within each rotation, residents are assigned to work in the family health center (outpatient clinic). The time the resident spends in clinic is dependent on how much time a particular rotation requires. To increase knowledge in subspecialty areas of medicine, elective (four-week) and selective (two-week) rotations are offered during the second and third years of training.

During all rotations and in the family health center, physician preceptors provide supervision and work with residents as they learn more about that particular field of medicine. Residents see patients with preceptors in the inpatient (hospital) setting (also called "rounding on patients") and in the outpatient (clinic) setting to determine plans of care. Preceptors include faculty members of the family medicine residency group practice and community physicians in their particular specialty/subspecialty, who are either in a solo private practice or a member of a larger group practice. All preceptor physicians complete evaluations on interns and residents at the conclusion of each rotation and submit these reports to the residency program administration office for tracking residents' academic progress.

Along with their clinical learning experiences, residents who participated in this study also attended lectures during lunchtime every day, and an entire afternoon each week was

devoted to didactics. The format for afternoon didactic sessions included a combination of the following: a faculty or guest lecture, a master class, a group of resident-led lectures, offsite nursing home visits to check on continuity geriatric patients, board review sessions, hospital and program committee meetings, and meetings with resident research groups. The final option involving research is an important one as the Accreditation Council for Graduate Medical Education (ACGME), a national accrediting organization that oversees medical residency training, mandates completion of some type of scholarly activity as a requirement for completing the training program.

Two landmark events occur during residency. During the intern year, residents register for and successfully pass the United States Medical Licensing Step 3 examination; once they complete their first year of training, they apply for and obtain a state medical license (Philibert & Taradejna, 2011). Once granted the license by the state medical board, they are licensed family medicine physicians.

The second landmark event is passing the American Board of Family Medicine Certification Examination. To prepare for this exam, an In-Training Examination (ITE) is scheduled by the American Board of Family Medicine each year during the final week of October. The exam is offered online and residents are allowed four hours to complete it. The process of studying for and taking the ITE each year, along with the knowledge gained from rotations, provides residents with the experience and proficiency required to take the American Board of Family Medicine Certification Exam during the latter half of their final year of training.

Each training program receives a report of their residents' ITE scores each year. For first-year residents, this initial score is an individual baseline score. Second- and third-year residents should improve each year as they become familiar with the exam process and more experienced

clinically. In the program from which this study's population was drawn, if no progress is reported in the exam results from one year to the next, the resident meets with his or her faculty advisor to determine the obstacle(s) to progress. An action plan is then created and goals are set to improve for the ITE score the following year.

As stated before, residents take the ITE during each year of training in preparation for taking the final board certification examination. Upon passing that final examination in the spring of their third year of training, residents become board certified family medicine physicians. Thus, the residents graduate from the training program as state licensed, board certified physicians and may begin the practice of medicine with no further supervision.

The Problem

The ACGME and the American Osteopathic Association mandated in 2003 new limits on residents' duty hours in programs across the United States (Miulli & Valcore, 2010; Philibert & Taradejna, 2011). This new model decreased the residents' time spent in a learning environment. Even more restrictive limitations were implemented in 2011. If physician training programs utilized experiential learning as one of their teaching methods, did these duty hour limitations affect the learning outcomes, as measured by ITE scores?

Carek, Diaz, Dickerson, Peterson, and Johnson (2012) published a study that "examines the perception of graduates of family medicine residency programs immediately prior to and following the implementation of duty hours regarding preparedness to practice, board certification status, and patient care activities" (p. 539). A survey research methodology was utilized. For 1999–2003 graduates prior to implementation of duty hours, 130 surveys were analyzed and 136 surveys were examined for 2005–2009 graduates following implementation of duty hours (n = 266). Comparisons between the two groups of graduates were made in the

categories “preparation for practice” and “professional activities.” These comparisons demonstrated that “in general, family medicine residents in this study completing training after the implementation of duty hour restrictions feel as prepared for practice in most curricular areas as those residents who completed training prior to the restrictions” (Carek et al., 2012, p. 542). However, graduates after the restrictions were imposed reported feeling less prepared for surgery and other procedures (Carek et al., 2012).

Other findings reflect that the practice patterns of more recent graduates changed significantly from the graduates prior to the duty hours. Fewer recent graduates are entering solo or small family practice settings and are not making themselves available for after-hours call as frequently as had their predecessors. In contrast to earlier graduates, recent graduates are not seeing patients in nursing home facilities, caring for hospitalized patients, or making home visits (Carek et al., 2012). These activities historically occurred prior to or after regular office hours, and extended a family medicine physician’s hours worked per week. “The implementation of limited duty hours and how certain activities may impact their quality of life may have influenced recent graduates regarding their choice to provide many of these services” (Carek et al., 2012, p. 544).

Also as stated earlier, recent graduates may not be caring for hospitalized patients because they did not receive enough experience during their training with procedures associated with such care (Carek et al., 2012), possibly occurring due to duty hour restrictions. These earlier studies concluded that the implementation of resident duty hour restrictions appear to have improved only the residents’ quality of life without any established benefit to medical education or patient care (Carek et al., 2012; Fletcher et al., 2004).

In a systematic review of research of duty hour outcomes conducted by Levine, Adusumilli, and Landrigan (2010), only 14 studies gleaned from the initial 2,984 citations assessed educational outcomes. However, the studies' populations included residents from surgery, obstetrics and gynecology, and pediatric residency programs. The article reported that, of the 14 studies, "4 found improvements, 9 found no significant changes and 1 found education had worsened" (Levine et al., 2010, p. 1043). No citations of family medicine residents were found.

The Purpose

The purpose of this ex post facto, quantitative study was to determine if there were differences in ITE scores of family medicine graduates the year before and the year after duty hour limitations, 2003, as well as the year of duty hour limitations updates, 2011, at a community-based hospital residency program in South Central Texas (see Figure 1).

An ex post facto study uses pre-existing data in its research, with no interference from the investigator (Silva, 2010).

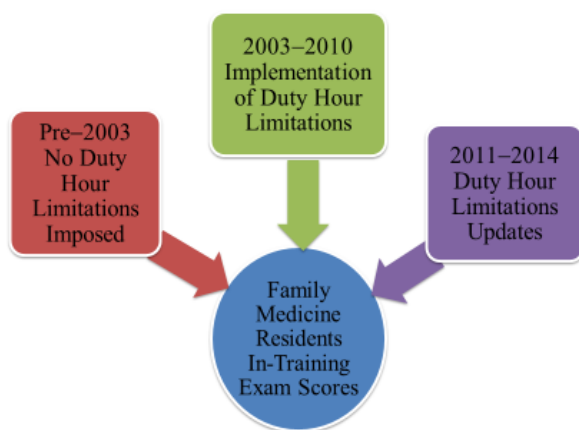


Figure 1. Duty hour mandates and family medicine residents ITE scores.

Research Questions

To assess educational outcomes for family medicine residents after implementation of duty hour limitations, the following questions are provided for investigation:

1. Is there a difference in overall scores of the exam for residents who took the ITE (a) before the 2003 duty hour limitations (1997–2002), (b) after implementation of the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?
2. Is there a difference in scores within the exam categories of adult medicine and maternity care for residents who took the ITE (a) before the 2003 duty hour limitations (1997–2002), (b) after implementation of the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?
3. What effects do the demographic variables of gender, age, and ethnicity have on ITE scores (a) before the 2003 duty hour limitations (1997–2002), (b) after implementation of the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?

Theoretical Background

Since all medical residency training programs consist of adult trainees who spend a majority of their time with patients in hospitals and clinics learning in an experiential manner, adult learning and experiential learning theories were explored.

Adult learning. Two adult learning theory pioneers, Malcolm Knowles and Peter Jarvis, will be discussed.

Knowles (1968) introduced an adult learning theory focusing on the “art and science of helping adults learn” (p. 351). The theory of “andragogy is based on the following assumptions of adult learners:

- A person’s self-concept moves from one of being dependent to one of being self-directed as he or she matures.
- An adult draws from previous experiences as a resource for learning.
- The readiness of an adult to learn is closely related to the developmental tasks of his or her social role.
- As a person matures there is a change in time perspective, from future application of knowledge to immediacy of application—making the adult learner more problem-centered than subject-centered in learning” (Knowles, 1973, pp. 45-47).
- “The most potent motivators are internal rather than external. ...
- Adults need to know why they need to learn something” (Knowles, 1984, p. 12).

These assumptions are the framework for designing adult learning programs (Figure 2). From his “model of assumptions” (Knowles, 1980, p. 43), which he also labeled his “system of concepts” (Knowles, 1984, p. 8), the noted adult-learning theorist designed, implemented, and evaluated numerous learning activities with adults. (Merriam, Caffarella, & Baumgartner, 2007).

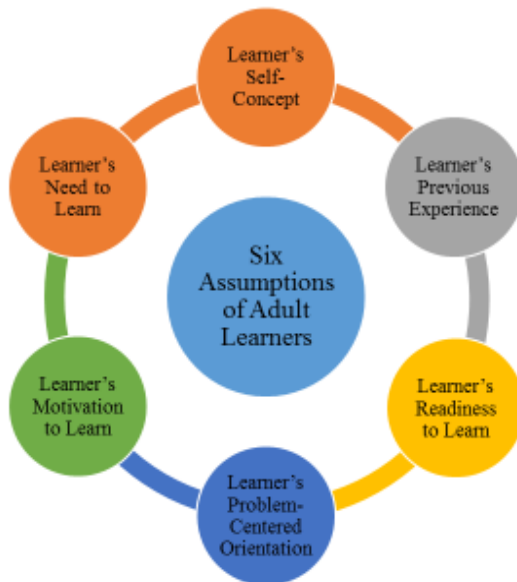


Figure 2. Malcolm Knowles’s six assumptions for adult learners.

Peter Jarvis (1987) asserted, “even miseducative experiences may be regarded as learning experiences. ...all [adult] learning begins with experience (p. 16).” Jarvis’s learning process incorporates the five human senses (sound, sight, smell, taste, and touch) as the tools used to learn. However, some experiences occur so frequently that they are taken for granted and do not lead to learning (Merriam et al., 2007). A learning cycle begins when an individual is faced with a situation that is unfamiliar. Previous learning is not helpful with this new situation and the individual becomes aware that he or she is not sure how to act. Something new must be considered or a plan must be made to deal with this situation (Merriam et al., 2007). For Jarvis, therefore, learning always begins with a new experience that will be learned and assimilated by the person through practice.

Both of these adult learning theorists integrate experience into their learning processes. Family medicine residents are adult learners who increase their medical knowledge through clinical experiences in various healthcare settings. When these residents leave patients in the care of another because of a duty hour limit, the mandate may detract from experiential learning.

Experiential learning. Medical education has a centuries-old tradition of “learning on the job” (Yardley, Teunissen, & Dornan, 2012, p. 162). It begins in medical school with clerkship experiences, during which students participate in different medical specialty environments to determine the areas they will choose for residency training. This experiential learning model continues into residency and is vital to resident trainees’ future careers. Thus, authentic workplace experience is the most important means by which people learn to practice as healthcare professionals (Yardley et al., 2012).

Dewey (1938) stated in his definitive book, *Experience and Education* that there is a connection between one’s life experiences and learning. Dewey (1938) postulated, “all genuine

education comes about through experience” (p. 13). Dewey (1938) then stated that this “does not mean that all experiences are genuinely or equally educative” (p. 13). Some experiences are not educational as they may “distort growth ... narrow the field of further experiences” (p. 13). For effective experiential learning, Dewey (1938) described two major principles that must occur: the continuity and the interaction of experiences. The first principle, the continuity of experience, means “learners must connect what they have learned from current experiences to those in the past as well as see possible future implications” (p. 27). The second principle, the interaction of experience, Dewey (1938) defined thus: “An experience is always what it is because of the transactions taking place between an individual and what, at the time, constitutes his environment” (p. 41). The continuity and interaction principles work together to form the foundation for experiential learning. In Dewey’s model, the situation is crucial to the promotion of learning. In order for adults to learn from their experiences, it is very important for educators to develop a welcoming and comfortable atmosphere, provide the right materials, and link these materials to learners’ past and future experiences. Learning, according to Dewey, occurs by linking past experiences and future implications using the mediums of continuity and interaction of the experiences (Figure 3).

Kolb (1984), developer of the Experiential Learning Theory, stated, “learning is the process whereby knowledge is created through the transformation of experience” (p. 38). Kolb (1984) also proposed that “learning is a continuous process grounded in experience. Knowledge is continuously derived and tested out in the experiences of the learner” (p. 27). He developed an experiential learning model that guides the learner through four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, n.d.)

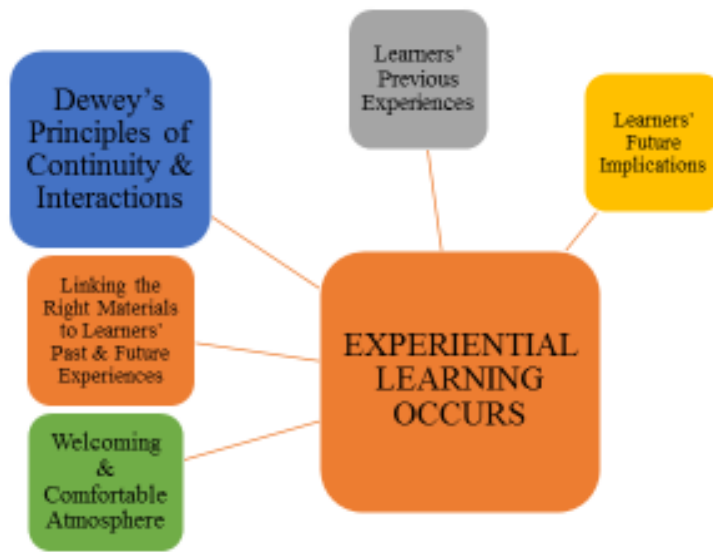


Figure 3. John Dewey’s effective experiential learning theory.

Concrete experience is the ability to involve one’s self in new experiences. Reflective observation is the ability to view the experience from a variety of perspectives. Abstract conceptualization is the ability to integrate ideas and concepts created from the observations. Active experimentation is the ability to put new ideas and concepts into actual practice (Merriam et al., 2007). The learner may begin the cycle at any stage, but the cycle must be followed in sequence once begun. Through research conducted using this model, Kolb (n.d.) identified four learning styles associated with each stage: assimilators, convergers, accommodators, and divergers. Each style highlights conditions for which student learning is more effective. Kolb (1984), stated, “Learning is a continuous process that is grounded in experience and is not measured by outcomes” (p. 27) (Figure 4).

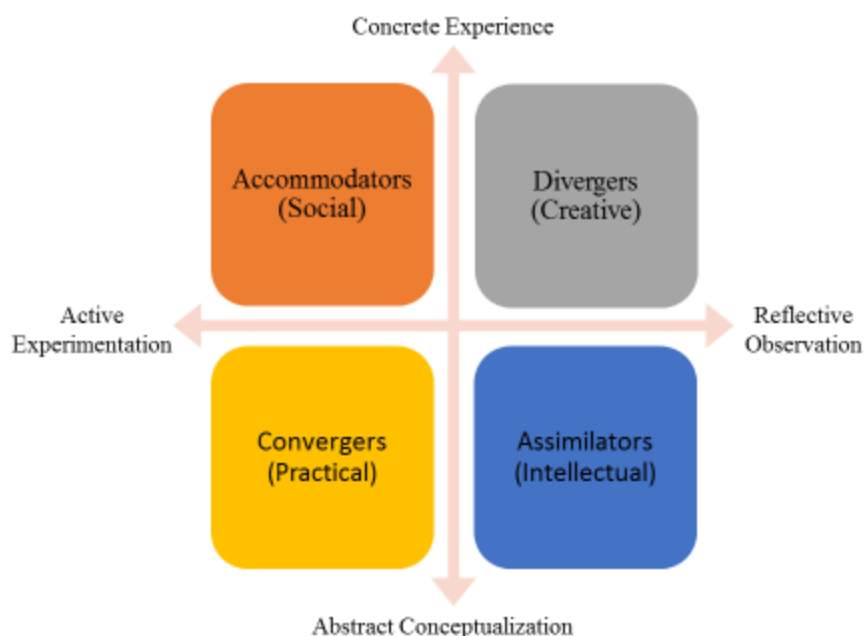


Figure 4. David Kolb's experiential learning model showing four learning styles.

Significance of the Study

After an exhaustive literature review, a gap was found in research regarding the relationship between the duty hour limitation mandates and graduate medical educational outcomes in family medicine residency programs.

This study is significant to many different groups in the medical field, including:

- directors of the family medicine residency training programs and teaching faculty who completed training before the duty hour limitations era;
- educational specialists;
- accreditation bodies who are policy makers, such as the Institutes of Medicine (IOM) and the ACGME;
- family medicine residents who have invested a substantial amount of time and money into becoming practicing physicians.

Limitations of the Study

A random selection process was not utilized for this study, so the participants may not be representative of the population of current family medicine residents nationally. Participants have taken or will take the ITE annually during their three-year training programs; this is considered a weakness in the study design because the same resident takes the exam three times over the course of their training period.

Medical school curriculums are not standardized across the country. For example, students from some medical schools may not be familiar with using an otoscope (device for looking in ears) during physical examinations, while other students are (Larry Karrh, MD, personal communication, October 13, 2015). The intern class begins its first year of training with each member of the class at a different level of medical knowledge.

