The Influence Of Medical Education On The Frequency And Type Of Medical Board Discipline Received By Licensed Florida Physicians

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THE INFLUENCE OF MEDICAL EDUCATION ON THE FREQUENCY AND TYPE OF MEDICAL BOARD DISCIPLINE RECEIVED BY LICENSED FLORIDA PHYSICIANS

by

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ABSTRACT

It has been estimated that in the United States, between 44,000 to 98,000 patients succumb to medical errors each year. Due to a shortage of graduates of domestic medical schools, many graduates of foreign medical schools are practicing in the United States. The medical education received in foreign medical schools may not be equivalent to the medical education received in domestic medical schools, which are schools located in the United States, Puerto Rico and Canada. Differences due to the educational backgrounds of the foreign-schooled physicians may contribute to an increase in medical board disciplining. Furthermore, graduates of medical schools where the instruction is not conducted in the English language may receive increased medical board disciplining when compared to the graduates of medical schools where English is the language of instruction. Finally, domestic medical schools that are ranked low according to *The Gourman Report, 8th Edition* may provide a substandard medical education, causing their graduates to have increased rates of discipline when compared to peers who have graduated from higher ranked medical schools.

This study examines the effects of undergoing foreign medical training as opposed to domestic medical training and receiving medical school instruction in the English language or another language, on the frequency and severity of disciplinary action taken by the Florida Board of Medicine against medical doctors licensed in Florida since 1952 (N = 39,559). Also examined are the effects of attending domestic medical schools that are ranked lower than other domestic medical schools on the frequency and severity of disciplinary action taken by the Florida Board of Medicine against medical doctors licensed in Florida since 1952 (n = 25,479). Control variables used in this logistic regression analysis include whether the medical doctor is specialty board certified or not, the specialty practiced and the medical doctor's race and gender. Archival data from the Florida Department of Health were used for this study.

This study found that the graduates of medical schools where the instruction is not in the English language are more likely to receive discipline and are more likely to receive more severe types of discipline than graduates of medical schools where the instruction is in the English language. It was also found that medical doctors who are ABMS certified, are practicing either a surgical specialty, obstetrics, gynecology, psychiatry, emergency medicine, family medicine or diagnostic radiology, or are male have increased odds of being disciplined by the Florida Board of Medicine.

This dissertation is dedicated to all medical doctors for they truly provide all of us with not only healthier lives but with life itself. Many good physicians have cared for me over the years and a few have actually saved my life during a medical emergency. In our present day and time, I believe medicine is one of the noblest professions that any human being could ever pursue.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

It has been estimated that in the United States, between 44,000 and 98,000 patients succumb to medical errors each year (Grober & Bohnen, 2005). This original estimate was proposed in a report from the Institute of Medicine (Kohn, Corrigan, & Donaldson, 1999) and although the estimate is thought by some to be exaggerated (McDonald, Weiner & Hui, 2000), Millenson (2003) used these figures to extrapolate that as many as 2.5 million patients may have died due to medical errors between the years of 1978 and 1999. Many of these medical errors may have resulted due to factors related to the training of medical doctors.

A shortage of American medical college trained medical doctors is the gateway for foreign trained physicians to be hired and to practice in the United States (Cooper, 2004). Approximately 25% of the total physician workforce in the United States consists of physicians who graduated from medical schools located outside of the United States, Puerto Rico, and Canada (Whelan, Gary, Kostis, Boulet, & Hallock, 2002). The medical education provided to foreign-trained physicians by medical schools located outside of the United States, Puerto Rico, and Canada may not be equivalent to the medical education provided by domestic medical schools, and such disparity may contribute to increased medical errors committed by foreign-trained physicians.

Some domestic medical schools may provide a substandard medical education causing their graduates to have increased rates of medical errors when compared to peers that have graduated from other medical schools. An increasingly common pattern of naming hospitals and health insurers as additional parties in medical malpractice litigation is occurring, and the prospect exists that future lawsuits may name medical education institutions as litigants in medical education malpractice claims, which are called "(m)ed-mal" claims by lawyers (Noah, 2005, p. 149).

Potential for Variation in Medical Training

The education and training received by medical doctors who obtain the degree of Doctor of Medicine is a long and arduous process and, as with most preparation for entry into a profession, facilitates further learning through actual experience or "practice" of the profession. Allopathic schools in the United States, Canada, and Puerto Rico are accredited by the American Association of Medical Colleges (AAMC), and most follow the traditional medical school model of instruction with two years of basic medical science followed by two years of clinical rotation through the various specialties that make up modern medical practice (The Princeton Review, n.d.). At Harvard Medical School, the first year of study centers on human anatomy and physiology, and the biomedical sciences including biochemistry, molecular biology and neuroscience, whereas the second year focuses on the pathophysiology of human disease processes (Harvard Medical School, 2004).

Despite the commonality in the length of medical school and the similarity in course of instruction, wide variation may exist between the curriculum, the method of pedagogy, the school's resources, the school's culture, and the overall quality of instruction. For instance, Waters, Lefevre, and Budetti (2003) believe that medical schools vary in educational quality with the graduates of lower quality schools less prepared to practice medicine and less prepared to cope with the demands of patients and their families if such skills are not taught. Waters et al. also believe that variation in the institutional cultures of medical schools can influence the students’ choice of medical specialty and even their individual behavior. Regarding pedagogical differences between medical schools, Noah (2005) writes that the development of critical thinking skills by medical students may be lessened by the excessive reliance on the memorization abilities required to be successful during the first and second years of medical school. Curricular differences between medical schools include offering or not offering important subjects such as communication skills, medical ethics, genetics, palliative care, and pain management (Noah). The amount of resources possessed by a medical school may impact whether or not the school is able to offer the latest in pedagogical technology, such as realistic high-tech procedural simulators, virtual reality, or realistic high-tech interactive patient simulators (Ziv, Small & Wolpe, 2000).

Summing up the possible variation between medical schools, McManus (2003) writes, “Medical schools differ in their social worlds and in their philosophy, outlook and approach to teaching, and students at different schools have different amounts of clinical experience” (p. 324). Furthermore, the quality of other post-graduate training, along with differing specialty qualifications, may produce widely divergent levels of competency among physicians.

The Need To Study the Effect of Medical Training on Discipline

Bodenheimer and Grumbach (2002) have stated, “Five to fifteen percent of physicians are not fully competent to practice medicine, either because of inadequate medical skills, impairment caused by the use of drugs or alcohol, or deficiencies resulting from mental illness” (p. 128). Additionally, graduates of foreign medical training have a greater risk for being subject to disciplinary action from state medical boards than graduates of U.S. medical schools (Khaliq, Dimassi, Huang, Narine & Smego, 2005). Finally, medical doctors that have documented behavioral concerns in their medical school records are more likely than other medical doctors to receive later sanctioning from state medical boards (Papadakis, Hodgson, Teherani, & Kohatsu, 2004). Clearly, further study of the factors involved in the education and training of medical doctors, which may predispose them to practice medicine below the expected standard, is warranted. The cost of medical error is not only expressed in financial terms but also in the physical and psychological damage to patients and their families, and the reasons for medical error caused by medical doctors needs to be studied further.

Theoretical Framework of the Relationship Between Medical Training and Error

Many integrated aspects can influence the professional competence of medical doctors. Epstein and Hundert (2002) believe that physician competence is developmental, impermanent, and dependent on context, and has the following dimensions: cognitive, technical, integrative, contextual, affective, habits of mind, and associational. Human information-processing theory, most commonly associated with aviation accidents and pilot error, but applicable to human error in general and specifically adapted to physician decision making, is shown in Figure 1 as adapted from Allnut (1982).

As shown in Figure 1, it is proposed that the independent variables of domestic or foreign medical school attendance, the medical school language of instruction being English or another language and the Gourman ranking of domestic medical schools have an influence on the disciplinary records of medical doctors. According to Allnut's model (1982) as adapted for this study to medical doctor error instead of pilot error and simplified for use in this context, a medical doctor is presented with a patient's condition (stimuli) via his or her physical senses (sensation) and an association with previous experience is sought from short-term memory (perception). The medical doctor then has to assemble and interpret the perception through a single decision channel and then perform an analysis by drawing upon long-term memory (decision) and thereafter a response is rendered (response). It is proposed that during this information-processing sequence, a medical doctor draws upon his long term memory including his medical education background to make a decision and that the appropriateness of the decision is influenced by the quality of that educational background. Other factors, such as being female or male, which make up the individual persona of any particular medical doctor, also contribute to the medical doctor's life experiences and are thus part of the long-term memory.