CHAPTER TWO: REVIEW OF THE LITERATURE

The purpose of this ex post facto, quantitative study was to determine if there were differences in ITE scores of family medicine graduates the year before and the year after implementation of duty hour limitations, 2003, as well as the year of duty hour limitations updates, 2011, at a community-based hospital residency program in South Central Texas.

This review of the literature includes three sections. The first and second segments delineate the histories of family medicine residency training and duty hour reforms, and the third segment reviews different perspectives during each period connected to duty hour reforms in graduate medical education.

History of Medical Residency Training

Residency training programs were approved by the American Medical Association as early as 1910 (Petersdorf & Bentley, 1989). During the first half of the 20th century, the transition from medical student to career physician required long hours, hard work, and dedication. “One year of graduate medical education, the internship, had become the norm for graduates of most U.S. medical schools by 1920, and subsequently was adopted by most states as a criterion for licensure” (Petersdorf & Bentley, 1989, p. 175). The medical resident’s training followed the traditional model of physician education, which included brief periods of intense training during which responsibility for patients rested with residents 24 hours a day, seven days a week. Hence, the term “resident physician” was coined because the trainee spent so much time in residence at the hospital (Miulli & Valcore, 2010; Petersdorf & Bentley, 1989).

During the second half of the 20th century, the training period transitioned into a multiyear experience allowing the resident to train in an environment “that combined exposure to patients with new learning modalities in a vastly changed delivery system” (Philibert &

Taradejna, 2011, p. 6). In the 1950s, Residency Review Committees were formed. These committees were responsible for accrediting residency training programs for individual specialties. Residency Review Committees performed their peer review and accreditation functions independently, with support and staffing from the American Medical Association (Philibert & Taradejna, 2011).

In 1972, the Liaison Committee for Graduate Medical Education was established to provide organizational support for the Residency Review Committees. By 1981, the Liaison Committee for Graduate Medical Education transitioned into the present-day ACGME with five organizations providing membership: the American Medical Association, the American Board of Medical Specialties, the American Hospital Association, the Association of American Medical Colleges, and the Council of Medical Specialty Societies (Philibert & Taradejna, 2011).

The general requirements for the ACGME included standards that apply to all accredited programs in the United States. The Residency Review Committees generated specialty-specific program requirements. “The early requirements of 1981 did not explicitly reference resident hours; instead, they mentioned resident supervision and the learning environment, requiring a ‘well organized and well qualified teaching staff’ and an educational committee of the staff which is responsible for the organization, supervision, and direction of the residency program” (Philibert & Taradejna, 2011, p. 5).

History of Duty Hours Reform

Many in the medical profession believe that the duty hour reform movement began when a freshman college student named Libby Zion was admitted to New York Hospital in Manhattan on October 4, 1984, and died within 24 hours. The doctors assigned to her case were two medical residents, one an intern with eight months of training, and the other a resident with nearly two

years of training. The faculty doctor supervising both residents that evening made all clinical decisions for Zion by phone. When Zion's condition deteriorated, nurses called the intern and emergency measures were taken but to no avail. Neither the intern nor the nurses ever contacted the second-year resident or the faculty attending physician. Charap (2004) stated, "[Zion's] death was ... related to a lack of knowledge and a failure of supervision" (p. 814).

Zion's father, Sidney, was convinced that his daughter's death was a murder, the result of inadequate staffing on the part of the hospital. He was a lawyer, a columnist for the *New York Daily News*, and had established relationships with many powerful people in New York City. He began to write columns about the state of medical education and how interns were overworked and lacked supervision in caring for patients.

In 1986, Sidney Zion's publicity paid off. The Manhattan District Attorney allowed Zion to press murder charges against the hospital for the death of his daughter. The grand jury did not indict, but did criticize "the supervision of interns and junior residents at a hospital in New York County" (Lerner, 2006, p. 2). This criticism led to creation of a panel of experts by the New York State Health Commissioner. Bertrand Bell, M.D., a long-time critic of the lack of supervision of residents, was appointed to lead the panel and evaluate the training and supervision of doctors in the state. The panel, named the Bell Commission, recommended that "residents could not work more than an 80 hour work week, that residents could work no more than 24 hours of consecutive duty, and senior attending doctors should be physically present in the hospital at all times" (Lerner, 2006, p. 2). In 1989, the state of New York adopted these recommendations.

Also in 1989, ACGME recommended reduction of duty hours to 80 hours in several specialties, reduction of in-house call to every third night, and for residents in all specialties to

take one day off in seven. Many physicians in the national medical community did not pay attention to the recommendations. They did not believe that a resident could become a qualified doctor if they were not present during the first 36 hours of a patient's illness, which is often unpredictable (Lerner, 2006). Other critics stated that hand-offs from one shift to another would affect the continuity of patient care. The New York regulations and ACGME recommendations were largely ignored across the nation.

Implementation of 2003 duty hour limitations. Fourteen years passed and in 2003, the ACGME mandated reduced duty hours for all specialties (ACGME, 2003). If programs did not comply with the duty hour limitations, the ACGME would close the program. The Bell Commission recommendations were included within the ACGME duty hour restrictions creating the following seven mandates:

- “Eighty hours per week averaged over four weeks.
- One day off in seven averaged over four weeks.
- Ten hours off between work shifts.
- One in-house call (the resident stays overnight in the hospital to provide patient care when necessary) scheduled every third night.
- In-hospital hours during call from home (the resident goes home after the day shift and waits to be called in if necessary to provide care for a patient) counted as a call night.
- 24-hour of continuous duty allowed per shift (plus up to six hours to include time for daily didactics, patient transfers, and patient continuity of care).
- In-house moonlighting counts toward the 80 hour weekly limit” (Friedmann, 2007, slide 7).

The Accreditation Council for Graduate Medical Education promised to maintain oversight of the duty hour limitations standards and review them in five years.

Institute of Medicine report. In December 2008, the Committee on Optimizing Graduate Medical Trainee (Resident) Hours and Work Schedules to Improve Patient Safety, charged by the IOM, released a report delineating additional modifications to ACGME duty hour limitations standards. As reported by Ulmer, Wolman, and Johns (2008), the committee

recommended the following adjustments: (a) each resident's work shift should not exceed 16 hours unless an uninterrupted five-hour nap break is provided within shifts that last up to 30 hours; (b) programs should provide variable off-duty periods between shifts for sleep each day, along with regular days off allowing residents to rest; and (c) resident moonlighting should be limited.

The IOM committee also noted that current limits on duty hours were not followed and violations were underreported, so recommendations were made allowing for “changes to ACGME monitoring practices, including unannounced visits and strengthened whistle-blower processes to encourage resident reporting of violations of limits and undue pressure to work too long” (Ulmer et al., 2008, p. 2).

The IOM committee also proposed suggestions on how these recommendations could be implemented without increasing a resident's workload pressure. By working with each specialty's Residency Review Committee, residency programs can create “specialty-specific guidelines for the number of patients a resident should be permitted to treat during a shift, based on the level of residents' competency and patient characteristics. The committee found that closer supervision leads to fewer errors, lower patient mortality, and improved quality of care” (Ulmer et al., 2008, p. 2). The IOM committee felt that these proposed recommendations and suggestions produced better-trained residents. However, decreasing residents' duty hours meant hiring additional personnel (support staff, clinicians, and additional residents) to provide care when a resident is not available. The national cost for these replacements would be in the range of \$1.7 billion.

Concurrent with the IOM committee report, the ACGME—noting the five-year anniversary of the implementation of the reduced duty hour standards—formed the ACGME

Duty Hour Task Force (Task Force), which was charged with determining any improvements to the duty hour standards and reporting them to the ACGME Board of Directors and Committee on Requirements. In accordance with an open letter to the Graduate Medical Education community dated October 28, 2009, from Thomas Nasca, MD, Chief Executive Officer of the ACGME, the task force followed the timeline below:

- December 2008—IOM report received and ACGME surveyed residents, faculty, program directors, and designated institutional officials.
- March 2009—ACGME sponsored the International Symposium on Resident Duty Hours and the Learning Environment.
- June 2009—Task Force received written position papers from more than 140 medical organizations, and personal testimony from more than 70 national organizations representing the broad range of medical specialties, resident and student organizations, membership organizations, and the five ACGME Member Organizations.
- July–December 2009—Additional testimonies received from other perspectives, including leadership of the national patient safety movement, leadership of the United States Veterans Administration patient safety programs, experts from the sleep physiology and sleep medicine community, experts from the stress inoculation research community, the New York Hospital Association, the safety net hospitals, leadership of the Joint Commission, and three members of the IOM Committee that crafted the Report.

- February 2010–Task Force drafted new requirements to be presented to the ACGME Council of Review Committees (CRC) and the ACGME Board of Directors (BOD) for their input.
- February–September 2010–Edit and revision process conducted of new requirements by the CRC with final approval by the BOD (Nasca, 2009).

Implementation of the updated duty hour standards began with the onset of the educational year on July 1, 2011.

Implementation of 2011 duty hour limitations. The second phase of duty hour limitations implemented in 2011 were more extensive than the 2003 limitations, as shown in Tables 1–5 comparing 2003 and 2011 standards.

Table 1

Resident Duty Hours: Work per Week, Moonlighting, Time Free of Duty

2003	2011
Duty hours must be limited to 80 hours per week, averaged over a four-week period, inclusive of all in-house call activities.	Duty hours must be limited to 80 hours per week, averaged over a four-week period, inclusive of all in-house call activities and all moonlighting.
Moonlighting must not interfere with the ability of the resident to achieve the goals and objectives of the educational program.	Moonlighting must not interfere with the ability of the resident to achieve the goals and objectives of the educational program.
Internal moonlighting must be considered part of the 80-hour weekly limit on duty hours.	Time spent by residents in Internal and External Moonlighting must be counted towards the 80-hour Maximum Weekly Hour Limit.
Residents must be provided with one day in seven free from all educational and clinical responsibilities, averaged over a four-week period, inclusive of call.	PGY-1 residents are not permitted to moonlight. Residents must be scheduled for a minimum of one day free of duty every week (when averaged over four weeks). At-home call cannot be assigned on these free days.

Note: Adapted from the ACGME Website, <http://acgme.org/acgmeweb/Portals/0/PDFs/dh-ComparisonTable2003v2011.pdf>

Table 2

Resident Duty Hours: Maximum Duty Period Length

2003	2011
Continuous on-site duty, including in-house call, must not exceed 24 consecutive hours. Residents may remain on duty for up to six additional hours to participate in didactic activities, transfer care of patients, conduct outpatient clinics, and maintain continuity of medical and surgical care. No new patients may be accepted after 24 hours of continuous duty.	<p>Duty periods of PGY-1 residents must not exceed 16 hours in duration.</p> <p>Duty periods of PGY-2 residents and above may be scheduled to a maximum of 24 hours of continuous duty in the hospital. Programs must encourage residents to use alertness management strategies in the context of patient care responsibilities. Strategic napping, especially after 16 hours of continuous duty and between the hours of 10:00 p.m. and 8:00 a.m. is strongly suggested.</p> <p>It is essential for patient safety and resident education that effective transitions in care occur. Residents may be allowed to remain on-site in order to accomplish these tasks; however, this period of time must be no longer than an additional four hours.</p> <p>Residents must not be assigned additional clinical responsibilities after 24 hours of continuous in-house duty.</p> <p>In unusual circumstances, residents, on their own initiative, may remain beyond their scheduled period of duty to continue to provide care to a single patient.</p> <p>Justifications for such extensions of duty are limited to reasons of required continuity for a severely ill or unstable patient, academic importance of the events transpiring, or humanistic attention to the needs of a patient or family.</p> <p>Under those circumstances, the resident must: appropriately hand over the care of all other patients to the team responsible for their continuing care; and, document the reasons for remaining to care for the patient in question and submit that documentation in every circumstance to the program director.</p> <p>The program director must review each submission of additional service, and track both individual resident and program-wide episodes of additional duty.</p>

Note: Adapted from the ACGME Website, <http://acgme.org/acgmeweb/Portals/0/PDFs/dh-ComparisonTable2003v2011.pdf>

Table 3

Resident Duty Hours: Minimum Time Off Between Scheduled Duty Periods

2003	2011
<p>Adequate time for rest and personal activities must be provided. This should consist of a 10-hour time period provided between all daily duty periods and after in-house call.</p>	<p>PGY-1 residents should have 10 hours, and must have eight hours, free of duty between scheduled duty periods.</p> <p>Intermediate-level residents [as defined by the Review Committee] should have 10 hours free of duty, and must have eight hours between scheduled duty periods. They must have at least 14 hours free of duty after 24 hours of in-house duty.</p> <p>Residents in the final years of education must be prepared to enter the unsupervised practice of medicine and care for patients over irregular or extended periods.</p> <p>This preparation must occur within the context of the 80-hour, maximum duty period length, and one-day-off-in-seven standards. While it is desirable that residents in their final years of education have eight hours free of duty between scheduled duty periods, there may be circumstances when these residents must stay on duty to care for their patients or return to the hospital with fewer than eight hours free of duty.</p> <p>Circumstances of return-to-hospital activities with fewer than eight hours away from the hospital by residents in their final years of education must be monitored by the program director.</p>

Note: Adapted from the ACGME Website, <http://acgme.org/acgmeweb/Portals/0/PDFs/dhComparisonTable2003v2011.pdf>

Table 4

Resident Duty Hours: Frequency of In-House Night Float, In-House On-Call Frequency

2003	2011
	Residents must not be scheduled for more than six consecutive nights of night float.
In-house call must occur no more frequently than every third night, averaged over a four-week period.	PGY-2 residents and above must be scheduled for in-house call no more frequently than every-third-night (when averaged over a four-week period).

Note: Adapted from the ACGME Website, <http://acgme.org/acgmeweb/Portals/0/PDFs/dhComparisonTable2003v2011.pdf>

Table 5

Resident Duty Hours: At-Home Call

2003	2011
The frequency of at-home call is not subject to the every-third-night, or 24+6 limitation. However at-home call must not be so frequent as to preclude rest and reasonable personal time for each resident.	Time spent in the hospital by residents on at-home call must count towards the 80-hour maximum weekly hour limit. The frequency of at-home call is not subject to the every-third-night limitation, but must satisfy the requirement for one-day-in-seven free of duty, when averaged over four weeks.
Residents taking at-home call must be provided with one day in seven completely free from all educational and clinical responsibilities, averaged over a four-week period.	At-home call must not be so frequent or taxing as to preclude rest or reasonable personal time for each resident.
When residents are called into the hospital from home, the hours residents spend in-house are counted toward the 80- hour limit.	Residents are permitted to return to the hospital while on at-home call to care for new or established patients. Each episode of this type of care, while it must be included in the 80-hour weekly maximum, will not initiate a new "off-duty period."

Note: Adapted from the ACGME Website, <http://acgme.org/acgmeweb/Portals/0/PDFs/dhComparisonTable2003v2011.pdf>

Duty Hour Limitations Perspectives in Graduate Medical Education

This section discusses various reports connected to duty hour limitations in graduate medical education. The articles are grouped into three periods: the pre-duty hour limitation

period (before 2003), the implementation of duty hour limitations (2003–2010), and the updates to the duty hour limitations (2011–2014).

Pre-duty hour limitations period (before 2003). Within the Graduate Medical Education community, the impact of extensive duty hours was the subject of reports on the impact of the limitations mandate in the United States.

When comparing U.S. medical training to European medical training, Klazinga and van Bolderen (2003) noted large differences between the two models; they suggest redesigning training programs using a modular approach, with more exchange among training programs of different specialties. The Dutch adopted this approach more than a decade ago. The residents' workweek was decreased from 70 to 80 hours to 40 to 60 hours per week. While there is still room for improvement, "the medical community has accepted the necessity of working time regulation and regulated working weeks have become part of the professional culture" (Klazinga & van Bolderen, 2003, p. 110). Investigating other approaches to duty hour limitations transformation could result in positive educational outcomes for residents.

Carek et al. (2012) examined "family medicine residency programs immediately prior to and following the implementation of duty hours regarding preparedness to practice, board certification status, and patient care activities" (p. 539). From South Carolina family medicine residency programs, the researchers analyzed surveys completed by 130 graduates (1999–2003) prior to implementation of duty hours and by 136 graduates (2005–2009) following implementation of duty hours (n = 266). Comparing the categories "preparation for practice" and "professional activities" between the two groups of graduates, the data indicated that "in general, family medicine residents in this study completing training after the implementation of duty hour restrictions [felt] as prepared for practice in most curricular areas as those residents who

completed training prior to the restrictions” (Carek et al., 2012, p. 542). However, graduates after duty hour restrictions were imposed reported feeling less prepared for surgery and some other procedures (Carek et al., 2012).

In addition, the practice patterns of more recent graduates changed significantly from graduates prior to implementation of duty hours. Fewer recent graduates are entering solo or small family practice settings, nor are they making themselves available for after-hours call as frequently as earlier graduates were. The duty hour limitations graduates are also not seeing patients in nursing home facilities, caring for hospitalized patients, or making home visits (Carek et al., 2012). These activities historically occurred prior to or after regular office hours, and extended the hours worked per week by a family medicine physician. “The implementation of limited duty hours and how certain activities may impact their quality of life may have influenced recent graduates regarding their choice to provide many of these services” (Carek et al., 2012, p. 542).

In addition, recent graduates may not be caring for hospitalized patients because, as residents, they did not receive enough experience with procedures associated with care of hospitalized patients (Carek et al., 2012). This lack of experience is a direct result of less experience in the hospital setting due to duty hour restrictions. These results led researchers to conclude that “the implementation of resident duty hour restrictions appear to have improved only the residents’ quality of life without any established benefit to medical education or patient care” (Carek et al., 2012, p. 542).

Implementation of duty hour limitations (2003–2010). Several reports discussed topics implementation of the 2003–2010 duty hour limitations within the Graduate Medical Education community in the United States.

Swide and Kirsch's (2007) meta-analysis reviewed current literature and discussed the effectiveness of duty hour limitations on anesthesiology residency training programs after three years of experience. The study examined information published by ACGME that provided "data on compliance by specialty with duty hour rules by ACGME site visits through 2006" (p. 581).

Results of the meta-analysis indicated that the anesthesiology specialty accounted for 2.4% of duty hours citations in the academic year 2005–2006 (Swide & Kirsch, 2007). Overall, U.S. residency programs complied with ACGME duty hour mandates. Swide & Kirsch (2007) reported that "the evidence published since the inception of the resident duty hour rules in July 2003 strongly supports an improvement in resident well-being, resident morale, improvement on resident fatigue and overall satisfaction with the duty hour restrictions" (p. 583). Since the data was based upon potentially biased self-reporting of resident and faculty perceptions rather than true outcome data, the effect of duty hours on resident education and patient care is less clear (Swide & Kirsch, 2007).

Miulli and Valcore's (2010) provided an osteopathic medicine perspective regarding duty hour limitations. Miulli and Valcore's objective was "to analyze the impact of resident duty hour limitation implementation on residents, faculty, and patients" (p. 385). A faculty and resident survey measured attitudes regarding duty hour limitations in the Graduate Medical Education department at a California medical center (n = 108).

Results from Miulli and Valcore's survey (2010) indicated both faculty and residents believed that the decrease in duty hours would affect residents' involvement in procedures, operations, and consultations. Faculty also felt that it would weaken the quality of residents' educational experiences. Miulli and Valcore determined that "statistical data on actual outcomes revealed that residency programs are not adversely affected by limiting resident work hours to 80

hours per week, and benefits appear to include improved patient care and well-rounded and psychologically balanced residents” (p. 384). While these results were promising, Miulli and Valcore concluded by stating their uncertainty as to whether additional limitations of resident work hours were necessary or could accommodate the growing amount of information and skills required to become a competent physician (p. 394).

Updates to duty hour limitations (2011–2014). Many previously mentioned researchers as well as others within the Graduate Medical Education community have investigated the 2011–2014 updates to duty hour limitations in the United States.

In December 2009, Carek et al. (2009) published a study that “examined the opinions of family medicine residency program directors concerning the potential impact of the IOM resident duty hour recommendations on patient care and resident education” (p. 195). An electronic survey was disseminated to 265 family medicine residency program directors through Zoomerang (an online survey software provider). Results revealed that a majority of family medicine residency program directors disagreed or strongly disagreed with a statement that the 2008 IOM duty hour recommendations resulted in improved patient safety and resident education. The majority of program directors also disagreed or strongly disagreed with the statement that “the proposed IOM rules would result in residents becoming more compassionate, more effective family physicians” (p. 197).

In another study published in the Family Medicine Updates section of the *Annals of Family Medicine*, Kozakowski et al. (2009) alerted the medical community to the findings from the Carek et al. (2009) survey conducted by the Association of Family Medicine Residency Directors. Survey results included the affirmative finding that two-thirds or more of the program directors responded that it would be “very easy” or “easy” to implement the following duty hour

mandates: in-hospital call every third night, no averaging, 10 hours off after day shift, and internal and external moonlighting within the 80-hour weekly limit.

In other findings discussed in the Kozakowski et al. (2009) paper, two-thirds or more of the directors responded that it would be “difficult” or “very difficult” to

- ensure a five-hour protected sleep period between 10:00 p.m. and 5:00 a.m. in a 30-hour period;
- limit residents to a 16-hour shift;
- make sure that residents take 12 hours off after night shift;
- confirm that residents are assigned in-hospital night shift a total of four nights at the maximum, with 48 continuous hours off after three or four nights of consecutive duty;
- make certain that residents take five days off per month; one day (24 hours) off per week, no averaging; one 48-hour period off per month (Kozakowski et al., 2009).

Of the possible new mandates listed above, the only change in duty hours implemented by the ACGME in 2011 was the second mandate: limiting first year residents, or interns, to 16-hour shifts. In the South Central Texas family medicine residency program, this change in the experiential framework of residency training meant that when the intern went home due to duty hour limitations, the second-year resident became responsible for taking care of patients, spending as much as 24 hours (but no more than 24 hours) in the hospital during inpatient rotations.

Kozakowski et al. (2009) also reported that over 90% of the program directors expressed concerns about (a) graduating doctors who generally take less “ownership” of, and do not know, patients as thoroughly as in the past; (b) residents developing a “shift-worker mentality”

exacerbated by the IOM rules; and (c) future doctors unprepared for the work hour demands of practice (p. 276).

Significant concerns by program directors related to financial issues, as well as to reassigning patient care to hospitalists (physicians who only work in a hospital setting, with no outpatient clinic visits), to other healthcare professionals with either less extensive training (nurse practitioners), or to healthcare professionals who are not governed by work duty hour restrictions (Kozakowski et al., 2009).

Another study by Levine, Adusumilli, and Landrigan (2010) focused on the IOM recommendation that work shifts should no longer exceed 16 hours without sleep. The objective of this study, which included all specialties, was to “comprehensively evaluate the effects of eliminating or reducing shifts over 16 hours” (Levine, Adusumilli, & Landrigan, 2010, p. 1043). Using a systematic review design, 2,984 citations were identified from Medline and then reviewed by two authors to determine if the criteria were met for inclusion in the analysis portion of the study. The criteria included “outcomes relevant to quality of life, education, and safety” (Levine et al., 2010, p. 1044). After review, 23 studies were included in the analysis. Fourteen studies were identified that assessed educational outcomes. Of the 14, four studies found improvement in residents’ education, nine found no significant changes, and one found education worsened. The conclusion drawn from this systematic review of the literature was “that reduction or elimination of resident work shifts exceeding 16 hours did not adversely affect resident education” (Levine et al., 2010, p. 1048).

In the fall 2009 edition of the resident review newsletter (retrieved from acgme.org), the Council of Review Committee Residents (CRCR), an advisory council to ACGME composed of 29 members who represent 26 RRCs, along with the Transitional Year Review Committee and

the Institutional Review Committee, reported their formal position on the recommendations put forth by the IOM Report. The CRCR report could not make a formal recommendation regarding the scope of the duty hour standards because of a disagreement among the resident physicians about the necessity for long duty hours.

“There are residents who feel that the current system of duty hour limitations is impinging on their ability to adequately prepare for independent practice, while others believe that the current system optimally balances the need for rest and the need to learn to function in adverse environments” (CRCR, 2009, p. 3).

These beliefs vary across the medical specialties (for example, pediatrics, surgery, internal medicine, and psychiatry) since the work culture differs in each of them.

The CRCR report stated three areas that reformers should keep in mind were patient safety, resident well-being, and resident education. In a residency training program, residents give a patient update report to their counterparts at the end of their shift. It is imperative that the patient updates be thorough because miscommunication (or lack of communication) can lead to a potentially bad outcome. The potential for the loss of continuity of care is one of the more important patient safety processes to examine. Meta-analysis research conducted by Fletcher, et al., (2004) determined that the “evidence on patient safety is insufficient to inform the process of reducing resident work hours. ... Future research should focus on patient safety indicators as outcomes when interventions to decrease resident work hours are implemented” (p. 852).

The CRCR report also discussed resident well-being. In one study, interns reported working hours that were noncompliant with ACGME duty hour standards during at least one month in the year following the standards’ introduction (Landrigan, Barger, Cade, Ayas, & Czeisler, 2006). These noncompliant months involved extended shifts of 24 hours or more. A

Harvard study focused on interns working intensive care unit shifts. This study, conducted on behalf of the Harvard Work Hours, Health, and Safety Group, found that “eliminating interns’ extended work shifts in an intensive care unit significantly increased sleep and decreased attentional failures during night work hours” (Lockley et al., 2004, p. 1829).

While the studies mentioned above focus on interns’ work hours, the other training year levels should also be examined. Time-consuming rotations occur in the family medicine second and third years of training as well. Examples of these rotations include the hospital-based inpatient medicine and obstetric rotations.

The final area that the CRCR report reviewed is of great concern among trainees about the quality of their postgraduate education. A significant number of studies have reported findings on patient safety and resident well-being; however the number of studies illustrating the effect that duty hours have on the quality of residency education is limited.

ACGME’s 2011 duty hour week proposal reported the results of a national online survey of family medicine residents’ perceptions of the proposed changes to the duty hour limitations. A 27-question survey assessed the four ACGME duty hour proposal domains: resident supervision, 80-duty-hour week, maximum duty-period length, and maximum frequency of in-hospital duty. The survey also requested residents’ opinions on the following: “reasonable weekly work hours, under-reporting practice, and residents’ activities during hours off, residents’ perceptions of their programs’ ability to comply with future duty-hour regulations, and [residents’] overall satisfaction” (p. 319).

Conclusions drawn from ACGME’s 2011 study indicate that the sample of family medicine residents (n = 720) indicated mixed support for the proposed duty hour changes, with “more than half of the residents questioning further restrictions on interns’ work hours and their

program's ability to implement the new changes" (p. 324). The study's authors recommend that ACGME consider the concerns of the residents and program directors before enacting the proposed updates to duty hour limitations.

CHAPTER THREE: METHODOLOGY

Purpose of Research Study

The purpose of this ex post facto, quantitative study was to determine if there were differences in ITE scores of family medicine residency graduates the year before and the year after implementation of duty hour limitations (2003), as well as the year of duty hour limitations updates (2011), at a community-based hospital residency program in South Central Texas.

Research Questions

To assess educational outcomes for Family Medicine residents after implementation of duty hour limitations, the following questions are provided for investigation:

1. Is there a difference in overall scores of the exam for residents who took the ITE (a) before implementation of the 2003 duty hour limitations (1997–2002), (b) after implementation of the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?
2. Is there a difference in scores within the exam categories of Adult Medicine and Maternity Care for residents who took the ITE (a) before implementation of the 2003 duty hour limitations (1997–2002), (b) after implementation of the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?
3. What effects do the demographic variables of gender, age, and ethnicity have on ITE scores (a) before implementation of the 2003 duty hour limitations (1997–2002), (b) after implementation of the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?

Study Design

The research combined an ex post facto quantitative study with inferential analysis to determine if there was a difference in test scores that represent student learning outcomes. Statistical testing was used to measure the degree of the relationship between the variables (Creswell, 2008). The predictors, or independent variables (IV), used in analyzing data are the periods before (1997–2002) and after (2003–2010, 2011–2014) the implementation of the ACGME duty hour standards. The criteria, or dependent variables (DV), are the family medicine resident In-Training Examination scores. The exams were taken annually before and after implementation of duty hour limitations (2003–2010) and its updates (2011–2014).

Inferential analysis compared the mean scores of the three groups of residents to determine if differences existed within exam period categories.

Population

Covering a span of 17 years, annual examination scores of 355 medical residents who completed training in a community-based Family Medicine residency program were analyzed in this study ($n = 355$). The groups' scores were divided into 3 segments. The first segment included examination scores for the period 1997–2002 (109 residents), when duty hour mandates did not exist. The post-implementation segments included examination scores for 2003–2010 (165 residents), and 2011–2014 (81 residents). Each segment represents a period identified with implementation of duty hour limitations. During the 2011–2014 period, more stringent duty hour mandates were imposed.

Data Collection

Ex post facto data used for this dissertation originated from two sources: the annual examination score reports of the American Board of Family Medicine ITE and the New

Innovations Residency Training Management Suite software program. A total of 355 annual examination scores of physicians-in-training are included in the database, with dates ranging from 1997 to 2014. The ITE consists of 240 questions covering the following content categories:

cardiovascular	respiratory	patient-based systems
endocrine	special sensory	(includes clinical
gastrointestinal	population-based care	decision-making,
hematologic/ immune	(includes biostatistics	communication and
integumentary	and epidemiology,	doctor-patient
musculoskeletal	evidence-based	interaction, family and
nephrologic	medicine, prevention,	cultural issues, ethics,
neurologic	health policy and legal	palliative care, and
nonspecific	issues, bioterror,	end-of-life care)
psychogenic	quality improvement,	
reproductive-female	and geographic/ urban/rural issues)	
reproductive-male		

The NI database provided the descriptive data (age, gender, and ethnicity) for this study of Family Medicine Residency Program trainees located at a faith-based community hospital in South Central Texas. A total of eight variables were included in the database: exam year, resident ID, scaled score, adult medicine score, maternity score, age, gender, and ethnicity. The “resident ID” identifier in the dataset consisted of the resident’s initials. This variable was used for tracking purposes during data entry and not used in the analysis portion of this project.

The data was prepared for descriptive analysis by determining missing cases and outliers through frequency analysis. Results on the three categorical variables indicated no missing cases, so no further action was necessary (Tabachnick & Fidell, 2013).

Data Analysis

Data analysis was completed using the Statistical Package for the Social Sciences (SPSS), version 23 for Windows. Univariate analysis provided descriptive statistics for gender, ethnicity, and age. Inferential analysis compared the mean scores of the three groups of residents and determined if relationships exist within exam time categories.

Protection of Human Subjects

No human subjects were involved in the actual process of this research study. Examination scores were de-identified and coded numerically before reporting.

CHAPTER FOUR: FINDINGS

Purpose of Research

The purpose of this ex post facto, quantitative study was to determine if there were differences in ITE scores of family medicine graduates the year before and the year after duty hour limitations (2003), as well as the year of duty hour limitations updates (2011), at a community-based hospital residency program in South Central Texas. The data were coded (Appendix B) and entered into IBM® SPSS® version 23 statistical program for the purpose of performing descriptive and inferential analysis. No missing values or outliers were found in the data set ($n = 355$).

Descriptive Analysis of Data

For the three sets of duty hour groups, frequency descriptive analyses were conducted for the gender, age, and ethnicity variables. The total number of resident examination scores was 355. Since the training program's inception in 1997, 61% of the 355 program's examinees were female and 39% were male. Of special interest is an increase in female residents during the duty hour period 2003–2010. This increase may be due to a surge in women entering the medical profession (Figure 5).

For this study, the mean age of residents taking the ITE was 30 years, with the youngest resident examinee's age being 25 years and the oldest examinee's age being 53 years (Table 6).

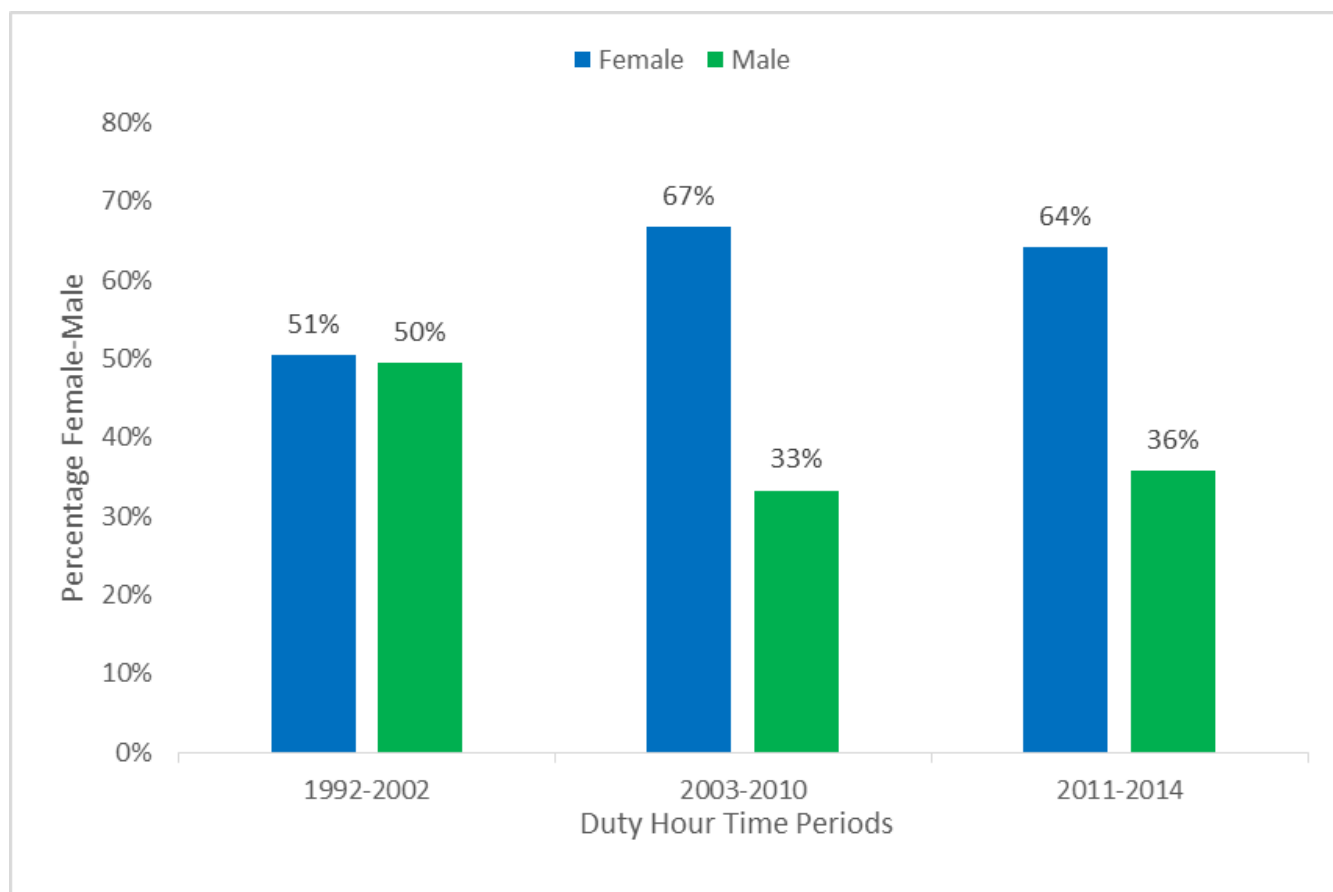


Figure 5. Gender comparison of resident examinees.