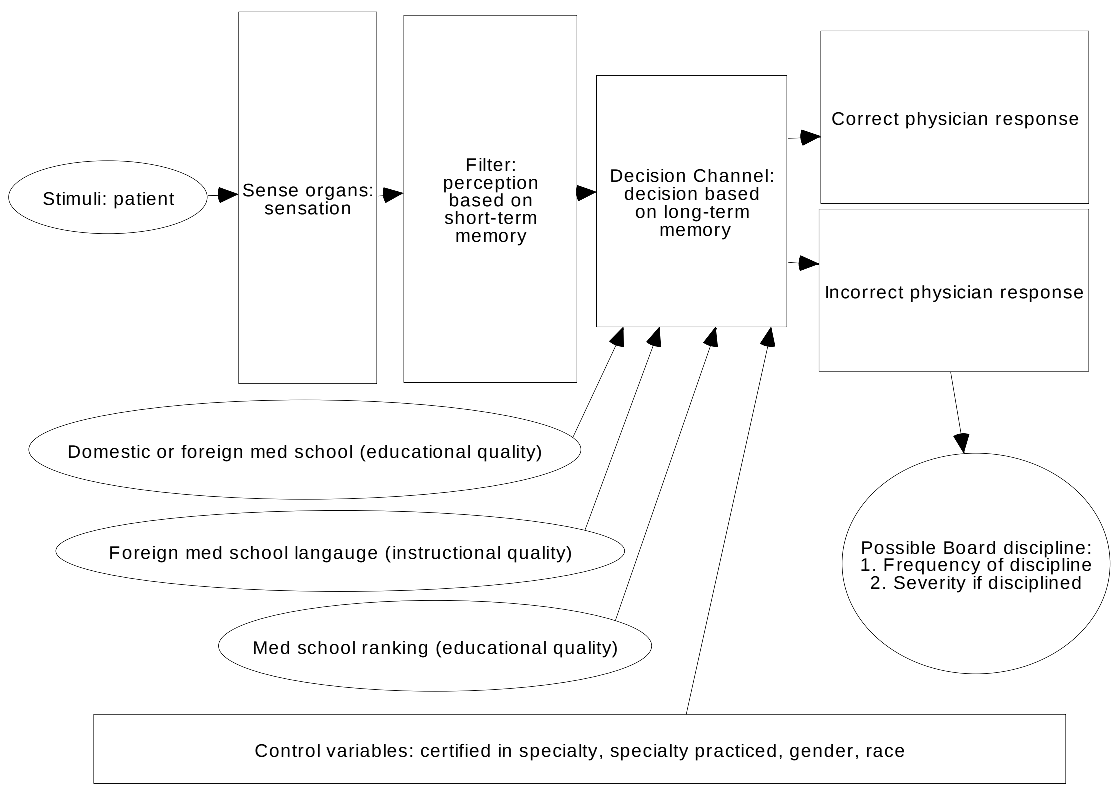

Figure 1. Physician Decision Making Sequence and the Relationship to Discipline

The human information-processing sequence is contained within the structure of systems theory for particular commercial applications, and, as an example, the disaster-fraught industries of nuclear power and aviation have developed many redundancies and risk-avoidance techniques into their systems to minimize human error (Bates & Gawande, 2000). In the area of medical training, a recent systemic, risk-avoidance measure in effect in the United States since July, 1, 2003, is the restriction that residents can work no more than 80 hours per week (Sakorafas & Tsiotos, 2004).

Iatrogenic (medical doctor induced) injury may result from a combination of events (including the medical doctor decision-making sequence) within broader contextual and systemic settings (the overall healthcare system and environment). Therefore, any specific medical doctor's background, as it relates to the variables of medical school attended and the language used for instruction, may affect the doctor's decision making process via long-term memory and is undoubtedly a factor within the many integrated aspects of healthcare delivery.

Problem Statement

Medical errors made by medical doctors are a continuing problem in the State of Florida and elsewhere. The purpose of this study is to define the relationship between varying factors as predictors of a medical doctor's preparation to practice medicine: domestic versus foreign medical school attendance; the language used for instruction at medical schools; and the Gourman ranking of domestic medical schools, with specified, manifested acts of medical malpractice for which medical doctors have been disciplined by the Florida Board of Medicine.

As a result of this study, efforts could be undertaken by the Florida Board of Medicine to review physician licensure requirements, possibly causing further scrutiny of educational qualifications or limiting entry into the practice of medicine in Florida of medical doctors identified as possessing identified risk factors that could predispose them to practice substandard medicine. The end effect might very well be a reduction in the incidence of iatrogenic error and therefore a corresponding reduction in harm to patients in the state of Florida.

Research Questions

This study addresses the following research questions:

1) Does graduation from a foreign medical school increase the probability that the Florida Board of Medicine will discipline the medical doctor who has graduated from a foreign medical school?

2) Does graduation from a foreign medical school increase the probability that the medical doctor who has graduated from a foreign medical school will be subject to more severe types of discipline if disciplined by the Florida Board of Medicine?

3) Do graduates of medical schools where the classes are not conducted in the English language receive discipline more than the graduates of medical schools where classes are conducted in the English language?

4) Do graduates of medical schools where the classes are not conducted in the English language receive more severe types of discipline if disciplined by the Florida Board of Medicine than graduates of medical schools where classes are conducted in the English language?

5) Does graduation from a lower-ranked domestic medical school as ranked by *The Gourman Report* (8th edition) increase the probability that the Florida Board of Medicine will discipline the medical doctor who graduated from that particular school?

6) Does graduation from a lower-ranked domestic medical school as ranked by *The Gourman Report, 8th Edition* increase the probability that the medical doctor who has graduated from that particular school will receive more severe types of discipline if disciplined by the Florida Board of Medicine?

Delimitations and Limitations of the Study

This study was limited to the sub-population of medical doctors (allopathic physicians) who received their Florida licensure during the time frame of January 10, 1952, through February 8, 2008. Because of this 56-year time frame, the study included medical doctors that varied widely in age; thus age was not used as a control variable.

The innate differences as to intelligence, personality, attitude, and physical capabilities of individual medical doctors are variables that cannot be controlled because data regarding these variables are not available or are inaccessible due to reasons of confidentiality. Additionally, any individual medical doctor's practice setting or location, such as a solo, group, or hospital based practice, which may be located in a rural or urban area of the state, is not available in the data and therefore the effects of such cannot be determined. Also prohibited from use as study variables are confidential tests scores such as the United States Medical Licensing Examination (USMLE).

Definitions of Terms

The following definitions of terms are applicable to this study:

Allopathic medicine – medicine practiced by medical doctors that treat disease using remedies and therapies that cause effects opposite or different to the effects caused or produced by the disease.

COMPAS – Customer Oriented Medical Practitioner Administration System, which is the practitioner database for the FL DOH.

Discipline rate - the frequency or number of times that a medical doctor has incurred disciplinary action levied by the Florida Board of Medicine. Discipline rate as used in this study refers to whether a medical doctor has never been disciplined or has been disciplined only once or two or more times.

Discipline type – the method or means by which a medical doctor is disciplined including the following measures in increasing order of severity: the issuance of a citation, the issuance of a reprimand, the payment of a fine, enactment of a practice limitation or requiring an obligation such as obtaining additional education or training, required probation, license suspension, voluntary license surrender, or permanent license revocation. For the purpose of this study, type of discipline is synonymous with level or severity of discipline and is expressed as low severity discipline: citation, reprimand, fine, practice limitation or obligation, and probation; or high severity discipline if the recipient must stop practicing medicine: license suspension, voluntary license surrender in lieu of further disciplinary proceedings or license revocation.

Domestic medical school – any medical educational institution located within the United States, Puerto Rico, or Canada that awards the academic degree of Doctor of Medicine, which permits the holder of such degree to be eligible for medical licensure by the State of Florida.

FL DOH – Florida Department of Health

Foreign medical school - any medical educational institution that awards the academic degree of Doctor of Medicine or the foreign equivalent that is located outside of the United States, Puerto Rico, or Canada, and which permits the holder of such degree to be eligible for medical licensure, with or without additional training, by the State of Florida.

IMED – The International Medical Education Directory that is available online at http://imed.ecfmg.org and provides descriptive listings of medical schools located worldwide as confirmed by the Foundation for Advancement of International Medical Education and Research (FAIMER).

Medical doctor – a person possessing the academic degree of Doctor of Medicine or the foreign equivalent and licensed by the State of Florida to practice allopathic medicine within the State of Florida; synonymous with physician or practitioner for the purposes of this study.

Medical malpractice – any event involving error in diagnosis, error during a surgical procedure, or error in medication prescribing or administering, or another violation of the minimum standard as set for practitioners for which a medical doctor may receive disciplinary action from the State of Florida Board of Medicine; includes adverse medical events caused by either omission or commission.

Residency training – a period (up to seven-years) of formal, properly accredited, graduate medical education in a medical specialty recognized by the Florida Board of Medicine.

Specialty Board Certification – the certification of a physician by the American Board of Medical Specialties (ABMS) in any of 24 medical specialties.

Study Significance and Uniqueness

This study investigates a timely and important topic: the competence of medical doctors. Whereas most previous studies of this topic have used the results of civil lawsuits or malpractice insurance settlements as the dependent variables, this study is one of only few where disciplinary actions rendered against medical doctors by a state board of medicine are used as the dependent variables for a more accurate indication of substandard medical practice; since it is believed that settlements awarded to patients in a court of law may not be an indication that any medical malpractice has occurred (Charles, Gibbons, Frisch, Pyskoty, Hedeker, & Signha, 1992).

Also novel to this study is that the Florida Board of Medicine disciplinary actions are measured in two dimensions: number of times disciplined and the severity of discipline. Finally, another unique component of this study is the analysis of whether graduates of medical schools where classes are not conducted in the English language fare better or worse regarding imposition of medical board disciplinary action when compared to graduates of medical schools where instruction is given in English, since there is some indication that lack of fluency in English may affect the ability of medical school graduates to successfully pass an examination of clinical skills (Ben-David, Klass, Boulet, De Champlain, King, & Pohl, 1999).

Medical doctors are a very well respected component of society because they have the responsibility to enhance our health and prolong our lives. This study should help to determine which medical doctors are most capable of supporting our health and well-being based on their medical education background. Such information should provide guidance to policy-makers and regulatory agencies to enact appropriate measures to safeguard all patients.

CHAPTER TWO: LITERATURE REVIEW

The quality of healthcare in the United States is a persistent concern for both consumers and policy-makers (Brennan, Horwitz, Duffy, Cassel, Goode, & Lipner, 2004). It is believed that between 44,000 and 98,000 persons die each year due to preventable iatrogenic injury (Kohn et al., 1999). This estimated amount of medical error is thought by some researchers to be lower than the amount of error that is actually occurring (Ziv et al., 2000). The reasons for medical errors are explored below.

The Theory of Human Error

Much of the theory of human error has been developed through the study of pilot error in the aviation industry. Allnut (1982) defines five steps wherein incoming information is processed as a person arrives at a course of action: (1) sensation is where a signal of some sort must be registered by one of the human senses such as vision, hearing, etc.; (2) perception occurs when the receiving sense or senses convey the message to the brain and the meaning is perceived; (3) attention involves the message passing through a long-term memory influenced decision channel that only permits the processing of single pieces of information at a time while other pieces are waiting in short-term memory storage to pass through the decision channel; (4) a cognitive decision is then made, which may result in, (5) action, which may be incorrect action.

This decision-making sequence can take place in less than a second and errors can occur at any of the steps (Allnut, 1982). Reason's (1997) model of error causation can be directly applied to medical error in that complex systems such as medical care facilities often have several layers of defense that exist to prevent error. However, these layers each have constantly moving holes of opportunity for errors that may briefly align to allow an error to pass through the openings in all of the layers in one shot, just like an arrow. It is also argued that the procedures and technology developed in medicine were not designed with full consideration of human limitations (Bates & Gawande, 2000).

Causes of Medical Errors

Medical errors occur due to different causes. Between 5% and 15% of physicians practice medicine incompetently due to inadequate medical skills, impairment caused by the use of drugs or alcohol, or deficiencies resulting from mental illness (Bodenheimer & Grumbach, 2002). Also, medical doctors who have documented negative behavioral episodes during their years at medical school, such as unreliable and irresponsible behavior, and the absence of adaptability, motivation, and initiative, are more likely than other medical doctors to receive sanctioning from state medical boards (Papadakis et al., 2004; Teherani, Hodgson, Banach, & Papadakis, 2005). Additionally, low scores on the Medical College Admission Test (MCAT) and on the United States Medical Licensing Examination (USMLE Step 1), as well as poor grades during the first and second years at medical school, have been associated with later errors and therefore sanctioning from state medical boards (Papadakis, Teherani, Banach, Knettler, Rattner, & Stern 2005).

In addition to these reasons for medical errors by medical doctors based on individual deficiencies, other reasons for medical errors not related to individual proclivities or deficits appear to exist. For instance, male medical doctors, non-white medical doctors, graduates of foreign medical schools, and medical doctors without specialty board certification have a greater risk for experiencing disciplinary action from state medical boards than female medical doctors, white medical doctors, board-certified medical doctors, and graduates of U.S. medical schools (Khaliq et al., 2005). However, Khaliq et al. also found that despite the indication via univariate analysis that foreign medical school graduates had a higher risk of facing disciplinary action, such a finding was not confirmed using multivariate analysis, and they could not explain the reason for the increased risk of discipline for physicians who are male, non-white, or not board-certified.

The Institute of Medicine's 1999 report (Kohn et al., 1999) proposed continuous quality improvement for the medical industry via a systems approach, which took precedence over the accountability that individual physicians have for medical error. The issue of physician skills, abilities, and fitness for practice has also been relegated to second place behind healthcare systems improvement due to the perception that only limited and unreliable approaches exist to measure individual physician quality (Brennan et al., 2004). Throughout the last half of the 20th century, physician quality was thought to be ensured through rigorous medical education and training and the requirement of physicians to pass seemingly stringent licensing examinations in order to gain admission to the practice of medicine (Bodenheimer & Grumbach, 2002). However, it is now known that marginal performers in medical school can successfully pass state licensure examinations to practice medicine (Noah, 2005).

Medical Error in the Context of the Practice of Medicine

Jain (2004) defines error as "a wrong action attributable to a bad judgment, ignorance or inattention" (p. S531). A three-fold classification of error types related to cognitive control modes has been developed and includes (1) skill-based lapses and slips during automated routines not requiring conscious attention, (2) rule-based mistakes caused by the application of an incorrect or misinterpreted rule, and (3) knowledge-based mistakes caused by lack of expertise (Reason, 1990).

According to the Institute of Medicine (Kohn et al., 1999), a medical error is a planned action that fails to be completed as desired, or it can also be utilization of an inappropriate method to achieve a goal. Furthermore, if injury to the patient occurs as a result of a medical error, the event is termed an adverse incident that can fall into one of three categories: (1) the patient receives treatment that has no value or purpose and which could actually be harmful, (2) the patient does not receive the necessary treatment, or (3) the patient's treatment has defects, errors, or is otherwise similarly deficient; this latter adverse incident being the popular definition of medical malpractice. Again, it can be emphasized that medical errors often result due to cumulative opportunities for error inherent in multifaceted and complicated medical systems (Darr, 2004).

The majority of medical errors are medication errors, such as administering the incorrect dosage, medicating the wrong patient, prescribing an inappropriate medication, or giving medication at the wrong time (Longest, Rakich, & Darr, 2000). Medical errors occur because physicians have to integrate complex technical skills and their own functional knowledge with human psychology in a setting where incomplete data and instant feedback must be quickly evaluated to render decisions regarding patient care (Wachter & Shojania, 2004).

Previous Empirical Studies Related to the Study Variables

Several empirical studies dating back to 1989 indicate predictive relationships between physicians with certain medical education background characteristics and either state medical board disciplinary action levied upon or medical malpractice claims taken against these physicians. These studies are grouped below according to the categories of variables that were studied.