Table 6

Statistics for Ages of Resident Examinees

	Age of Residents
Mean	30.35
Median	29.06
Mode	28
Kurtosis	5.439
Std. Error of Kurtosis	.258
Minimum	25
Maximum	53

Resident examinees' ethnicities are summarized in Figure 6.

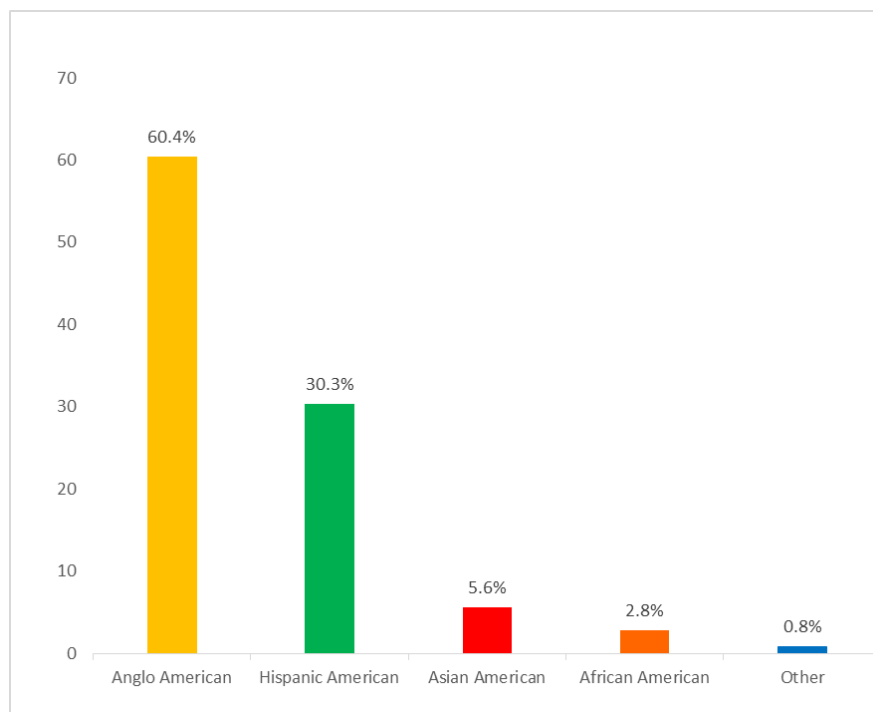


Figure 6. Percentages of ethnicities of resident examinees.

The total examination scores per mandate period are illustrated in Figure 7.

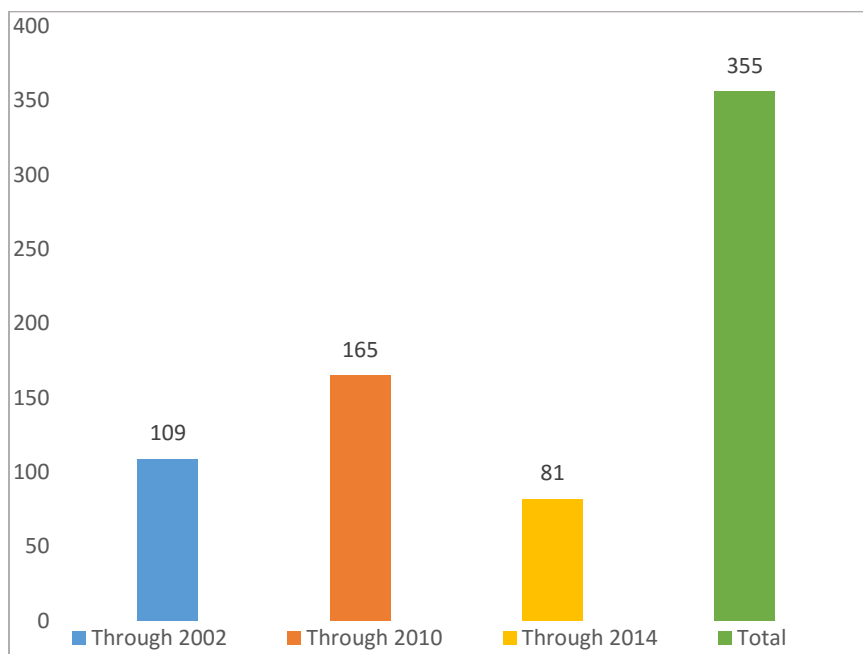


Figure 7. Total examination scores per mandate period.

To verify that data were normally distributed, descriptive statistics for the dependent variable—the scaled scores—of each duty hour group are detailed below. Results for the pre-duty hour limitations group are presented in Table 7. The Kolgomorov-Smirnov Test of Normality indicates that this group is part of a normal population. The Q-Q plot (Figure 8) and the histogram (Figure 11) also indicate normality. Because of all of the preceding factors, it may be concluded that the pre-duty hour limitations group has a normal distribution.

Table 7

Statistics for Scaled Score: Pre-Duty Hour Limitations Group

	Scaled Score
Mean	531.65
Median	530.00
Standard Deviation	94.893
Kurtosis	-.116
Std. Error of Kurtosis	.459
Minimum	300
Maximum	740
Kolmogorov-Smirnov	.200

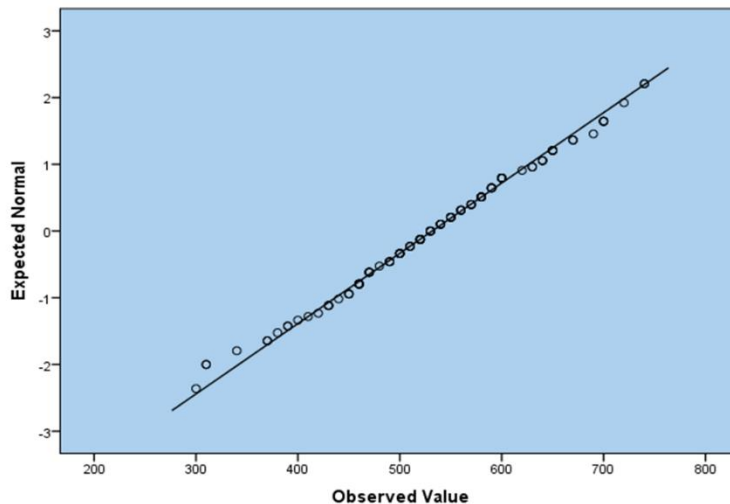


Figure 8. Q-Q plot of scaled score: pre-duty hour limitations group.

Results for the initial duty hour limitations group (2003–2010) are presented in Table 8.

The Kolmogorov-Smirnov Test of Normality indicates that this group is part of a normal population. The Q-Q plot (Figure 9) and the histogram (Figure 11) also indicate normality.

Because of all of the preceding factors, it may be concluded that the initial duty hour limitations group has a normal distribution.

Table 8

Statistics for Scaled Score: After 2003 Duty Hour Limitations Group

	Scaled Score
Mean	516.91
Median	510.00
Standard Deviation	91.075
Kurtosis	.013
Std. Error of Kurtosis	.376
Minimum	250
Maximum	750
Kolmogorov-Smirnov	.200

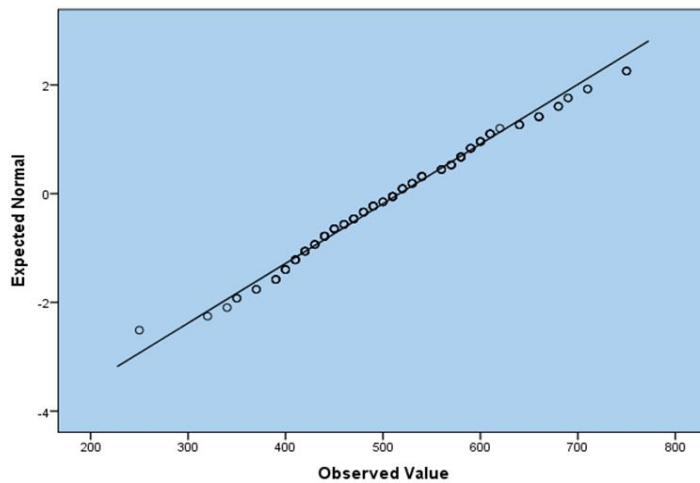


Figure 9. Q-Q plot of scaled score: After 2003 duty hour limitations group.

Results for the updated duty hour limitations group are presented in Table 9. The Kolmogorov-Smirnov Test of Normality indicates that this group is part of a normal population. The Q-Q plot

(Figure 10) and the histogram (Figure 11) also indicate normality. Because of all of the preceding factors, it may be concluded that the updated duty hour limitations group has a normal distribution.

Table 9

Statistics for Scaled Score: After 2011 Updated Duty Hour Limitations Group

	Scaled Score
Mean	440.49
Median	450.00
Standard Deviation	68.299
Kurtosis	.754
Std. Error of Kurtosis	.529
Minimum	270
Maximum	580
Kolmogorov-Smirnov	.047

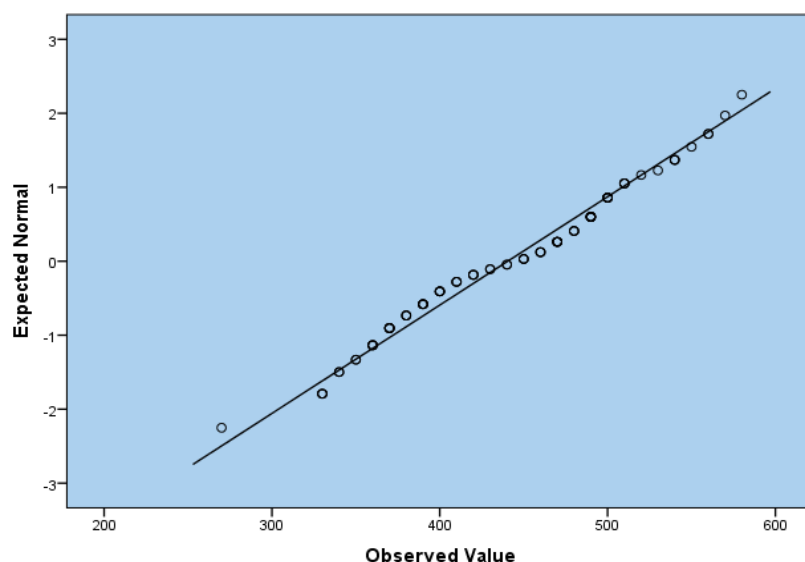


Figure 10. Q-Q plot of scaled score: After 2011 updated duty hour limitations group.

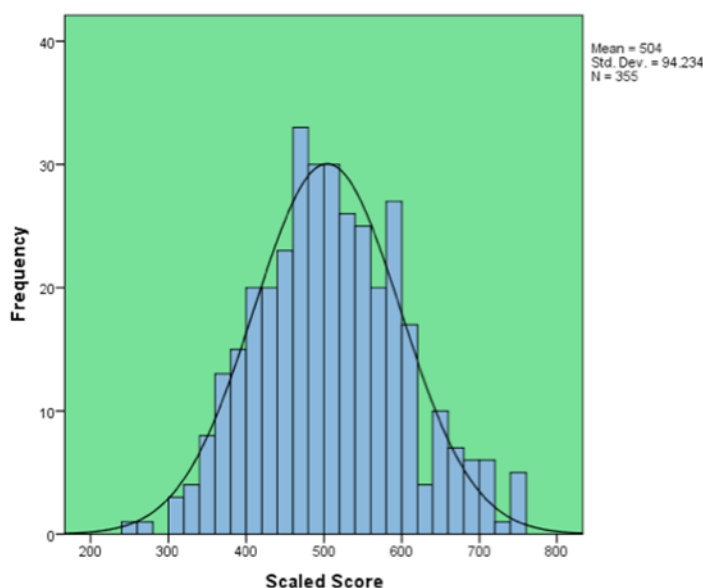


Figure 11. Histogram of normality of scaled score.

Inferential Analysis of Data

Was a difference measured in the family medicine residents' ITE scores after implementation of duty hour limitations? To assess educational outcomes for family medicine residents after duty hour limitations, the questions listed below are provided for investigation.

1. Is there a difference in overall scores of the exam for residents who took the ITE (a) before the 2003 duty hour limitations (1997–2002), (b) after the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?
2. Is there a difference in scores within the exam categories of adult medicine and maternity care for residents who took the ITE (a) before the 2003 duty hour limitations (1997–2002), (b) after the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?

3. What effects do the demographic variables of gender, age, and ethnicity have on ITE scores (a) before the 2003 duty hour limitations (1997–2002), (b) after the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?

Research Question One

The first research question put forth for analysis was the following: Is there a difference in overall scores of the exam for residents who took the ITE (a) before the 2003 duty hour limitations (1997–2002), (b) after the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?

A one-way analysis of variance (ANOVA) was used to compare the means of examination scores before (1997–2002) and after duty hour limitations (2003–2010), as well as after updating of duty hour limitations (2011–2014). This test was chosen because the data was parametric with no covariates, has one independent variable with more than two levels of independence within the independent group (duty hour periods) and one dependent variable (ITE scores).

A significant difference was observed between the pre-duty hour limitations (1997–2002) group and the updated duty hour limitations (2011–2014) group, ($F(2,352) = 30.89, p < .05$) (Table 10). A Tukey HSD post-hoc test revealed that ITE scores were significantly higher in the pre-duty hour limitations (1997–2002) group ($531.65 \pm 94.89, p < .05$) than in the updated duty hour limitations (2011–2014) group ($437.90 \pm 62.92, p < .05$). This analysis revealed that the means of the examination scores from the pre-duty hour limitations (1997–2002) group were significantly higher ($m = 531.65, sd = 94.89$) than the means of the examination scores in the

updated duty hour limitations (2011–2014) group ($m = 437.90$, $sd = 62.92$) (Table 10 and Figure 12).

Table 10

Statistics and ANOVA Results by Duty Hour Limitations Period.

Variable	Pre-Duty Hours (1)		Duty Hour Implementation (2)		Duty Hour Updates (3)		$F(2,352)$	p	η^2	Tukey's HSD
	M	SD	M	SD	M	SD				
Examination Scores	531.65	94.89	516.97	91.04	437.90	62.92	30.89	.000	.15	1, 2 > 3

Note: The numbers in parentheses in column heads refer to the numbers used for illustrating significant differences in the post-hoc column.

A significant difference was also found when comparing the initial duty hour limitations (2003–2010) group and the updated duty hour limitations (2011–2014) group, ($F(2,352) = 30.89$, $p < .05$) (Table 10). A Tukey HSD post-hoc test revealed that ITE scores were significantly higher in the initial duty hour limitations (2003–2010) group (516.97 ± 91.04 , $p < .05$) than in the updated duty hour limitations (2011–2014) group (437.90 ± 62.92 , $p < .05$).

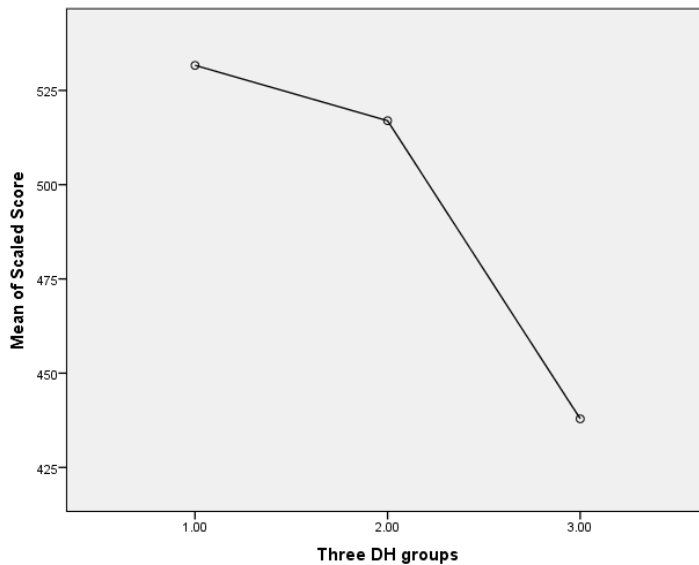


Figure 12. Mean plots graph: ITE scores over three duty hour periods.