Domestic Versus Foreign Medical School

Adamson, Baldwin, Sheehan, and Oppenberg (1997) examined the relationship between the background of surgeons (N = 427) and claims of malpractice against the surgeons and found that a higher rate of claims were made against surgeons that were not graduates of domestic medical schools. Kohatsu, Gould, Ross, and Fox (2004) conducted an unmatched, case-control study of physicians (N = 890) who were subject to discipline meted out by the California Medical Board and compared them with a randomly selected control group of physicians who had never been disciplined. They found that an elevated risk for disciplinary action was associated with physicians who were educated in a foreign medical school. Khaliq et al. (2005) analyzed 14,314 physicians licensed by Oklahoma and found that of the 396 physicians who had been disciplined by the state Medical Board, the risk of discipline increased if the physician was a graduate of a foreign medical school, although this result was not confirmed by multivariate analysis. Table 1 summarizes these studies that indicate foreign medical school graduates have a greater risk of receiving Medical Board discipline or having higher rates of malpractice claims.

Table 1. Empirical Literature Regarding Domestic Versus Foreign Medical Schools

Study	Sample size and description	Findings
Adamson et al. (1997)	N=427 California physicians	Surgeons who were not graduates of domestic medical schools had higher rates of malpractice claims than other surgeons.
Khaliq et al. (2005)	N=14,314 Oklahoma physicians	Foreign Medical School Graduates had a greater risk of being subject to disciplinary action from the Oklahoma Board of Medical Licensure, although this finding was not confirmed by multivariate analysis.
Kohatsu et al. (2004)	N=890 physicians disciplined by the Medical Board of California	Attendance at a foreign medical school was associated with a greater risk of incurring discipline from the California Medical Board.

Physician Fluency in English

Ben-David et al. (1999) found that graduates of foreign medical schools who have adequate fluency in English were more successful on clinical skills examinations than graduates of foreign medical schools who did not have adequate fluency in English. Table 2 summarizes this study, which indicates that graduates of foreign medical schools who have inadequate fluency in English are less successful on clinical skills examinations.

Table 2. Empirical Literature Regarding Physician Language

Study	Sample size and description	Findings
Ben-David et al. (1999)	n=33 foreign medical students n=151 U.S. medical students	Graduates of foreign medical schools who did not have adequate fluency in English were less successful on clinical skills examinations than graduates of foreign medical schools who did have adequate fluency in English.

Medical School Attended

Sloan, Mergenhagen, Burfield, Bovbjerg, and Hassan (1989) used multinomial logit analysis to study the Florida Medical Professional Liability Insurance Claims file (N = 5,934), which is a database of the insurance indemnities and other expenses paid on behalf of insured physicians. They found that physicians holding prestigious credentials, which they defined as those physicians that have graduated from the "top one third of U.S. medical schools as ranked by the 1977 Gourman Report" (p. 3292) did not have a more favorable (less) malpractice claims experience than other physicians.

Waters et al. (2003) studied the relationship between medical school attended and malpractice claims data from the states of Florida, Maryland, and Indiana (N = 30,288) and found that physicians who have graduated from a medical school whose graduates are frequently sued for malpractice also have a significantly increased chance of being sued. This study also found that medical schools whose graduates were more frequently sued were more often recently established (new) medical schools and were more likely to be public schools. On the other hand, medical schools with graduates less frequently sued appeared to have better mentor-to-student ratios according to the study. Table 3 summarizes these studies, which indicate that medical school attended has an impact on the malpractice claims made against the schools' graduates.

Table 3. Empirical Literature Regarding Medical School Attended

Study	Sample size and description	Findings
Sloan et al. (1989)	N=5,934 medical malpractice claims involving Florida physicians	Physicians who have prestigious credentials, defined as those graduated from the "top one-third of U.S. medical schools as ranked by the 1977 Gourman Report" did not have less malpractice claims experience than other physicians.
Waters et al. (2003)	N=30,288 Florida, Maryland, and Indiana physicians	Graduates of medical schools whose graduates are frequently sued have increased probability of themselves being sued.

Previous Empirical Studies Related to the Control Variables

Several empirical studies dating back to 1989 indicate predictive relationships between physicians with certain background characteristics or demographic qualities and either state medical board disciplinary action levied upon or medical malpractice claims taken against these physicians. These studies are grouped below according to the categories of control variables that were used in this study.

Specialty Board Certification

Adamson et al. (1997) examined the relationship between the background of surgeons (N = 427) and claims of malpractice against the surgeons and found that a higher rate of claims were made against surgeons that were not specialty board certified or members of professional societies. Kohatsu et al. (2004) conducted an unmatched, case-control study of physicians (N = 890) who were disciplined by the California Medical Board and compared them with a randomly selected control group of physicians who had never been disciplined. They found that elevated risk for disciplinary action was associated with lack of specialty board certification. Khaliq et al. (2005) analyzed 14,314 physicians licensed by Oklahoma and found that of the 396 physicians who were subject to state Medical Board discipline, the risk of discipline increased if the physician was not specialty board certified. Table 4 summarizes these studies, which indicate that lack of specialty board certification is associated with increased risk of receiving discipline or malpractice claims.

Table 4. Empirical Literature Regarding Specialty Board Certification

Study	Sample size and description	Findings
Adamson et al. (1997)	N=427 California physicians	Surgeons who were not specialty board certified had higher rates of malpractice claims than other surgeons.
Khaliq et al. (2005)	N=14,314 Oklahoma physicians	Physicians without specialty board certification were disciplined more by the Oklahoma Board of Medical Licensure than physicians with board certification.
Kohatsu et al. (2004)	N=890 physicians disciplined by the Medical Board of California	Lack of specialty board certification was associated with a greater risk of being disciplined by the California Medical Board.

Type of Specialty Practiced

Physicians in certain specialties, primarily those in surgical specialties such as orthopedic surgery, plastic surgery, and neurosurgery, face a greater risk of lawsuits than physicians in medical specialties such as dermatology, pediatrics, and internal medicine, with 2% to 8% of such physicians accounting for between 75% and 85% of lawsuit settlements and lawsuit awards (Sloan et al., 1989). Charles et al. (1992) drew a sample of physicians practicing in Oregon (N = 248) and found that surgeons had the highest risk for being named in claims involving medical malpractice.

Hickson, Federspiel, Pichert, Miller, Gauld-Jaeger, and Bost (2002) performed a retrospective longitudinal cohort study of both generalist and specialist physicians (N = 645) between January 1992 and March 1998 and found that patient complaints and risk management events were higher for surgeons than non-surgeons, and that patient complaints and risk management data were positively correlated with the physician's volume of clinical activity; i.e., greater exposure equals greater risk. Waters et al. (2003) studied malpractice claims data from the states of Florida, Maryland, and Indiana and found that physicians practicing the specialties of obstetrics, surgery, radiology, and emergency medicine were sued more often than physicians in other specialties.

Kohatsu et al. (2004) conducted an unmatched, case-control study of physicians (N = 890) who were disciplined by the California Medical Board and compared them with a randomly selected control group of physicians who had never been disciplined, and found that elevated risk for disciplinary action was associated with physicians practicing psychiatry, family practice, and obstetrics and gynecology when compared to the disciplinary rates of internal medicine specialists. Khaliq et al. (2005) analyzed 14,314 physicians licensed by Oklahoma and found that of the 396 physicians who had been disciplined by the state Medical Board, the risk of discipline increased if the physician was practicing in the areas of family medicine, psychiatry, general practice, obstetrics-gynecology, and emergency medicine.

Therefore it is inferred from the studies mentioned above that medical doctors practicing the following specialties all have increased risk of being sued or disciplined: (1) medical doctors who perform bodily invasive procedures (surgeons), (2) medical doctors who diagnose or treat complex, personal disease processes that affect distinct patient populations (obstetricians, gynecologists, and psychiatrists), and (3) medical doctors who provide primary or initial diagnostics services, whether emergent or not (family practitioners, radiologists, and emergency medicine specialists). Based on the premise that medical doctors practicing certain specialties have increased risk, this study will use different medical specialties as control variables and each medical doctor will be categorized into one of four groups based on specialty practiced as follows: (1) surgeons or other medical doctors who in their practice regularly perform bodily invasive procedures; (2) obstetricians, gynecologists, and psychiatrists who as medical doctors that treat selected populations (i.e., females or psychiatric disorders); (3) medical doctors who specialize in primary care, diagnostic services (except pathologists), or initial referring and emergent treating medical doctors, this category being primarily limited to family practitioners, radiologists, and emergency medicine specialists; and (4) all other medical doctors who practice a specialty other than one that can be included into one of the first three categories. These studies showing that physicians practicing the specialties of surgery, family medicine, emergency medicine, psychiatry, radiology, obstetrics and gynecology all had a greater risk for medical malpractice claims, medical board discipline, patient complaints or risk management events are summarized in Table 5.