This analysis revealed that the means of the scores from the initial duty hour limitations (2003–2010) group were significantly higher ($m = 516.97.65$, $sd = 91.04$) than the means of the examination scores in the updated duty hour limitations (2011–2014) group ($m = 437.90$, $sd = 62.92$) (Table 10 and Figure 12).

The scores from the pre-duty hour limitations (1997–2002) group and the initial duty hour limitations (2003–2010) group were compared and no significance was established ($p > .05$) (Table 10). The analysis revealed that the means of the examination scores from the pre-duty hour limitations (1997–2002) group were higher ($m = 531.65$, $sd = 94.89$) than the means of the examination scores in the initial duty hour limitations (2003–2010) group ($m = 516.97.65$, $sd = 91.04$), but no significance was reported. (Table 10 and Figure 12).

Research Question Two

The second research question presented for analysis proposed to examine two of the most time-intensive rotations during a family medicine resident's training program: the inpatient service and maternity service rotations. Both rotations take place within the hospital. The research question is as follows: Is there a difference in scores within the exam categories of adult medicine and maternity care for residents who took the ITE (a) before the 2003 duty hour limitations (1997–2002), (b) after the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?

A one-way ANOVA test was used to compare the means of examination scores in the categories of adult medicine and maternity care before (1997–2002) and after initial duty hour limitations (2003–2010), as well as after the updated duty hour limitations (2011–2014). This test was chosen because the data was parametric with no covariates, has one independent

variable with more than two levels of independence within the independent group (the duty hour periods) and one dependent variable respectively (adult medicine and maternity care scores).

A significant difference was observed between the means of the adult medicine examination scores of the pre-duty hour limitation (1997–2002) group and the updated duty hour limitations (2011–2014) group, ($F(2,247) = 34.06, p < .05$) (Table 11). A Tukey HSD post-hoc test revealed that ITE scores were significantly higher in the pre-duty hour limitations (1997–2002) group ($518.90 \pm 93.78, p < .05$) than in the updated duty hour limitations (2011–2014) group ($425.06 \pm 74.32, p < .05$). The analysis revealed that the means of the adult medicine examination scores in the pre-duty hour limitations (1997–2002) group was significantly higher ($m = 518.90, sd = 93.78$) than the means of adult medicine examination scores in the updated duty hour limitations (2011–2014) group ($m = 425.06, sd = 74.31$) (Table 11 and Figure 13).

Table 11

Statistics and ANOVA Results for Adult Medicine and Maternity Care ITE Scores

Variable	Pre-Duty Hours (1)		Duty Hour Implementation (2)		Duty Hour Updates (3)		$F(2,247)$	p	n^2	Tukey's HSD
	M	SD	M	SD	M	SD				
Adult Medicine	518.90	93.78	518.55	74.68	425.06	74.32	34.06	.00	.22	1, 2 > 3
Maternity Care	554.13	82.26	549.03	99.82	542.03	205.59	.18	.84	.002	1, 2 > 3

Note: The numbers in parentheses in column heads refer to the numbers used for illustrating significant differences in the post-hoc column.

A significant difference was also found when comparing the means of adult medicine examination scores from the initial duty hour limitations (2003–2010) group and the updated duty hour limitations (2011–2014) group, ($F(2,247) = 34.05, p < .05$) (Table 12). A Tukey HSD post-hoc test revealed that ITE scores were significantly higher in the initial duty hour limitations

(2003–2010) group (518.55 ± 74.68 , $p < .05$) than in the updated duty hour limitations (2011–2014) group (425.06 ± 74.32 , $p < .05$). The analysis revealed that the means of the adult medicine scores from the initial duty hour limitations (2003–2010) group were significantly higher ($m = 518.55$, $sd = 74.68$) than the means of the examination scores in the updated duty hour limitations (2011–2014) group ($m = 425.06$, $sd = 74.31$) (Table 11 and Figure 13).

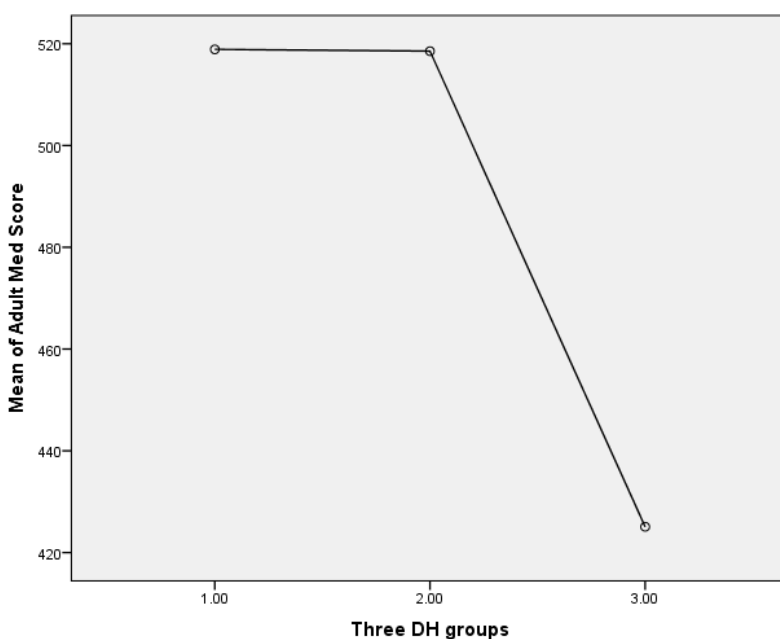


Figure 13. Mean plots graph: Adult medicine ITE scores over three duty hour periods

The adult medicine scores from the pre-duty hour limitations scores (1997–2002) group and the initial duty hour limitations scores (2003–2011) group were compared and no significance was established ($p > .05$). The analysis revealed that the means of the adult medicine examination scores from the pre-duty hour limitations (1997–2002) group were higher ($m = 518.90$, $sd = 93.78$) than the means of the adult medicine examination scores in the initial duty hour limitations (2003–2011) group ($m = 518.55$, $sd = 74.68$). (Table 11); but no significance existed (Table 11 and Figure 13).

The maternity care scores from the pre-duty hour limitations (1997–2002) group, the initial duty hour limitations (2003–2010) group, and the updated duty hour limitations (2011–2014) group were compared and no significance was established ($p > .05$) (Table 11). The analysis revealed that the mean of the maternity care examination scores from the pre-duty hour limitations (1997–2002) group were higher ($m = 554.13$, $sd = 82.26$) than the mean of the maternity care examination scores in the initial duty hour limitations (2003–2010) group ($m = 549.03$, $sd = 99.82$). Both means were higher than the means of the maternity care examination scores from the updated duty hour limitations (2011–2014) group ($m = 542.03$, $sd = 205.59$), but no significance was found (Table 11 and Figure 14).

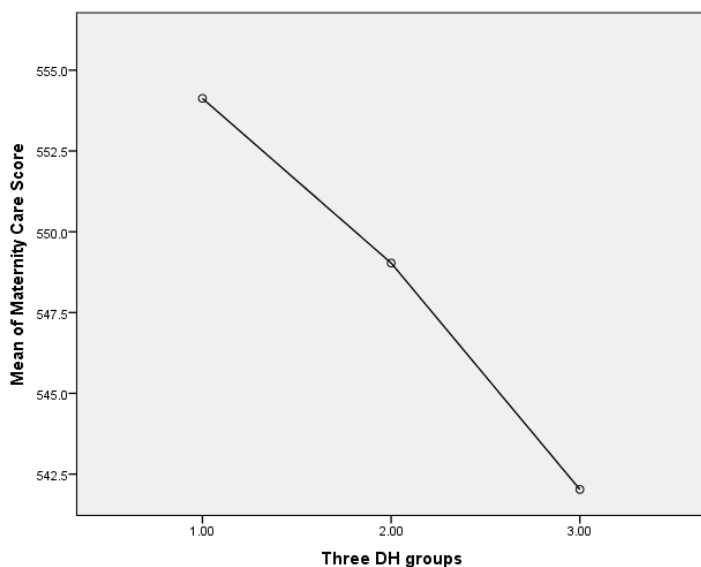


Figure 14. Mean plots graph: Maternity care ITE scores over three duty hour periods.

Research Question Three

The final research question allowed further exploration of whether characteristics of the study's demographic characteristics affected the educational outcomes of residents' training. The question is: What effects do the demographic variables of gender, age, and ethnicity have on

ITE scores (a) before the 2003 duty hour limitations (1997–2002), (b) after the 2003 duty hour limitations (2003–2010), and (c) after the 2011 update to the duty hour limitations (2011–2014)?

Gender variable. For the first demographic variable, gender, a Mann-Whitney *U* test was used to determine if gender made a difference in ITE outcomes for each period. Before beginning this analysis within each period, four assumptions were met:

- Assumption One: The dependent variable must be ordinal or continuous. ITE scores are categorized using continuous numbers and meet this assumption.
- Assumption Two: The independent variable should consist of two categorical, independent groups. The gender variable meets this assumption with its male/female categories.
- Assumption Three: Each group should be independent of the other; no variable may be a member of the other group. For this population, the gender variable meets this assumption with its male/female categories and does not include ITE scores within its categorization.
- Assumption Four: The variables must not be normally distributed, or nonparametric. Descriptive analysis confirms that the male/female categories are not normally distributed with 61% of the population being female and 39% of the population male.

A Mann-Whitney *U* test was run to examine the difference between female and male participants' ITE scores within each of the three duty hour periods. For the first period, before the 2003 duty hour limitations (1997–2002), no significant difference was found in examination scores between the two genders with one more female (m gender = 53.02) taking the examination than males (m gender = 57.02; $U = 1376.00$, $p^* > .05$) (Table 12).

Table 12
Gender Ranks: Before 2003 Duty Hour Limitations

	Mean Rank (<i>m</i>)	n	Mann-Whitney <i>U</i>	<i>p</i>
Female	53.02	55		
Male	57.02	54		
			1376.00	.51

For the second period, occurring after the duty hour limitations (2003–2010), no significant difference was found in examination scores between the two genders with more females (*m* gender = 84.24) taking the examination than males (*m* gender = 83.52; $U = 3081.00$, $p^* > .05$) (Table 13).

Table 13
Gender Ranks: After 2003 Duty Hour Limitations

	Mean Rank (<i>m</i>)	n	Mann-Whitney <i>U</i>	<i>p</i>
Female	84.24	111		
Male	83.52	56		
			3081.00	.93

For the third period, occurring after the update to duty hour limitations (2011–2014), no significant difference was found in examination scores between the two genders with more females (*m* gender = 40.35) taking the examination than males (*m* gender = 42.17; $U = 720.00$, $p^* > .05$) (Table 14).

To confirm these results, a chi-square test of independence was completed to determine if the two variables—residents' gender and ITE scores—are independent of each other. No significant relationship was found ($\chi^2 (46) = 58.601$, $p > .05$). Gender and ITE scores appear to be independent events.

Table 14

Gender Ranks: After 2011 Updated Duty Hour Limitations

	Mean Rank (<i>m</i>)	N	Mann-Whitney <i>U</i>	<i>p</i>
Female	40.35	52		
Male	42.17	29		
			720.00	.74

Age variable. For the second demographic variable, age, a one-way ANOVA was calculated to compare the means of the residents' ages for the three duty hour periods.

A significant difference was revealed between the pre-duty hour limitations (1997–2002) age group and the initial duty hour limitations (2003–2010) age group, ($F(2,352) = 11.67, p < .05$) (Table 15). A Tukey HSD post-hoc test revealed that the residents' ages were significantly higher in the pre- duty hour limitations (1997–2002) group ($31.48 \pm 5.97, p < .05$) than in the initial duty hour limitations (2003–2010) group ($29.70 \pm 2.72, p < .05$). The analysis revealed that the mean of examinees' ages in the pre-duty hour limitations (1997–2002) group was significantly higher ($m = 31.48, sd = 5.97$) than the mean of examinees' ages in the initial duty hour limitations (2003–2010) group ($m = 29.70, sd = 2.72$) (Table 15 and Figure 15).

A significant difference was also found when comparing the pre-duty hour limitation (1997–2002) age group and the updated duty hour limitations (2011–2014) age group, ($F(2,352) = 11.67, p < .05$) (Table 15). A Tukey HSD post-hoc test revealed that the residents' ages were significantly higher in the pre-duty hour limitations (1997–2002) group ($31.48 \pm 5.97, p < .05$) than in the updated duty hour limitations (2003–2010) group ($28.82 \pm 2.32, p < .05$). This analysis revealed that the mean of the examinees' ages in the pre-duty hour limitations (1997–2002) group was significantly higher ($m = 31.48, sd = 5.97$) than the mean of examinees' ages in

the updated duty hour limitations (2011–2014) group ($m = 28.82$, $sd = 2.32$) (Table 15 and Figure 15).

Examinees' ages from the initial duty hour limitations (2003–2010) group and from the updated duty hour limitations (2011–2014) group were also compared and no significance was established ($p > .05$). The analysis revealed that the mean of the examinees' ages from the initial duty hour limitations (2003–2010) age group were higher ($m = 29.70$, $sd = 2.72$) than the mean of the examinees' ages in the updated duty hour limitations (2011–2014) group ($m = 28.82$, $sd = 2.32$), but not enough for a significance to be found (Table 15).

Table 15

Statistics and ANOVA Results for Examinees' Ages and Duty Hour Limitations Periods.

Variable	Pre-Duty Hours		Duty Hours Implementation		Duty Hours Updated		$F(2,352)$	p	η^2	Tukey's HSD
	M	SD	M	SD	M	SD				
Examinees' Ages	31.48	5.97	29.70	2.72	28.82	2.32	11.67	.00	16.08	2, 3 < 1

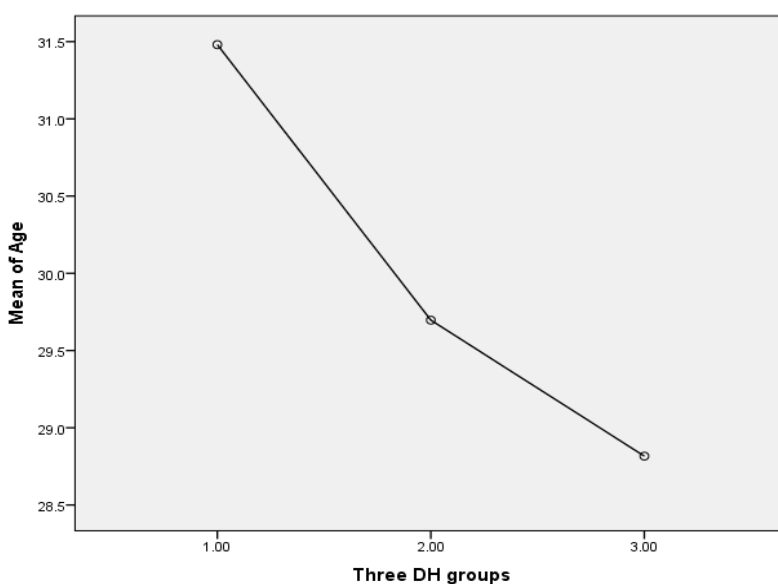


Figure 15. Mean plots graph: Examinees' ages over three duty hour periods.

Ethnicity variable. For the final demographic variable, ethnicity, a Kruskal-Wallis test was conducted to determine if there were statistically significant differences between the residents' ethnicities and ITE scores within each of the three duty hour periods. The following four assumptions were met before analysis was conducted:

- Assumption One: The dependent variable must be ordinal or continuous. The duty hour periods are categorized using continuous numbers and meet this assumption.
- Assumption Two: The independent variable should consist of two or more categorical, independent groups. The ethnicity variable meets this assumption with its five categories.
- Assumption Three: Each group should be independent of the other; no variable may be a member of the other group. For this population, the ethnicity variable meets this assumption with its five categories and the ITE score variable meets this assumption with its continuous number value. There is no crossover of variable usage.
- Assumption Four: The two variables must not be normally distributed, or nonparametric. Descriptive analysis confirms that the ethnicities categories are not normally distributed with 60% of the population being Anglo American and 30% of the population being Hispanic American (Figure 6).

For the first period, occurring before the 2003 duty hour limitations (1997–2002), results from a Kruskal-Wallis test showed no statistically significant difference in scores with regard to ethnicity, ($H(4) = 9.44, p > .05$). Ethnicity did not influence ITE scores during this period (Table 16).

Table 16

Examinees' Ethnicity and ITE Scores: After Pre-Duty Hour Limitations Period

Ethnicity	N	Mean rank
Anglo American	81	59.91
Hispanic American	18	46.72
Asian American	6	30.00
African American	2	26.50
Other	2	34.25

Test Statistics

	Scaled Score
Chi-square	9.443
Df	4
Asymp. Sig	.051

- a. Kruskal Wallis Test
- b. Grouping Variable: Ethnicity

For the second period, occurring after duty hour limitations (2003–2010), results from a Kruskal-Wallis test showed no statistically significant difference in ITE scores with regard to ethnicity, ($H(4) = 8.30, p > .05$). Ethnicity did not influence ITE scores during this period (Table 17).

For the third period, after the update to the duty hour limitations (2011–2014), results from a Kruskal-Wallis test showed no statistically significant difference in ITE scores with regard to ethnicity, ($H(2) = 4.02, p > .05$). Ethnicity did not influence ITE scores during this period (Table 18).

Table 17

Examinees' Ethnicity and ITE Scores: After 2003 Duty Hour Limitations Period

Ethnicity	N	Mean rank
Anglo American	91	92.73
Hispanic American	59	72.35
Asian American	9	66.94
African American	7	84.64
Other	1	126.50

Test Statistics

	Scaled Score
Chi-square	8.298
df	4
Asymp. Sig	.081

- a. Kruskal Wallis Test
- b. Grouping Variable: Ethnicity

Table 18

Examinees' Ethnicity and ITE Scores: After Updated Duty Hour Limitations Period

Ethnicity	N	Mean rank
Anglo American	45	45.20
Hispanic American	31	37.15
Asian American	5	27.10
African American	0	
Other	0	

Test Statistics

	Scaled Score
Chi-square	4.023
Df	2
Asymp. Sig	.134

- a. Kruskal Wallis Test
- b. Grouping Variable: Ethnicity

Summary

These data indicate significant differences in the means of ITE scores in two of the three duty hour periods. Differences were also reported in the means of the adult medicine subcategory scores over two of the three duty hour periods, with no difference reported in the means of the maternity care subcategory scores.

Regarding the demographic variables and their possible effects on the examination scores, no significance was reported in any of the three duty hour periods related to gender and ethnicity. There was significance in the examinees' age demographic. Results indicate that the examinees' mean age declined during each period.

CHAPTER FIVE: DISCUSSION

Purpose of Research

The purpose of this ex post facto, quantitative study was to determine if there were differences in ITE scores of family medicine graduates the year before and the year after duty hour limitations (2003), as well as the year of duty hour limitations updates (2011), at a community-based hospital residency program in South Central Texas.

The study found that, while a significant difference existed between two of the three periods of ITE scores of family medicine residents, the demographic variables of residents' gender and ethnicity had no significant impact on their examination scores. Residents' ages did show a difference in learning outcomes, as measured by ITE scores, between the pre-duty hour limitations implementation period, the 2003 duty hour limitations period, and the 2011 updates to duty hour limitations period. The following discussion provides a closer look at the results in the context of adult learning and experiential theories.

Summary of Results

Analysis of these data indicates significant differences in the means of ITE scores in two of the three duty hour periods. Differences were also reported in the means of the adult medicine subcategory scores over two of the three duty hour periods, with no difference reported in the means of the maternity care subcategory scores.

Theoretical Inferences

All medical residency training programs revolve around experiential learning, because a majority of residents' time is spent with patients in hospitals and clinics. During training, the resident physician draws from previous experiences as a resource for learning (Dewey, 1938; Jarvis, 1987; Knowles, 1973; Kolb 1984).

The initial duty hour limitations implemented in 2003 met with an outcry from the Graduate Medical Education community regarding the potential decline in residents' education as well as other aspects of residency, such as patient safety and resident well-being. Medical residency training programs consisted of adult trainees who spent a majority of their time with patients in hospitals and clinics learning in an experiential manner. During this apprentice-like training period, precepting physicians readily shared their years of experience with trainees. Adult and experiential learning theorists maintain that the longer a student remains in an instructive environment, the more the student learns (Dewey, 1938; Jarvis, 1987; Knowles, 1973; Miulli & Valcore, 2010). "Learners have to be actively engaged within their surroundings if they are to gain applied knowledge" (Yardley et al., 2012). This increased learning from longer experiential residencies is no different for medical students.

The 2003 initial duty hour limitations reduced the hours spent on duty by physician trainees to 80 hours per week. The mean of In-Training Examination scores from the 2003–2010 period was lower than that of the pre-duty hour limitations period (1997–2002). The difference, however, was not significant. The 2011 updated duty hour limitations substantially lowered hours spent on duty, especially for the first year residents (interns).

Drastic changes occurred in the time trainees spent on duty. These changes limited their clinical experiences and reduced their learning. Dewey (1938) stated,

We live from birth to death in a world of persons and things which in large measure is what it is because of what has been done and transmitted from previous human activities. When this fact is ignored, experience is treated as if it were something which goes on exclusively inside an individual's body and mind ... experience does not occur in a vacuum. (p. 34)

Neither does patient care occur in a vacuum. To add to the discussion, findings published by Drolet, Anandarajah, and Fischer (2014) indicate that, on a general level, family medicine

residents do not approve of the updated 2011 duty hour limitations. These residents also noted that the quality of education has not improved; it has actually worsened.

The adult medicine ITE scores may have resulted in significant differences because the study of adult medicine involves many different subspecialties—cardiology, endocrinology, infectious disease, allergy, nephrology, psychiatry, hematology, and gastroenterology. Gaining enough experience to achieve the mastery level in such a broad spectrum of medical subspecialties can be difficult, especially if a resident is pulled from duty and sent home to avoid violating duty hour mandates. Jarvis (1987) states that learning always begins with a new experience learned and assimilated by the person through practice. Learning will most likely not be achieved when a resident rotates through the adult medicine service with a reduction in duty hours. In analyzing the drops in ITE scores during both periods, I believe that the reduction in exposure to clinical experiences may be one of the reasons for the differences.

Maternity care examination scores did decrease with each period; however, the results were not as dramatic. The lack of significant results in this analysis is probably due to the fact that maternity care is one subspecialty—women giving birth—whereas adult medicine includes many different areas. Jarvis (1987) stated that learning always begins with a new experience learned and assimilated by the person through practice. Learning is successful when a resident rotates through the maternity care service, as it only focused on the obstetric aspect of clinical care.

Both adult medicine and maternity care examination scores declined since the inception of duty hour limitations in 2003. A good argument for this decrease is that family medicine training involves comprehensive care for patients of all ages in both inpatient and outpatient settings (Drolet et al., 2014). The duty hour limitations are restricting the volume of educational

experiences (Drolet et al., 2014; Lesko, Hughes, Fitch, & Pawels, 2012). It is the family medicine educators' responsibility to generate innovative ways of educating future family physicians, such as use of simulated training dummies, a didactic curriculum for night shifts, and extending the length of the training program (Drolet et al., 2014).

These innovations, as well as educational applications throughout the residents' training period, would provide the foundation for Dewey's experiential theory, which uses the continuity and interaction of an experience as means for learning. As mentioned earlier, Dewey (1938) postulated that in order for adults to learn from their experiences, it is very important to develop a welcoming and comfortable atmosphere, provide the right materials, and link these materials to their past and future experiences.

ACGME General Competencies

To illustrate how critical it is for the resident to spend an appropriate amount of time working in a clinical setting with a faculty preceptor, a discussion of the ACGME general competencies follows. In 2002, ACGME identified six general competencies residency training programs to evaluate residents' learning. These competencies include patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice. These benchmarks are measured in a clinical environment.

Patient care. The patient care competency requires that "residents must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health" (ACGME Family Medicine Program Requirements [FMPR], 2015, p. 11). During residency, family medicine trainees provide care for patients in many different settings. They provide care for patients who are hospitalized with acute and

chronic illnesses, in emergency settings, and in outpatient settings. In these settings, trainees conduct histories and physicals, request diagnostic tests, record psychosocial backgrounds, perform family medicine-specific procedures, identify patients with chronic conditions and generate problem lists, document clinical encounters, and work with the patient and family to improve the health of the patient. If a trainee has questions or does not know how to approach a situation, the resident may contact the faculty preceptor, who is available in the clinical setting. This type of experiential learning cannot occur by being removed from the clinical environment.

Medical knowledge. The medical knowledge competency states that “residents must be able to demonstrate knowledge about established and evolving biomedical, clinical, and cognate (epidemiological and social behavioral) sciences and the application of this knowledge to patient care” (ACGME FMPPR, 2015, p. 13). During residency, family medicine trainees must demonstrate how they apply critical thinking and decision-making skills to patient care scenarios through correct interpretation of basic clinical tests and x-rays. They must also demonstrate an understanding that they can improve their medical knowledge through focused study based on the results of in-training examinations with the outcome being successful completion of their board certification examination. When residents begin the training program, they are assigned faculty advisors who meet quarterly with them and mentor them throughout the course of training. Advisors work with residents if any medical knowledge issues arise during this time. If a medical knowledge issue occurs in a clinical setting, the faculty preceptor assists the trainee with determining the appropriate solution. These medical knowledge issues can only be identified in a clinical setting while the resident is on duty.

Practice-based learning and improvement. The practice-based learning and improvement competency requires that “residents must be able to investigate and evaluate their

patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices” (ACGME FMPR, 2015, p. 13). Through self-directed learning, family medicine trainees must be able to identify and categorize research study designs so they can locate and incorporate scientific evidence related to their patients’ health problems. If there is a gap in their personal knowledge base, the trainee should ask for feedback from his or her advisor/faculty preceptor and utilize this feedback to improve learning and performance. The trainee should also seek to improve systems where they provide care. Over the three years a resident spends in this training program, they complete research projects that identify and measure a specific area related to patient care. The trainees also are members of various hospital committees, which oversee different aspects of health care delivery, including quality improvement. These types of experiences are found only in a health care setting where residents’ perform duty hours with faculty physicians.

Interpersonal and communication skills. The interpersonal and communication skills competency states that “residents must be able to demonstrate interpersonal and communication skills that result in effective information exchange and teaming with patients, patients’ families, and professional associates” (ACGME FMPR, 2015, p. 14). During residency, family medicine trainees must demonstrate that they can effectively communicate with patients, their families, health professionals, and the public. They must be aware of cultural and social differences that may hinder communication and upset the relationship between themselves and the patient, as well as with others they communicate with throughout the training period. The trainees must also demonstrate recognition of the use of technology in a physician/patient relationship, along with the ethical and legal implications of using technology in a health care setting. Trainees must learn to communicate in a professional and personal manner with patients in a clinical setting.

Faculty preceptors are instrumental in teaching residents to communicate effectively with their patients by suggesting options on how to communicate with various ethnicities and cultures and by modeling the behavior for trainees.

Professionalism. The professionalism competency requires that “residents must be able to demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population” (ACGME FMPR, 2015, p. 14). During residency, family medicine trainees must understand what defines the process of professionalism. They should be honest, respectful, compassionate, and empathetic with patients while recognizing how patients’ culture impacts their health. Patient confidentiality must also be maintained. Trainees must recognize that any conflict with personal biases should be put aside in order to complete professional duties as required. Again, the past experiences of family medicine preceptors allow them to counsel trainees on professional and ethical standards when the need arises. These mentoring opportunities occur during a resident’s duty hour shift.

Systems-based practice. Residents must “demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value” (ACGME FMPR, 2015, p. 15). During residency, trainees learn that they may advocate for improvements in health care systems (a) that will impact patients, (b) that, in order for quality patient care to occur, teamwork should be respectful and effective, (c) that patient safety (medical errors) issues arise when there is ineffective team-based care, and (d) that a healthcare team should always consider the community’s characteristics and resources when providing patient care. By working with faculty preceptors on a healthcare team, the trainees observe the interactions between the members of the interprofessional team and learn from these interactions.

Each of these ACGME competencies demonstrates how important it is for family medicine residents to have as much exposure as possible to their faculty preceptors during clinic and their faculty attending physicians during inpatient rotations. The experiential learning process is enriched when senior faculty members' experiences are interwoven into the residents' training. Corresponding with Knowles's assumptions that adult learners draw from previous experiences as a resource for learning, I propose that such experiences may be pulled from a faculty preceptor's previous experiences as well. When the duty hour limitations were established in 2003, faculty mentoring became even more critical to the family medicine residents' training.

First-Year Resident Study Participants' Scores Versus National Averages

The findings of this study demonstrate a decrease in ITE scores after the 2003 implementation of duty hour limitations. To provide further confirmation of the results of this study, the means of examination scores of first-year residents grouped by year for this population were compared to the mean scores of first-year residents nationally. As seen in Figure 16, the trend in reduction of examination scores exhibited by this study population also occurred with scores on a national level.

Recommendations for Future Research

At the onset, research regarding the 2003 initial duty hour limitations was minimal, particularly regarding the residents' educational outcomes. It was reported the opinions of both experienced clinicians and physicians in training who have concerns about the quality of education and measurement of competence must be considered (Antiel, Thompson, & Hafferty, 2011; McCoy, Halvorsen, Loftus, McDonald & Oxentenko, 2011; Moonesinghe & Beard, 2011). In contrast, more contributions to the body of knowledge have occurred regarding the 2011 updates to duty

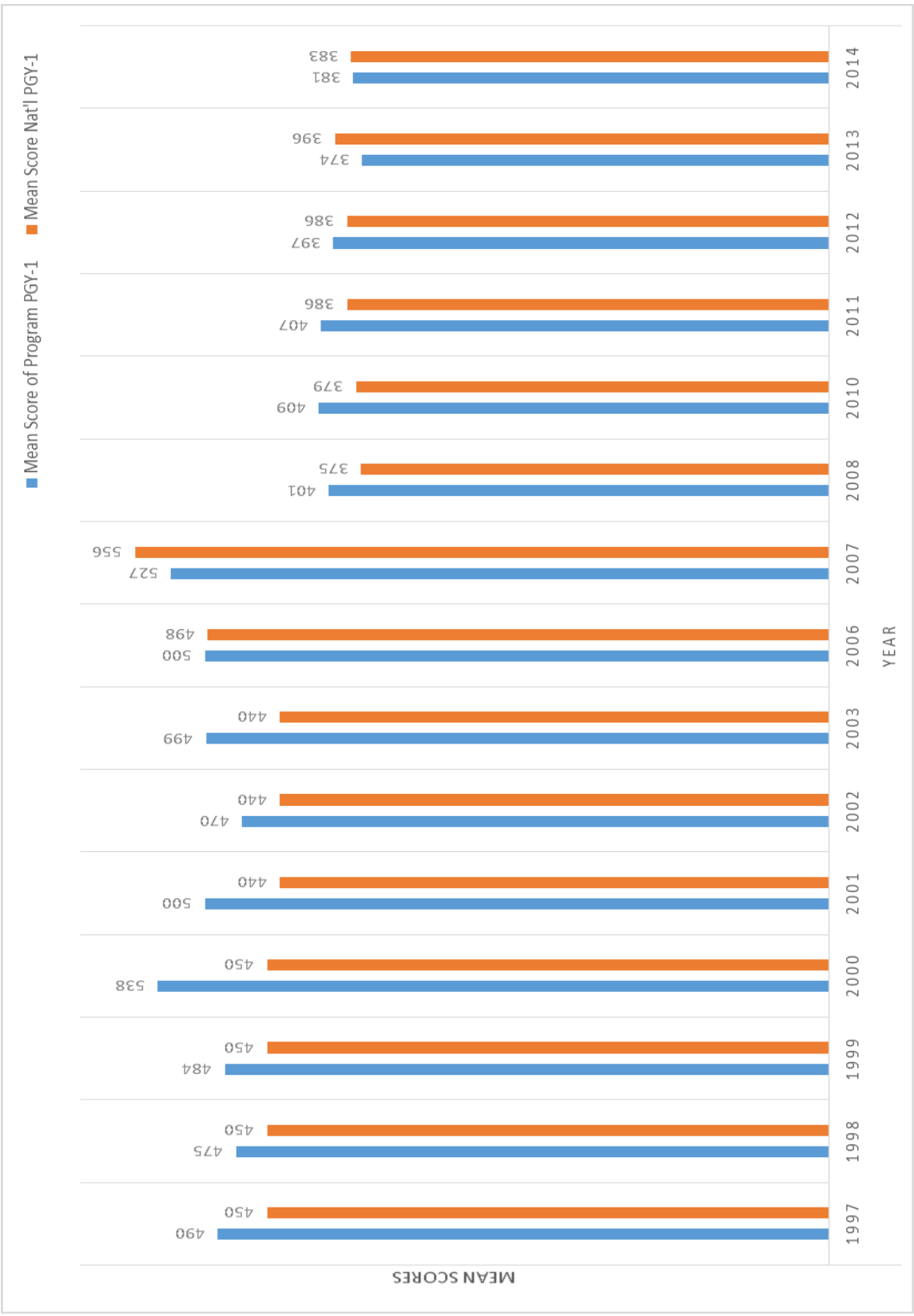


Figure 16. First-year resident study participants' ITE scores versus national averages

hour limitations

In the family medicine realm of duty hour limitations, additional research should be conducted in the three areas of concern: patient safety, resident health, and educational outcomes. A large amount of literature discusses the impact of duty hour limitations on patient safety and resident health. However, limited literature focuses on individual specialties, like family medicine, and residents' educational outcomes (CRCR, 2009).

In the future, the issue of residents' educational outcomes is an area I plan to pursue in my professional endeavors. In this study, inferential analysis compared ITE scores of residents trained in the program between 1997 and 2002 (pre-duty hour limitations) with residents trained between 2003 and 2010 (after initial duty hour limitations), and between 2011 and 2014 (updated duty hour limitations), to determine if there were differences. Using these research processes with other community-based family medicine programs, a larger population size might be reported.

Comparisons between community-based and university-based family medicine programs might also determine if there are significant differences between the two types of programs regarding duty hour mandates and their impact on educational outcomes for resident physicians.

Other research focusing on details of curricular and educational processes used during residency training to offset duty hour mandates might also be conducted in order to identify innovative practices and share resources across medical residency training programs nationally and internationally.

Another option is conducting research using a qualitative design method, such as interviewing residents and faculty to explore recurring themes related to duty hour limitations and graduate medical education.