Table 5. Empirical Literature Regarding Medical Specialties and Malpractice Claims

Study	Sample size and description	Findings
Charles et al. (1992)	N=248 Oregon physicians	Physicians in surgical specialties was the strongest predictor of risk for malpractice claims out of nine physician characteristics.
Hickson et al. (2002)	N=645 general and specialist physicians	Patient complaints and risk management events were higher for surgeons than non-surgeons.
Khaliq et al. (2005)	N=14,314 Oklahoma physicians	Physicians practicing general medicine and the specialties of family medicine, psychiatry, obstetrics and gynecology, and emergency medicine were at greater risk for medical board discipline.
Kohatsu et al. (2004)	N=890 physicians disciplined by the Medical Board of California	Physicians practicing the specialties of psychiatry, family practice, and obstetrics and gynecology had greater risk of incurring disciplinary action.
Sloan et al. (1989)	N=5,934 medical malpractice claims involving Florida physicians	Malpractice claims more frequently involved physicians in surgical specialties than those in medical specialties.
Waters et al. (2003)	N=30,288 Florida, Maryland, and Indiana physicians	Obstetricians/Gynecologists, surgeons, radiologists, and emergency medicine specialists were sued for malpractice more than physicians in all other specialties.

Gender of Physician

It was found by Kohatsu et al. (2004) that an elevated risk for disciplinary action was associated with male physicians. Khaliq et al. (2005) also found that the risk of discipline increased if the physician was male. Table 6 summarizes these two studies, which both indicate that male physicians have a greater risk of receiving discipline.

Table 6. Empirical Literature Regarding Gender

Study	Sample size and description	Findings
Khaliq et al. (2005)	N=14,314 Oklahoma physicians	Male physicians had a greater risk of being disciplined by the Oklahoma Board of Medical Licensure.
Kohatsu et al. (2004)	N=890 physicians disciplined by the Medical Board of California	Male physicians had a greater risk of being disciplined by the California Medical Board.

Race of Physician

Khaliq et al. (2005) analyzed 14,314 physicians licensed by Oklahoma and found that of the 396 physicians who had been disciplined by the state Medical Board, the risk of discipline increased if the physician was not white. Table 7 summarizes this study, which indicates that non-white physicians face increased risk of discipline.

Table 7. Empirical Literature Regarding Race

Study	Sample size and description	Findings
Khaliq et al. (2005)	N=14,314 Oklahoma physicians	Non-white physicians had a greater risk of being disciplined by the Oklahoma Board of Medical Licensure than white physicians.

Studies Calling for Further Research

Teherani et al. (2005) found that the documented problematic behavior in medical school that portended future California Medical Board disciplinary action for the physicians studied consisted of three domains of unprofessional behavior: (1) lack of responsibility and reliability; (2) poor adaptability and non-existent self-improvement skills; and (3) lack of motivation and initiative. Similarly, Papadakis et al. (2005) compared graduates (n = 235) of three medical schools who were subject to disciplinary actions against them by one of 40 state medical boards after becoming practicing physicians, with a control group of physicians (n = 469) who had graduated at the same time from the same three medical schools. They found that disciplinary action taken against physicians by medical boards was strongly associated with unprofessional behavior by those physicians in medical school, and the strongest predictor of future medical board disciplinary action was the display of severe irresponsibility and an extremely diminished capacity for self-improvement by students.

Charles et al. (1992) also found that physicians (N = 248) considered being at high-risk for malpractice claims included older physicians (those having been in practice for greater than 15 years). Kohatsu et al. (2004) conducted an unmatched, case-control study of physicians

(N = 890) in California and found that increased risk for disciplinary action was associated with increasing age of the physician.

Leape and Fromson (2006) expressed the need for further studies regarding the characteristics that predict physician success in medical practice by stating:

> Performance failures of one type or another are not uncommon among physicians, posing substantial threats to patient welfare and safety.… It is time for a national effort to develop better methods for assessing performance and better programs for helping those who are deficient. (p. 114)

Writing upon the same theme, McManus (2003) believes that the factors responsible for variation in the professional competence of physicians warrant further study.

Waters et al. (2003) call for analysis of medical school curricula as a possible variable that has impact on whether a physician later gets accused of malpractice. Kohatsu et al. (2004) also believe that additional research is warranted regarding the association of physician discipline with certain specialties, gender, age, location of medical school attended, and lack of board certification, such that “a systematic approach to the early identification and remediation of physician deficiencies might be developed to enhance patient safety” (p. 657).

Hypotheses

This study explored the following hypotheses:

1) The graduates of foreign medical schools have higher rates of discipline than the graduates of domestic medical schools.

2) The graduates of foreign medical schools have more severe types of discipline than the graduates of domestic medical schools.

3) The graduates of medical schools where the instruction is not in the English language will have higher disciplinary rates than graduates of medical schools where the instruction is in the English language.

4) The graduates of medical schools where the instruction is not in the English language will have more severe types of discipline than graduates of medical schools where the instruction is in the English language.

5) The graduates of lower ranked domestic medical schools (based on *The Gourman Report, 8th Edition* rankings) have correspondingly higher rates of discipline and graduates of higher ranked medical schools have correspondingly lower rates of discipline.

6) The graduates of lower ranked domestic medical schools (based on *The Gourman Report, 8th Edition* rankings) have correspondingly more severe types of discipline and graduates of higher ranked medical schools have correspondingly less severe types of discipline.

Summary

The results of this research should elucidate factors that affect medical doctor performance. The amount of empirical research on this subject is limited because research on this topic has been preempted by systems approach studies, such as the Institute of Medicine's 1999 landmark study (Kohn et al., 1999), and the results of such studies have caused emphasis on efforts to improve the overall quality of healthcare delivery systems. Therefore, variability in individual medical doctor preparedness should be scrutinized as to how these factors affect the frequency of medical doctor disciplinary action.

As a result of this study, a review could be undertaken by the Florida Board of Medicine to evaluate the need for physician licensure requirements that would cause further scrutiny of educational qualifications or possibly limit entry into the practice of medicine in Florida for medical doctors identified as possessing identified risk factors that could predispose them to practice substandard medicine. Any measures that would further scrutinize physicians that desire to become licensed to practice in the State of Florida could cause a reduction in the occurrence of medical doctors being disciplined. Additionally, the results of this research may enable the Florida Board of Medicine to propose legislation that allows increased peer monitoring of medical doctors that have received disciplinary action.

CHAPTER THREE: METHODOLOGY

Overview

This study sought to explore the influence of the following variables on the disciplinary histories of licensed medical doctors (allopathic physicians) that practice in the State of Florida: foreign medical school attendance; medical school language of instruction; and Gourman ranking of domestic medical schools. The control variables used in this study are (1) specialty board certification or not; (2) category of specialty practiced by sorting the medical doctors into one of the following four categories: (a) surgeons or other medical doctors that regularly perform bodily invasive procedures; (b) obstetricians, gynecologists, and psychiatrists; (c) family practitioners, radiologists, and emergency medicine specialists; or (d) medical doctors that practice a specialty other than one that can be included into one of the first three categories; (3) gender; and (4) race.

The hypotheses were tested using multinomial logistic regression analysis. The unit of analysis is the individual medical doctor licensed in Florida. The two study samples include: (1) medical doctors that attended either domestic or foreign medical schools (N = 39,559), and (2) medical doctors that attended domestic medical schools (n = 25,479). The second sample is a subset of the first sample. The medical doctors in both study samples hold active, delinquent, relinquished (either voluntarily or involuntarily) or revoked Florida medical licenses and received their Florida licensure during the time period of January 10, 1952, through February 8, 2008.

The dependent variables in this study are the number of individual medical doctors who have never been subject to disciplinary action from the Florida Board of medicine or have been disciplined once or two or more times, and, if disciplined, the severity of the discipline that was imposed. Logistic regression analyses were used to test the relationships between the dependent variables and the independent variables of domestic or foreign medical school and medical school language of instruction; and between the dependent variables and the independent variable of Gourman ranking of domestic medical school.