One limitation of the study is that each participant has taken or will take the ITE annually over the course of the three-year training program. Quantitative research can be conducted using the ITE score from residents' initial examination attempts and the national average of the PGY-1 level for that particular year, measuring whether or not a difference exists.

Another limitation is that medical school curricula are not standardized across the country. For example, students from some medical schools may not be familiar with using an otoscope, while other students have familiarity and experience (Larry Karrh, MD, personal communication, October 13, 2015). When staff of residency programs interview medical school applicants, the United States Medical Licensing Examination Step 2 Clinical Knowledge scores are included in the application. Medical students take these exams during their final year of medical school and these scores are considered the final measure of their medical knowledge. Research could be conducted using a quantitative design comparing the USMLE Step 2 CK exam score data to ITE score data to determine how much a resident knows when he or she begins residency training.

Experimental studies could investigate whether or not a change in duty hours is reflected in ITE scores. The control group would follow the current duty hour limitations and the experimental group would follow any newer mandates.

Conclusion

Each year, first-, second-, and third-year residents from all programs take an In-Training Examination (ITE) distributed by their specialty board. The American Board of Family Medicine is responsible for making this exam available to all family medicine residency programs in the United States. The process of studying for and taking this four-hour exam each year provides the

resident with the experience and proficiency required to take the Family Medicine Board Certification Exam during the latter half of their final year of training.

Each program receives the results of their residents' ITEs each year. For first-year residents, this initial score is an individual baseline. Second- and third-year residents should improve each year as they become familiar with the exam process and more experienced clinically. For the current study's group of residents, if no progress is reported in results from one year to the next, an action plan is created during the resident's quarterly meeting with his or her advisor to increase the resident's knowledge base.

The medical profession has begun to shift its thinking of work processes related to postgraduate medical training, which, with time and education, will change its culture. The duty hour standards are now a permanent fixture of postgraduate medical training. Researchers should continue to focus on studying patient safety, residents' mental and physical health issues, and residents' educational outcomes related to work hours. Best practices should be publicized for all to implement within their own institutions, be they university-based or community hospital-based residency programs.

References

- Accreditation Council for Graduate Medical Education (2003). ACGME's approach to limit resident duty hours 12 months after implementation: A summary of achievements. http://www.acgme.org/acgmeweb/Portals/0/PFAssets/PublicationsPapers/dh_dutyhoursummary2003-04.pdf
- Accreditation Council for Graduate Medical Education (2011). Resident duty hours in the learning and working environment: Comparison of 2003 and 2011 standards. [http://www.acgme.org/acgmeweb/Portals/0/PDFs/jgme-monograph\[1\].pdf](http://www.acgme.org/acgmeweb/Portals/0/PDFs/jgme-monograph[1].pdf)
- Accreditation Council for Graduate Medical Education (2015). [FMPR] Program requirements for graduate medical education in family medicine. https://www.acgme.org/acgmeweb/Portals/0/PFAssets/ProgramRequirements/120_family_medicine_07012015.pdf
- Antiel, R. M., Thompson, S. M., & Hafferty, F. W. (2011). Duty hour recommendations and implications for meeting the ACGME core competencies: Views of residency directors. *Mayo Clinic Proceedings* 86(3), 185–191.
- CRCR position statement on IOM report. (2009, Fall). *Resident Review*. http://acgme.org/acWebsite/resReview/resR_newsFall_09.pdf
- Carek, P. J., Diaz, V., Dickerson, L. M., Peterson, L., & Johnson, S. (2012). Preparation for practice in family medicine: Before and after duty hours. *Family Medicine*, 44(8), 539–544.
- Carek, P. J., Gravel, J. W., Jr., Kozakowski, S., Pugno, P. A., Fetter, G., & Palmer, E. J. (2009) Impact of proposed Institute of Medicine duty hours: Family medicine residency directors' perspective. *Journal of Graduate Medical Education*, 1(2), 195–200. doi:<http://dx.doi.org/10.4300/JGME-D-09-00003.1>
- Charap, M. (2004). Reducing resident work hours: Unproven assumptions and unforeseen outcomes. *Annals of Internal Medicine*, 140(10), 814–815. doi:<http://dx.doi.org/10.7326/0003-4819-140-10-200405180-00019>
- Creswell, J. W. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (3rd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Dewey, J. (1938). *Experience and education*. New York, NY: Collier Books.
- Drolet, B. C., Anandarajah, G., & Fischer, S. A. (2014). The impact of 2011 duty hour requirements on family medicine residents. *Family Medicine*, 46(3), 215–218.

- Fletcher, K. E., Davis, S. Q., Underwood, W., Mangrulkar, R. S., McMahon, L. F., & Saint, S. (2004). Systematic review: Effects of resident work hours on patient safety. *Annals of Internal Medicine*, 141(11), 851–857. doi: <http://dx.doi.org/10.7326/0003-4819-141-11-200412070-00009>
- Friedmann, P. (2007). The ACGME approach to limiting resident duty hours. PowerPoint presentation retrieved from www.acgme.org on January 21, 2010.
- Jarvis, P. (1987). *Adult learning in the social context*. London, United Kingdom: Croom Helm.
- Klazinga, N., & van Bolderen, A. (2003). Epimetheus' responsibility: resident working hours and system redesign. *International Journal for Quality in Health Care*, 15(2), 109–110. doi:<http://dx.doi.org/10.7326/0003-4819-141-11-200412070-00009>
- Knowles, M. (1968). Andragogy, not pedagogy. *Adult Leadership*, 16(10), 350–352, 386.
- Knowles, M. (1973). *The adult learner: A neglected species*. Houston, Texas: Gulf Publishing Company.
- Knowles, M. (1980). *The modern practice of adult education: From pedagogy to andragogy* (2nd ed.). New York, New York: Cambridge Books.
- Knowles, M. S. (1984). *Andragogy in action: Applying modern principles of adult education*. San Francisco, California: Jossey Bass.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, New Jersey: Prentice Hall.
- Kolb, D. A. (n.d.) Experiential learning. *Learning-Theories.com: Knowledge base and bibliography*. New York, NY. www.learning-theories.com/experiential-learning-kolb.html (downloaded March 1, 2015)
- Kozakowski, S., Abercrombie, S., Carek, P., Carr, S., Dickson, G., Gravel, J., . . . Wieschhaus, M. (2009). Perceived impact of proposed Institute of Medicine duty hours on family medicine residency programs. *Annals of Family Medicine*, 7(3), 276–277. doi:10.1370/afm.1009
- Landrigan, C. P., Barger, L. K., Cade, B. E., Ayas, N. T., & Czeisler, C. A. (2006). Interns' compliance with Accreditation Council for Graduate Medical Education work-hour limits. *Journal of the American Medical Association*, 296(9), 1063–1070. doi:<http://dx.doi.org/10.1001/jama.296.9.1063>
- Lerner, B. H. (2006). A case that shook medicine: How one man's rage over his daughter's death sped reform of doctor training. *Special to the Washington Post*. <http://www.washingtonpost.com/wp-dyn/content/article/2006/11/24/AR2006112400985.html>

- Lesko, S., Hughes, L., Fitch, W., & Pauwels, J., (2012). Ten-year trends in family medicine residency productivity and staffing: Impact of electronic health records, resident duty hours, and the medical home. *Family Medicine*, 44(2), 83–9.
- Levine, A. C., Adusumilli, J., & Landrigan, C. P. (2010). Effects of reducing or eliminating resident work shifts over 16 hours: A systematic review. *Sleep*, 33(8), 1043–1053. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2910534/>
- Lockley, S. W., Cronin, J. W., Evans, E. E., Cade, B. E., Lee, C. J., Landrigan, C. P., . . . Czeisler, C. A. for the Harvard Work Hours, Health, and Safety Group. (2004). Effect of reducing interns' weekly work hours on sleep and attentional failures. *New England Journal of Medicine*, 351(18), 1829–1837. doi:<http://dx.doi.org/10.1056/NEJMoa041404>
- McCoy, C. P., Halvorsen, A.J., Loftus, C. G. McDonald, F.S., & Oxentenko, A.S. (2011). Effect of 16-hour duty periods on patient care and resident education. *Mayo Clinic Proceedings*, 86(3), 192–196.
- Merriam, S. B., Caffarella, R. S., & Baumgartner, L. M. (2007). *Learning in adulthood: A comprehensive guide* (3rd ed.). San Francisco, California: Jossey-Bass.
- Miulli, D. E., & Valcore, J. C. (2010). Methods and implications of limiting resident duty hours. *Journal of the American Osteopathic Association*, 110 (7), 385–395.
- Moonsinghe, R., & Beard, J. (2011). Inconclusive findings on effects of duty hour reduction. *Mayo Clinic Proceedings*, 86(7), 703–708. doi:10.4065/mcp.2011.0222
- Nasca, T. J. (2009). [Open letter to the GME Community]. http://acgme.org/acWebsite/home/NascaLetterCommunity10_27_09.pdf
- Petersdorf, R. G., & Bentley, J. (1989). Residents' hours and supervision. *Academic Medicine*, 64(1989), 175–181.
- Philibert, I., & Taradejna, C. (2011). Chapter 2: A brief history of duty hours and resident education. In *The ACGME 2011 duty hour standards: Enhancing quality of care, supervision, and resident professional development* (pp. 5–11). Chicago, Illinois: ACGME. Retrieved from [http://www.acgme.org/acgmeweb/Portals/0/PDFs/jgme-11-00-5-11\[1\].pdf](http://www.acgme.org/acgmeweb/Portals/0/PDFs/jgme-11-00-5-11[1].pdf)
- Silva, C. N., (2010). Ex post facto study. *Encyclopedia of Research Design*. Washington, D.C.: Sage. <http://dx.doi.org/10.4135/9781412961288>
- Swide, C. E., & Kirsch, J. R. (2007). Duty hour restrictions and their effect on resident education and academic departments: The American perspective. *Current Opinion in Anesthesiology*, 20, 580–584.

- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Upper Saddle River, NJ: Pearson Education, Inc.
- Ulmer, C., Wolman, D. M., & Johns, M. M. E. (Eds.). (2008). *Resident duty hours: enhancing sleep, supervision, and safety*. Washington, DC: The National Academies Press.
www.nap.edu
- Yardley, S., Teunissen, P. W., & Dorman, T. (2012). Experiential learning: Transforming theory into practice. *Medical Teacher*, 34(2), 161–164. doi:10.3109/0142159X.2012.643264

Appendices

Appendix A

Block Rotation Schedule

2015-2016 Resident Block Schedule

	1	2	3	4	5	6	7	8	9	10	11	12	13
	7/1/2015	7/27/2015	8/24/2015	9/21/2015	10/19/2015	11/16/2015	12/14/2015	1/11/2016	2/8/2016	3/7/2016	4/4/2016	5/2/2016	5/30/2016
	7/6/2015	8/3/2015	8/31/2015	9/28/2015	10/26/2015	11/23/2015	12/21/2015	1/18/2016	2/15/2016	3/14/2016	4/11/2016	5/9/2016	6/6/2016
	7/13/2015	8/10/2015	9/7/2015	10/5/2015	11/2/2015	11/30/2015	12/28/2015	1/25/2016	2/22/2016	3/21/2016	4/18/2016	5/16/2016	6/13/2016
	7/20/2015	8/17/2015	9/14/2015	10/12/2015	11/9/2015	12/7/2015	1/4/2016	2/1/2016	2/29/2016	3/28/2016	4/25/2016	5/23/2016	6/20/2016
PGY 1													
Res 1	PEDI1	IPS1	SURG	IPS2	OB1	NF1/PH	IPS3	NF/Psy	GYN	IPS4	PEDI2	OB2	ORTHO
Res 2	IPS1	OB1	NF1/Psy	GYN	IPS2	OB2	PEDI1	IPS3	NF2/PH	ORTHO	IPS4	PEDI2	SURG
Res 3	GYN	IPS1	OB1	NF1/Psy	ORTHO	IPS2	PEDI1	IPS3	OB2	NF2/PH	IPS4	SURG	PEDI2
Res 4	IPS1	GYN	PEDI1	OB1	NF1/PH	IPS2	PEDI2	ORTHO	SURG	IPS3	OB2	Psy/NF	IPS4
Res 5	OB1	PEDI1	IPS1	ORTHO	IPS2	Psy/NF1	OB2	IPS3	PEDI2	SURG	NF2/PH	IPS4	GYN
Res 6	IPS1	NF1/Psy	IPS2	PEDI1	SURG	ORTHO	NF2/PH	OB2	IPS3	GYN	PEDI2	IPS4	OB2
Res 7	ORTHO	OB1	IPS1	PEDI1	Psy/NF1	GYN	IPS2	OB2	IPS3	PEDI2	SURG	NF2/PH	IPS4
Res 8	PH/NF1	PEDI1	GYN	IPS1	PEDI2	OB1	IPS2	SURG	IPS3	OB2	ORTHO	IPS4	NF2/Psy
Res 9	OB1	IPS1	ORTHO	OB2	GYN	IPS2	PH/NF1	PEDI1	SURG	IPS3	Psy/NF2	PEDI2	IPS4
PGY 2													
Res 1	NF/Psy	GYN	IPS1	NICU	PEDI1	CARDS	OB1	ER	IPS2	ONF	OB2	DERM	NF/Ele
Res 2	PEDI	OB1	CARDS	OB2	NF1/O	DERM	IPS1	GYN	ER	IPS2	NICU	PEDI1	Ele/NF2
Res 3	IPS1	ADULT	OB1	O/NF1	GYN	IPS2	CARDS	E/NF2	NICU	DERM	PEDI1	OB2	SURG/ICU
Res 4	OB1	SURG	NICU	PEDI1	IPS1	OB2	GYN	DERM	E/NF2	ER	CARDS	ONF	IPS
Res 5	PEDI1	IPS1	O/NF1	CARDS	OB1	E/NF2	DERM	IPS2	OB2	NICU	GYN	ER	ICU/SURG
Res 6	NICU	O/NF	DERM	IPS1	ER	GYN	E/NF2	OB1	PEDI1	CARDS	IPS2	SURG/ICU	OB
Res 7	CARDS/OBN	DERM	OB1	IPS1	PH/NF	PEDI1	ORTHO	PEDI1	PEDI1	OB	Ele/NF	IPS	NICU
PGY 3													
Res 1	E/NF1	GI/E	NEU/ELE	IPS1	PM/ENT	ICU	Pedi Out	NF2/?	SPORTS	GERI	ELE/ELE	IPS2	URO/SEL
Res 2	NF1/Uro	IPS1	ELC/SEL	SPORTS	ELECT	GERI	ICU	PM/GI	IPS2	NEU/ELE	Pedi Out	NF2/EL	ENT/ELE
Res 3	Elective	GERI	ICU	NF1/Ele	IPS2	SPORTS	IPS1	GI/Elec	Sel/PM	Pedi Out	NF2/ELE	ELE/Uro	NEU/ENT
Res 4	ICU	NF1/ENT	SPORTS	Neu/PM	Pedi Out	IPS1	E/E	SEL/IPS	GERI	NF2/?	ELE/URO	ELE/GI	IPS2
Res 5	IPS1	Uro/EI	NF2/GI	ICU	Sports	NF1/ENT	GERI	IPS/PM	ELE/Ele	SEL/NEU	IPS2	Pedi Out	ELE/ELE
Res 6	Neu/Sel	ICU	IPS1	GERI	EI/Uro	Pedi Out	NF1/Elec	Elec/ENT	NF2/ELE	IPS2	SPORTS	PM/EL	ELE/GI

Appendix B
Code Book

Variable	Data Type	Description
Exam Year	Scale	Year ITE Taken
Resident ID	Nominal	Initials of First and Last Name
Adult Medicine Score	Scale	Score for Adult Medicine Section of Exam
Maternity Care Score	Scale	Score for Maternity Care Section of Exam
Scaled Score	Scale	Overall Exam Score
Gender	Nominal	Student's Gender (Male or Female) (Male=1, Female =2)
Age	Scale	Date of Birth of Examinee
Ethnicity	Nominal	Ethnicity of Examinee (1=Anglo American, 2=Hispanic American, 3=Asian American, 4=African American, 5=Other)

Appendix C

University of the Incarnate Word IRB Document



6/1/2015

Maria E. Marquise
440 Irongate Ridge
San Antonio, Texas 78253

Dear Maria:

Your request to conduct the study titled *Duty Hour Limitations and Educational Outcomes: Perspectives from a Community Hospital-Based Family Medicine Residency Program* was approved by exempt review on 6/1/2015. Your IRB approval number is 15-06-001. Any written communication with potential subjects or subjects must be approved and include the IRB approval number. Electronic surveys or electronic consent forms, or other material delivered electronically to subjects must have the IRB approval number inserted into the survey or documents before they are used.

Please keep in mind these additional IRB requirements:

- This approval is for one year from the date of the IRB approval.
- Request for continuing review must be completed for projects extending past one year. Use the **IRB Continuation/Completion form**.
- Changes in protocol procedures must be approved by the IRB prior to implementation except when necessary to eliminate apparent immediate hazards to the subjects. Use the **Protocol Revision and Amendment form**.
- Any unanticipated problems involving risks to subjects or others must be reported immediately.

Approved protocols are filed by their number. Please refer to this number when communicating about this protocol.