Multinomial logistic regression is the most appropriate analytical technique for this study because the dependent variables are multinomial and categorical, and the model can be expressed as the probability of an outcome (Babbie, 2004; Wan, 2002). According to Garson (2008), logistic regression analysis allows for the following:

1. Prediction of a dependent variable on the basis of independent variables;
2. Determination of the percent of variance in the dependent variable explained by the independent variables;
3. Ranking of the relative importance of independent variables;
4. Assessment of the interaction (moderator) effects between the variables; and
5. Understanding the impact of covariate control variables.

Florida Medical Doctor Population

According to the most recent Florida Department of Health, Division of Medical Quality Assurance (FL DOH-MQA) *July 1, 2006-June 30, 2007 Annual Report*, 55,961 allopathic physicians held licensure as medical doctors in the State of Florida, and their individual license numbers are indexed in the COMPAS database maintained by the Florida Department of Health (DOH). The population of medical doctors licensed in Florida is subject to fluctuation as individual medical doctors enter or leave the state, retire or otherwise terminate their practice of medicine, and receive initial licensure to practice. Therefore, the study sample of 39,559 medical doctors (and the subset of 25,479 medical doctors) with in-state, active, delinquent, relinquished, or revoked Florida medical licenses as of February 8, 2008, will not be the same population as shown in the FL DOH-MQA *July 1, 2006-June 30, 2007 Annual Report*. Table 8 summarizes this population of medical doctors licensed in Florida as of June 30, 2007.

Table 8. Number of Florida Licensed Medical Doctors

Florida medical license type	Number of medical doctors
In-state active: the medical doctor has a Florida address and can practice medicine within Florida	40,065
In-state inactive: the medical doctor has a Florida address and cannot practice due to self inactivation of the license	190
In-state delinquent active: the medical doctor has a Florida address and cannot practice due to failure to renew the license	674
In-state delinquent inactive: the medical doctor has a Florida address and cannot practice due to failure to renew and self inactivation of the license	105
Out-of-state active: the medical doctor has an address outside of Florida and can practice medicine within Florida	11,968
Out-of-state inactive: the medical doctor has an address outside of Florida and cannot practice due to self inactivation of the license	941
Out-of-state delinquent: the medical doctor has an address outside of Florida and cannot practice due to failure to renew the license	1,285
Retired: the medical doctor maintains a retired license status and cannot practice in Florida	733
Total	55,961

Source: DOH-MQA 2006–2007 Annual Report

The DOH-MQA *July 1, 2005-June 30, 2006 Annual Report* , *July 1, 2006-June 30, 2007 Annual Report and July 1, 2007-June 30, 2008 Annual Report* also include data regarding discipline meted out by the Florida Board of Medicine to Florida medical doctors during each fiscal year. Just as with the overall population of medical doctors, the number of medical doctors who are disciplined will also fluctuate from year to year. Table 9 displays these data in ascending order from the least severe (citation) to the most severe (revocation) type of discipline.

Table 9. Discipline Received by Florida Medical Doctors, July 1, 2005–June 30, 2008

Discipline type	Fiscal Year 2005-2006 Number and percentage of medical doctors disciplined		Fiscal Year 2006-2007 Number and percentage of medical doctors disciplined		Fiscal Year 2007-2008 Number and percentage of medical doctors disciplined	
Citation	472	(47.6%)	273	(32.5%)	305	(36.3%)
Reprimand	41	(4.1%)	46	(5.4%)	51	(6.1%)
Fine	185	(18.7%)	207	(24.7%)	200	(23.8%)
Limitation or obligation	190	(19.2%)	196	(23.7%)	164	(19.5%)
Probation	14	(1.4%)	29	(3.4%)	29	(3.4%)
Suspension	37	(3.7%)	33	(3.9%)	28	(3.3%)
Voluntary surrender	35	(3.5%)	38	(4.5%)	44	(5.2%)
Revocation	17	(1.7%)	16	(1.9%)	20	(2.4%)
Total	991	(99.9%)	838	(100.0%)	841	(100.0%)

Source: DOH-MQA 2005–2006, 2006–2007, 2007–2008 Annual Reports

This study includes medical doctors with active, delinquent, relinquished (either voluntarily or involuntarily), or revoked Florida medical licenses who report licensure addresses within the State of Florida. Therefore, it is presupposed that the study samples are comprised of medical doctors who are practicing or have recently practiced within the State of Florida.

In summary, this study includes medical doctors with addresses of record in the State of Florida who have In-State Active or In-State Delinquent Active licenses, or who voluntarily or involuntarily relinquished their licenses or had their licenses revoked by the Florida Board of Medicine. The time period during which these medical doctors received initial licensure from the State of Florida is from January 10, 1952, through February 8, 2008.

The medical doctors studied are shown in Table 10 grouped into the following four practice categories:

(1) Florida licensed medical doctors who in the practice of medicine regularly perform bodily invasive procedures, including surgeons certified or not certified by the American Board of Medical Specialties (ABMS);

(2) Florida licensed medical doctors who in the practice of medicine treat selected populations (i.e., females and persons with psychiatric or neurological disorders), including obstetricians, gynecologists, neurologists, and psychiatrists who may or may not be certified by the ABMS in one of these specialties;

(3) Florida licensed medical doctors who in the practice of medicine specialize in primary care or diagnostic services (except pathologists) or who are initial referring and emergent treating medical doctors. This category includes family practitioners, radiologists (except radiation oncologists), and emergency medicine specialists who may or may not be certified by the ABMS in one of these specialties;

(4) All other Florida licensed medical doctors who practice a specialty other than one that can be included into one of the first three categories and who may or may not be ABMS certified in any ABMS specialty. Table 10 shows the ABMS specialty and subspecialty titles within the specialty practice categories.

Table 10. Specialty Practice Categories with ABMS Specialty and Subspecialty Titles

Specialty practice category	ABMS specialty titles	ABMS subspecialty titles
(1) Florida licensed medical doctors that in the practice of medicine perform bodily invasive procedures	Colon and rectal surgery Neurological surgery Orthopedic surgery Plastic surgery Surgery Thoracic surgery Vascular surgery	Pediatric Surgery Plastic Surgery of the Head & Neck Surgery of the Hand Surgical Critical Care
(2) Florida licensed medical doctors that in the practice of medicine treat selected populations including obstetricians, gynecologists, and psychiatrists	Obstetrics Gynecology Psychiatry	Addiction psychiatry Child & adolescent psychiatry Gynecologic Oncology Maternal & Fetal Medicine Psychosomatic Medicine Reproductive Endocrinology
(3) Florida licensed medical doctors that in the practice of medicine specialize in primary care, diagnostic services (excluding pathologists) or are initial referring and emergent treating medical doctors	Emergency medicine Family medicine Diagnostic radiology Nuclear radiology Pediatric radiology Radiation oncology Vascular and interventional radiology	Adolescent Medicine Geriatric medicine Medical Toxicology Neuroradiology Pediatric Emergency Medicine Sports Medicine Undersea & Hyperbaric Medicine
(4) Florida licensed medical doctors that practice a specialty other than one that can be included into one of the first three categories. Includes medical doctors that did not list or specify a practice area. Also included are medical doctors that listed themselves as being in their transitional year (internship) before beginning residency in a specialty that requires the one-year transitional period	Aerospace Medicine Allergy & immunology Anesthesiology Dermatology Internal medicine Medical genetics Neonatology Neurology Nuclear medicine Occupational Medicine Ophthalmology Otorhinolaryngology Pathology Pediatrics Physical medicine & Rehabilitation Public Health & Preventative medicine Urology	Cardiovascular Disease Clinical Cardiac Electrophysiology Clinical Dermatology Critical Care Medicine Dermatological Immunology Dermatopathology Forensic Pathology Gastroenterology Hematology Hospice and Palliative Medicine Infectious Diseases Laboratory Dermatology Medical Toxicology Nephrology Neuromuscular Medicine Pain Medicine Pediatric Dermatology Pediatric Otolaryngology Pediatric Urology Rheumatology Sleep Medicine Transplant Hepatology

Sources: American Board of Medical Specialties, 2007; Florida Department of Health, 2007

Sources of the Data

All raw, archival data were obtained electronically and purchased for $430.20 as a Microsoft Excel file from the Florida Department of Health, Medical Quality Assurance, Strategic Planning Services Unit in Tallahassee, Florida, during February 2008. The archival data were derived in part from the online practitioner profiles of Florida licensed medical doctors, which is found at the following website: www.FLHealthSource.com.