Approval may be suspended or terminated if there is evidence of a) noncompliance with federal regulations or university policy or b) any aberration from the current, approved protocol.


Congratulations and best wishes for successful completion of your research. If you need any assistance, please contact the UIW IRB representative for your college/school or the Office of Research Development.

Sincerely,

Rebecca Penaloza

Rebecca Penaloza, MAA, CRA
Research Officer
University of the Incarnate Word IRB

Appendix D
CHRISTUS Santa Rosa IRB Document

		EXEMPT INITIAL APPLICATION EXEMPT REVIEW FORM MINIMAL RISK RESEARCH THAT IS EXEMPT FROM FULL IRB APPROVAL		FORM 1 919 Hidden Ridge Irving, Texas Tel: 469-282-2686																																																									
SECTION 1 TITLE AND INVESTIGATOR																																																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Principal Investigator <small>(name and title)</small></td> <td>Maria E. Marquise, M.A. Graduate Medical Education Coordinator</td> </tr> <tr> <td>Department</td> <td>Family Medicine</td> </tr> <tr> <td>Address</td> <td>11130 CHRISTUS Hills, Medical Plaza 3, Suite 201 San Antonio, TX 78251</td> </tr> <tr> <td>Phone</td> <td>(210) 703-9029</td> </tr> <tr> <td>E-mail</td> <td>Maria.marquise@christushealth.org</td> </tr> <tr> <td colspan="2">Resident <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Preceptor-</td> </tr> <tr> <td>Contact / Coordinator <small>(person completing form)</small></td> <td><input checked="" type="checkbox"/> Same as above</td> </tr> <tr> <td>Phone</td> <td></td> </tr> <tr> <td>Fax</td> <td></td> </tr> <tr> <td>Address</td> <td></td> </tr> <tr> <td>E-mail</td> <td></td> </tr> </table>		Principal Investigator <small>(name and title)</small>	Maria E. Marquise, M.A. Graduate Medical Education Coordinator	Department	Family Medicine	Address	11130 CHRISTUS Hills, Medical Plaza 3, Suite 201 San Antonio, TX 78251	Phone	(210) 703-9029	E-mail	Maria.marquise@christushealth.org	Resident <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Preceptor-		Contact / Coordinator <small>(person completing form)</small>	<input checked="" type="checkbox"/> Same as above	Phone		Fax		Address		E-mail		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">Protocol Title</th> </tr> <tr> <td colspan="2">Duty Hour Limitations and Educational Outcomes: Perspectives from a Community Hospital-Based Family Medicine Residency Program</td> </tr> <tr> <td colspan="2"> <input checked="" type="checkbox"/> Single Site <input type="checkbox"/> Multi-Site </td> </tr> <tr> <td style="width: 30%;"> Group <input type="checkbox"/> Biomedical <input type="checkbox"/> Social/Behavioral <input checked="" type="checkbox"/> Educational <input type="checkbox"/> Other _____ </td> <td style="width: 30%;"> Aim <input type="checkbox"/> Study <input type="checkbox"/> Residency <input checked="" type="checkbox"/> Dissertation <input type="checkbox"/> Other _____ </td> </tr> <tr> <th colspan="2" style="text-align: center;">Sponsor</th> </tr> <tr> <td colspan="2">Name of Sponsor: Jose Hinojosa, M.D.</td> </tr> <tr> <td colspan="2">Relationship to PI: Supervisor</td> </tr> <tr> <td colspan="2">Funding Source: n/a</td> </tr> </table>		Protocol Title		Duty Hour Limitations and Educational Outcomes: Perspectives from a Community Hospital-Based Family Medicine Residency Program		<input checked="" type="checkbox"/> Single Site <input type="checkbox"/> Multi-Site		Group <input type="checkbox"/> Biomedical <input type="checkbox"/> Social/Behavioral <input checked="" type="checkbox"/> Educational <input type="checkbox"/> Other _____	Aim <input type="checkbox"/> Study <input type="checkbox"/> Residency <input checked="" type="checkbox"/> Dissertation <input type="checkbox"/> Other _____	Sponsor		Name of Sponsor: Jose Hinojosa, M.D.		Relationship to PI: Supervisor		Funding Source: n/a		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">FOR OFFICE USE ONLY</th> </tr> <tr> <td style="width: 30%;">IRB Number</td> <td></td> </tr> <tr> <td>Date Received</td> <td></td> </tr> <tr> <td>Review Type</td> <td> <input type="checkbox"/> Full Board <input type="checkbox"/> Expedited </td> </tr> <tr> <td>Reviewer 1</td> <td></td> </tr> <tr> <td>Reviewer 2</td> <td></td> </tr> <tr> <td>CRI Contact</td> <td></td> </tr> <tr> <td>Risk Category</td> <td> <input type="checkbox"/> Category 1 <input type="checkbox"/> Category 2 <input type="checkbox"/> Category 3 <input type="checkbox"/> Category 4 </td> </tr> <tr> <td>Date Approved</td> <td></td> </tr> </table>		FOR OFFICE USE ONLY		IRB Number		Date Received		Review Type	<input type="checkbox"/> Full Board <input type="checkbox"/> Expedited	Reviewer 1		Reviewer 2		CRI Contact		Risk Category	<input type="checkbox"/> Category 1 <input type="checkbox"/> Category 2 <input type="checkbox"/> Category 3 <input type="checkbox"/> Category 4	Date Approved	
Principal Investigator <small>(name and title)</small>	Maria E. Marquise, M.A. Graduate Medical Education Coordinator																																																												
Department	Family Medicine																																																												
Address	11130 CHRISTUS Hills, Medical Plaza 3, Suite 201 San Antonio, TX 78251																																																												
Phone	(210) 703-9029																																																												
E-mail	Maria.marquise@christushealth.org																																																												
Resident <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO Preceptor-																																																													
Contact / Coordinator <small>(person completing form)</small>	<input checked="" type="checkbox"/> Same as above																																																												
Phone																																																													
Fax																																																													
Address																																																													
E-mail																																																													
Protocol Title																																																													
Duty Hour Limitations and Educational Outcomes: Perspectives from a Community Hospital-Based Family Medicine Residency Program																																																													
<input checked="" type="checkbox"/> Single Site <input type="checkbox"/> Multi-Site																																																													
Group <input type="checkbox"/> Biomedical <input type="checkbox"/> Social/Behavioral <input checked="" type="checkbox"/> Educational <input type="checkbox"/> Other _____	Aim <input type="checkbox"/> Study <input type="checkbox"/> Residency <input checked="" type="checkbox"/> Dissertation <input type="checkbox"/> Other _____																																																												
Sponsor																																																													
Name of Sponsor: Jose Hinojosa, M.D.																																																													
Relationship to PI: Supervisor																																																													
Funding Source: n/a																																																													
FOR OFFICE USE ONLY																																																													
IRB Number																																																													
Date Received																																																													
Review Type	<input type="checkbox"/> Full Board <input type="checkbox"/> Expedited																																																												
Reviewer 1																																																													
Reviewer 2																																																													
CRI Contact																																																													
Risk Category	<input type="checkbox"/> Category 1 <input type="checkbox"/> Category 2 <input type="checkbox"/> Category 3 <input type="checkbox"/> Category 4																																																												
Date Approved																																																													
SECTION 2 NOTE TO INVESTIGATOR																																																													
<p>Per 45 CFR 46.101(b), categories of exempt human subjects research apply to:</p> <ol style="list-style-type: none"> 1- Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as: <ol style="list-style-type: none"> (a) research on regular and special education instructional strategies or (b) research on the effectiveness or comparison among instructional techniques or curricula. 2- Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior <i>unless</i>: <ol style="list-style-type: none"> (a) information obtained is recorded in such a manner that subjects can be identified, directly or indirectly, <i>and</i> (b) any disclosure of human subject response outside of research could reasonably place the subjects at risk or criminal/civil liability or be damaging to subjects financial standing, employability or reputation. <p><i>EXEMPTION: Does not apply if subjects are elected or appointed public officials or candidates for public office or federal statutes require without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.</i></p> 3- Research involving the collection or study of existing data, documents, records, pathological/diagnostic specimens, if these sources are publicly available or the information is recorded by the investigator in such a manner that the subjects cannot be identified directly or through identifiers linked to the subjects. 4- Research and demonstration projects which are conducted by or subject to the approval of (federal) department or agency heads and which are designed to study, evaluate or otherwise examine: 																																																													

- (a) public benefit or service programs;
- (b) procedures for obtaining benefits or services under those programs;
- (c) possible changes in or alternatives to those programs or procedures; or
- (d) possible changes in methods or levels of payment for benefits and services under those programs.

5- **Taste and food quality evaluation and consumer acceptance studies**, if:

- (a) Wholesome foods without additives are consumed or
- (b) If a food is consumed contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental containment at or below the level found to be safe, by the FDA or EPA.

Note: Exceptions to exempt research do not apply if it involves:

- research involving prisoners (45 CFR 46 Subpart C)
- research involving children (45 CFR 46 Subpart D) *unless* for research involving educational tests or observations of public behavior when the researchers do not participate in the activities being observed.

Per 45CFR46.101 (b), research studies qualifying for exempt review are exempt from all requirements in 45CFR46, including continuing review.

SECTION 3

CRITERIA FOR EXEMPT REVIEW

1.	Research Question: The Accreditation Council for Graduate Medical Education introduced a new model that in 2003, implemented limits on residents' duty hours on residency programs across the United States (Philibert & Taradejna, 2011). This model decreases the residents' time spent in a learning environment. More stringent limitations were implemented in 2011. If physician training programs utilize experiential learning as one of their teaching methods, do these duty hour limitations affect their learning outcomes?
2.	Source of Information The Family Medicine Program Director will provide the annual In-Training Examination (ITE) score results (post hoc data) of current and graduate trainees from the Family Medicine Residency training program.
3.	Who will have access/be reviewing the source of information? The principal investigator
3.	Method of Data/Specimen Collection: (chart review- concurrent/retrospective; questionnaire, etc.) (please attach a copy of information/data collection form) Subjects for this study will be those current and graduate trainees from the CHRISTUS Santa Rosa Family Medicine Residency training program. Annual ITE score results (post hoc data) of current and graduate trainees will be used for data analysis (21 residents covering a span of 17 years).
4.	Where will the method of data/specimen collection be performed? The CHRISTUS Santa Rosa Family Medicine Residency program (CSRMFRP) administration office suite (where the principal investigator's office is located).
5.	Where will the files be maintained? The files will be maintained in the CSRMFRP administration office. The information will be kept securely and will be accessible only to the researcher and the Family Medicine program director, who is a member of the dissertation committee.
6.	Subject Selection Criteria: (age, gender, # of subjects)

The Family Medicine Program Director will provide the annual ITE score results (post hoc data) of current and graduate trainees from the Family Medicine Residency training program. A dataset will be created containing the resident's:

- Overall ITE grade
- Clinical Category Performance grade
- Gender
- Ethnicity
- Age

Yearly examination scores of 21 medical residents covering a span of 17 years will be utilized for analysis. The scores will be divided into 3 groups. The first group will include examination scores for the time period 1997-2002 (approximately 126 residents), when duty hour mandates did not exist. The post-implementation groups will include examination scores for 2003-2011 (168 residents), and 2012-2015 (62 residents). n=356

7. Study Design:

The research will incorporate a quantitative study using an inferential design. Statistical testing will be used to measure the degree of the relationship between the variables (Creswell, 2008). The predictor, or independent variables (IV) to be used in analysis are the time periods before (1997-2002) and after (2003-2011, 2012-2015) the implementation of the ACGME Duty Hour Standards. The criterion or dependent variables (DV) are the Family Medicine Resident In-Training Examination scores. The exams were taken annually before and after the Duty Hours Limitations and its updates were implemented (2003 and 2011) through the current year.

Analysis will be conducted to determine if a covariance exists between groups. If it is determined that there is a variance, multi-variate analysis will be performed (Creswell, 2008; Gall, Borg, & Gall, 1996). If needed, simple linear regression or multiple regression statistical tests may be run to determine the predictors that explain the criterion (Creswell, 2008).

8. Approximate Duration of Study:

Once I receive CHRISTUS IRB approval, analysis and reporting of the data is anticipated to take less than six months.

9. Description of the Procedures to be Performed:

Yearly examination scores of 21 medical residents covering a span of 17 years will be utilized for analysis. The scores will be divided into 3 groups. The first group will include examination scores for the time period 1997-2002 (approximately 126 residents), when duty hour mandates did not exist. The post-implementation groups will include examination scores for 2003-2011 (168 residents), and 2012-2015 (62 residents). The first post-implementation group represents the period of time the initial implementation of duty hour limitations were in effect; with more stringent duty hour mandates imposed in 2011. The study will compare data from three time periods: pre-duty hours implementation (1997-2002), duty hours implantation phase 1 (2003-2011) and duty hours implementation phase 2 (2012-2105) to determine if there is a significant relationship between the implementation of the Duty Hour Standards and Family Medicine residents' learning outcomes.

RISK	STEPS TO MINIMIZE RISK
(ex: PHI & Access to Records? Subject under physical, emotional, social constraints?)	Participant identifiers will not be provided by the residency program and all information will be presented in aggregate. The researcher will not have contact with individual subjects, as the Family Medicine residency program director will provide the anonymous participant data.

10. Method of Obtaining Informed Consent:
(if applicable, attach copy of ICF)

Post hoc data

11.	Has your current research request been reviewed by any other IRB? If so, what was the IRB's decision and what date was the decision obtained? (An IRB Approval letter may be attached in lieu of this question)
	Yes, see attached.

I, as the Principal Investigator, feel this study qualifies for exempt research based on: 3
(Choose category items 1-5 as applicable)

I, as the Principal Investigator, certify that I will seek additional IRB approval prior to any other data and/or work completion if my research deviates from the initial research request submitted as stated in this application.

I, as Principal Investigator, acknowledge and accept the responsibility for protecting the rights and welfare of human research subjects and for complying with all applicable provisions of the CSFCH I.R.B. policies dealing with protection of human subjects, including: *Federalwide Assurance of Protection of Human Subjects; The Belmont Report; The Code of Federal Regulations for the Protection of Human Subjects: Title 45 CFR Part 46; Title 21 CFR Part 50; Title 21 CFR Part 56; HIPAA Privacy Rules; CSFCH IRB Policies and Procedures.*

SECTION 4

PRINCIPAL INVESTIGATOR SIGNATURE

I certify that the above information is correct

Maria E. Marquise	June 5, 2015
Principal Investigator Signature	Date

SECTION 5

FOR IRB USE ONLY

Does this meet the criteria for exempt review? YES ☒ NO ☐

Additional comments	

ERIAN GUADUE		10-13-15
Printed Name IRB Reviewer	Signature IRB Reviewer	Date

Appendix E

CITI Training Certificate

CITI - Collaborative Institutional Training Initiative

Page 1 of 1

English Text size: A A Eliza Marquise ID: 1986622 | [Log Out](#) | [Help](#)

[Search Knowledge Base](#)

[Main Menu](#) | [My Profiles](#) | [My CEUs](#) | [My Reports](#) | [Support](#)

[Main Menu](#) > [Completed Course](#)

Social and Behavioral Sciences RCR Course For Unaffiliated Learner - NO COMPLETION REPORT - Basic Course

You completed the mandatory elements of this course on 02/26/15 with a final reported average score of 100%.

This is the date and score recorded in the Completion Report sent to your institution.

- You may review any of the course content and retake quizzes, including those for supplemental optional modules, but your reported quiz scores and dates will not change.
- You do not receive any extra credit for this course if you retake quizzes or complete additional quizzes on supplemental materials.
- In some cases, completion of additional modules may be required for eligibility for CEU credits.
- Additional completions and new quiz scores may transfer to other CITI Program courses, if you register for courses that include those modules. You must login using the same account, and the other institution must allow transfer credit.

Modules	Already Taken?	Score
Authorship (RCR-Basic) (ID: 16597)	02/26/15	5/5 (100%)
Collaborative Research (RCR-Basic) (ID: 16598)	02/26/15	5/5 (100%)
Conflicts of Interest (RCR-Basic) (ID: 16599)	02/26/15	5/5 (100%)
Data Management (RCR-Basic) (ID: 16600)	02/26/15	5/5 (100%)
Mentoring (RCR-Basic) (ID: 16602)	02/26/15	5/5 (100%)
Peer Review (RCR-Basic) (ID: 16603)	02/26/15	5/5 (100%)
Research Misconduct (RCR-Basic) (ID: 16604)	02/26/15	5/5 (100%)
Responsible Conduct of Research (RCR) Course Introduction (ID: 1522)	02/26/15	--
Introduction to the Responsible Conduct of Research Archived 1248 (ID: 1248)	11/01/10	--
Introduction to Data Acquisition and Management Archived 1344 (ID: 1344)	Optional	--
Introduction to Responsible Authorship Archived 1345 (ID: 1345)	Optional	--
Using Animal Subjects in Research (RCR-Basic) (ID: 13301)	02/26/15	5/5 (100%)
Research Involving Human Subjects (RCR-Basic) (ID: 13566)	02/26/15	5/5 (100%)

[Accessibility](#) [Copyright](#) [Privacy Notice](#) [Terms of Service](#) [Site Index](#) [Contact Us](#)

<https://www.citiprogram.org/members/index.cfm?pageID=147>

2/26/2015