From the practitioner profiles, the data compiled on each medical doctor included (1) name of medical school attended (from which it can be determined whether the school is domestic or foreign), and (2) if the medical doctor has specialty certification or not and the specialty practiced. If the medical doctor attended a domestic medical school, the school's ranking per *The Gourman Report, 8th Edition* was obtained, and if the medical doctor attended a foreign medical school, the IMED was consulted to obtain the medical school's language of instruction. All instruction was assumed to be conducted in English in domestic medical schools.

The Strategic Planning Services Unit also derived the archival data from the medical doctors' original applications for Florida licensure, which was accessed via the internal DOH Electronic Imaging System (EIS), and each individual medical doctor's gender and race was obtained. Any reference to any individual medical doctor's name was redacted upon transfer to SPSS to ensure the reporting of anonymous, aggregated data. Each medical doctor's Florida medical license disciplinary history (i.e., number of times disciplined and the type of discipline imposed) was obtained by the Strategic Planning Services Unit from the internal DOH Customer Oriented Medical Practitioner Administration System (COMPAS) database.

Data Request and Data Cleaning

The Strategic Planning Services Unit was asked to provide data for all Florida licensed medical doctors that hold In-State Active, In-State Delinquent Active, relinquished (either voluntarily or involuntarily), or revoked Florida medical licenses, regardless of date of original licensure. The raw data were cleaned by the elimination of duplicate entries for individual medical doctors, resulting in the data containing the requested information for 39,632 medical doctors. Further cleaning of the data eliminated 73 medical doctors with missing, unusable, or incomplete data, which resulted in the study sample of 39,559 medical doctors and the subset sample of 25,479 medical doctors that attended Gourman ranked, domestic medical schools.

Data Ranking and Data Coding

Table 11 shows the operational definitions for all dependent, independent, and control variables used in this study. As summarized in Table 11, the dependent variables are coded as follows:

(1) If the medical doctor has never been disciplined, the code 0 is used. Disciplinary action is coded as 1 for medical doctors who have been disciplined once and 2 for those who have been disciplined two or more times.

(2) If the medical doctor has never been disciplined, the code 0 is used. If a medical doctor was subject to any discipline (for multiple instances of discipline, the most severe type of discipline was selected for use in this study), the discipline that was imposed is coded as 1 for all lesser types of discipline (the issuance of a citation or a reprimand, the payment of a fine, the enactment of a practice limitation or the requirement of an obligation such as obtaining

additional education or training or being placed on probation) and coded as 2 for severe types of discipline (suspension of the medical license, voluntary surrender of the medical license in lieu of having disciplinary action imposed or enduring permanent revocation of the medical license).

Also as shown in Table 11, the independent variables are ranked or coded in the following manner:

(1) All medical schools are coded as follows:

Domestic medical schools are coded as 0;

Foreign medical schools are coded as 1.

(2) Language of instruction in medical school is coded as follows:

Instruction not in English is coded as 0;

Instruction in English is coded as 1.

(3) Domestic medical schools are coded based on the Gourman scores published in *The Gourman Report, 8th Edition* as follows:

Gourman scores 3.03 to 3.99 are coded as 0;

Gourman scores 4.00 to 4.93 are coded as 1.

Finally, as shown in Table 11, the control variables are coded as follows:

(1) Medical doctors without ABMS certification are coded as 0;

Medical doctors with ABMS certification are coded as 1.

(2) Surgeons or other medical doctors who in their practice of medicine regularly perform bodily invasive procedures are coded as 1 and all other medical doctors who practice other specialties are coded as 0.

(3) Obstetricians, gynecologists, and psychiatrists are coded as 1 and all other medical doctors who practice other specialties are coded as 0.

(4) Family practitioners, diagnostic radiologists, and emergency medicine specialists are coded as 1 and all other medical doctors who practice other specialties are coded as 0.

(5) The medical doctor’s gender is coded as 0 for female and 1 for male.

(6) The medical doctor’s race is coded as 0 for non-white and 1 for white.

Table 11. Operational Definitions of the Variables and Sources of Data

Variable	Operational definition	Source of data
Dependent		
Discipline rate	Never disciplined = 0 Disciplined once = 1 Disciplined two or more times = 2	FL DOH archival data: COMPAS
Discipline type	Never disciplined = 0 Citation, reprimand, fine, limitation, obligation or probation = 1 Suspension, voluntary license surrender or license revocation = 2	FL DOH archival data: COMPAS
Independent		
Domestic or foreign medical school	Domestic = 0 Foreign = 1	FL DOH archival data: physician profile, IMED
Medical school language of instruction	Non-English = 0 English =1	IMED
Gourman ranking of domestic medical school	Gourman score 3.03 to 3.99 = 0 Gourman score 4.00 to 4.93 = 1	FL DOH archival data: physician profile, and the Gourman Report, 8th edition (2007)
Control		
Not specialty certified or specialty certified	Not specialty certified = 0 Specialty certified = 1	FL DOH archival data: physician profile
Surgical specialty practice	Non-surgical practice = 0 Surgical specialties= 1	FL DOH archival data: physician profile
OB-GYN or psychiatric practice	All specialties other than OB-GYN and psychiatry =0 Obstetricians, gynecologists, and psychiatrists=1	FL DOH archival data: physician profile
Family practice, diagnostic radiology, or emergency medicine practice	All specialties other than family practice, diagnostic radiology, or emergency medicine = 0 Family practitioners, diagnostic radiologists, and emergency medicine specialists = 1	FL DOH archival data: physician profile
Gender	Female = 0 Male = 1	FL DOH archival data: licensure imaging system
Race	Non-white =0 White =1	FL DOH archival data: licensure imaging system

Figure 2 shows the conceptual model of relationships among the study variables. According to this conceptual model, medical doctors are the product of their respective backgrounds with a multitude of factors that affect their competency as a medical doctor. Probably more important than most other background factors is a medical doctor's medical education (the independent variables). This study hypothesizes that the quality of the medical doctors' educational background ultimately contributes to their propensity to make mistakes in their medical practice, which often results in their being disciplined by their peers (the dependent variables). Additionally, certain other factors (the control variables) whether demographic or whether the result of self-selection, such as specialty practiced, also contribute to the quality of the medical doctor's performance while practicing medicine.

Figure 2 encompasses the physician decision making sequence depicted in Figure 1 by showing how different components of a physician's background can converge to influence medical competence. The entire decision making process detailed in Figure 1, from the initial stimuli to the ultimate response made by the physician, manifests with either a correct or incorrect response from the physician with incorrect responses resulting in the potential for disciplinary action. Therefore, according to Figure 2, a physician is confronted with an event requiring a decision. The physician then draws upon components of their background (independent variables) and other personal factors (control variables) to render a decision that can be a correct or incorrect decision with incorrect decisions increasing the risk that the physician will receive discipline.

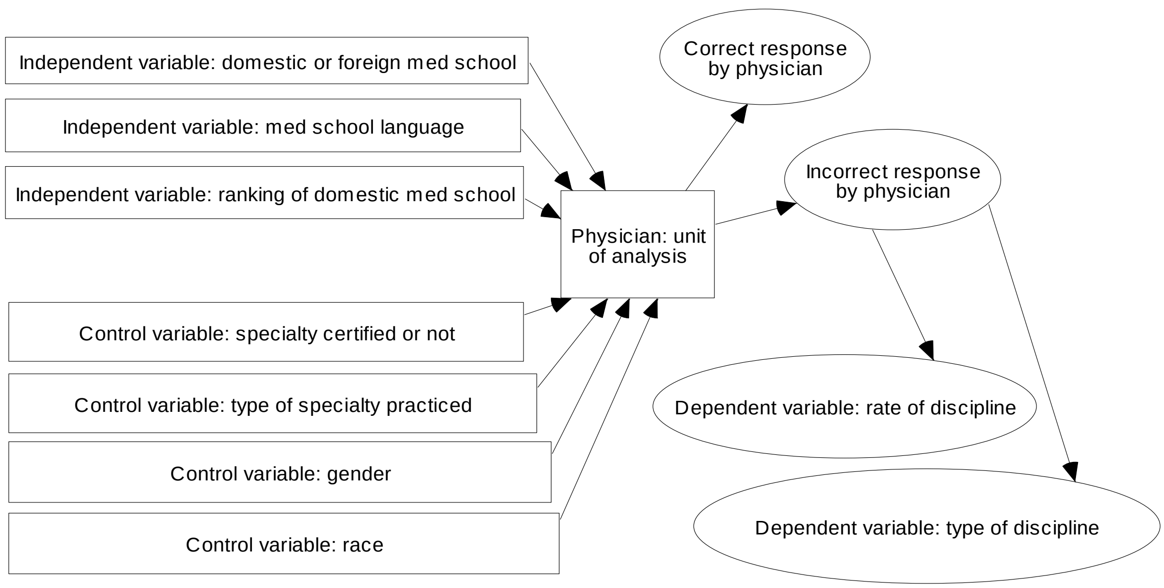

Figure 2. Conceptual Model of Relationships Among Variables

Specific Statistical Procedures

All statistical computations were made using SPSS Graduate Pack 16.0 (SPSS, Inc., 2007). The desired method to test the hypotheses is multinomial logistic regression, which is a statistical method that does not assume homoscedasticity and does not require a linear relationship between independent and dependent variables, but that can indicate the predictive relationship between independent and dependent variables (Garson, 2008).

Additionally, logistic regression analysis does not require a normal distribution of the data and is an ideal method to test whether specific, individual medical doctor characteristics such as graduation from a domestic or foreign medical school, the language of instruction at the medical school attended or the Gourman ranking of the domestic medical school that was attended, have any connection with being disciplined by the Florida Board of Medicine. Therefore, multinomial logistic regression analysis was used to establish the relative predictive importance of the independent variables—domestic or foreign medical school, medical school language of instruction and Gourman ranking of domestic medical school—in regard to incurring discipline from the Florida Board of Medicine.

The following steps were taken to test the hypotheses via SPSS statistical software. The basic logistic regression analysis equation used to test the hypotheses involving the independent variables of domestic or foreign medical school and medical school language of instruction is:

$$\text{logit}(p) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

where:

p = discipline rate or discipline type (response variables)

α = the constant of the equation

β_1 = coefficient of the first predictor variable of domestic or foreign medical school

β_2 = coefficient of the second predictor variable of medical school language of instruction

β_3 = coefficient of the control variables (specialty certified or not; specialty; gender; race)

X_1 = value of domestic or foreign medical school

X_2 = value of medical school language of instruction

X_3 = value of control variables

e = random error.

The basic logistic regression analysis equation used to test the hypotheses involving the independent variable of Gourman ranking of medical school is:

$\text{logit}(p) = \alpha + \beta_1 X_1 + \beta_2 X_2 + e$

where:

p = discipline rate or discipline type (response variables)

α = the constant of the equation

β_1 = coefficient of the predictor variable of Gourman ranking of medical school

β_2 = coefficient of the control variables (specialty certified or not; specialty; gender; race)

X_1 = value of Gourman ranking of medical school

X_2 = value of control variables

e = random error.

As the probability of a Type I error goes up, the probability of a Type II error goes down, and vice versa, and therefore when the probability of a Type I error is lowered, for instance to .01, the probability of a Type II error is increased. Type I errors are considered more serious than Type II errors. In consideration of the foregoing, for this study the *p*-value was set at $\alpha = 0.05$ and therefore *p*-values that are less than 0.05 will indicate a statistically significant correlation and predictive relationship between the variables. A 95% confidence interval was used for all point estimates of regression relationships.

Logistic regression yields a parameter estimate (the β coefficient) that is used to produce the odds ratio of the dependent variable. Therefore, the probability of amount or type of discipline (independent variables) in response to the predictor variables can be estimated.

Summary

This study used multinomial logistic regression analysis to explain but not predict the relationship between different aspects of a medical doctor's medical education and disciplinary history. The analyses included 39,559 medical doctors that attended foreign and domestic medical schools (sample 1) and a subset sample of 25,479 medical doctors that attended domestic medical schools (sample 2). All medical doctors studied have either In-State Active or In-State Delinquent Active licenses or voluntarily or involuntarily relinquished their licenses or had their licenses revoked by the Florida Board of Medicine. The time period during which these medical doctors received initial licensure from the State of Florida is from January 10, 1952, through February 8, 2008.

Archival data were used for this study. Anonymity of any individual medical doctor was assured by the redaction of names. Statistical power and therefore inference was maximized by analyzing very large samples ($N = 39,559$ and $n = 25,479$). The analyses were performed using SPSS software.

CHAPTER FOUR: RESULTS

Descriptive Data

Dependent Variables

As shown in Table 12, the descriptive statistics for the two dependent variables (discipline rate and discipline type) in sample 1 are coincidentally the same, explained in part because the 37,738 medical doctors that have never received any disciplinary actions (discipline rate) would therefore have never received any form of discipline (discipline type). Furthermore, the 1,538 medical doctors in sample 1 that have been disciplined at a rate of only once, all received a lesser type of discipline (citation, reprimand, fine, limitation, obligation or probation). Finally, the 283 medical doctors that have been disciplined two or more times, were also the same 283 medical doctors that received more severe types of discipline (suspension, voluntary license surrender or license revocation). This descriptive data supports the presumption that the Florida Board of Medicine invokes discipline that increases in severity for the medical doctors that appear before them more than once.

It was noted that only 1,821 medical doctors or 4.6% of the 39,559 medical doctors in sample 1 have been subject to disciplinary action. Table 12 shows the descriptive statistics for the independent variables of discipline rate and discipline type for both sample 1 and sample 2.

Table 12. Descriptive Statistics for the Dependent Variables in Samples 1 and 2

Dependent variable	Number of medical doctors in sample 1 and percentage of total	Number of medical doctors in sample 2 and percentage of total
Discipline rate		
Never	37,738 (95.4%)	24,331 (95.5%)
One time	1,538 (3.9%)	982 (3.9%)
Two or more times	283 (0.7%)	166 (0.7%)
Total	39,559 (100%)	25,479 (100.1%)
Discipline type		
None	37,738 (95.4%)	24,331 (95.5%)
Citation; reprimand; fine; limitation; obligation; probation	1,538 (3.9%)	990 (3.9%)
Suspension; voluntary license surrender; license revocation	283 (0.7%)	158 (0.6%)
Total	39,559 (100%)	25,479 (100%)

Independent Variables

Table 13 shows the totals and percentages of the two samples in regard to the independent variables. As can be see in Table 13, graduates of domestic medical schools are the majority of medical doctors practicing in the State of Florida; however the graduates of foreign medical schools make up more than one-third of practicing medical doctors, which is a higher percentage than for the United States as a whole, where graduates of foreign medical schools constitute approximately 25% of the total physician workforce (Whelan et al., 2002).

The domestic medical schools include 131 different institutions (see Appendix), which are grouped in Table 13 by Gourman score per *The Gourman Report, 8th Edition*. The Gourman scores ranged from 3.03 to 4.93 with a mean score of 3.91 and a standard deviation of 0.52.

Table 13. Descriptive Statistics for the Independent Variables

Independent Variable	Number of graduates	Percent
Domestic or foreign medical school		
Domestic	25,479	64.4%
Foreign	14,080	35.6%
Total	39,559	100.0%
Medical school language of instruction		
Non-English	8,179	20.7%
English	31,380	79.3%
Total	39,559	100.0%
Gourman ranking of medical school		
Gourman score 3.03 to 3.99	9,674	38.0%
Gourman score 4.00 to 4.93	15,805	62.0%
Total	25,479	100.0%

Although not shown in Table 13, 21.1% or 8,346 of the domestic trained medical doctors attended medical schools that are ranked in the “Strong” category by *The Gourman Report, 8th Edition*. Examples of such schools in the “Strong” category include Albert Einstein College of Medicine, Baylor College of Medicine, Boston University, Dartmouth Medical School, Georgetown University, The Ohio State University, Temple University, and Tufts University School of Medicine (see Appendix A for a full listing of medical schools by Gourman score).

Table 13 also shows that 8,179 medical doctors attended medical schools where the language of instruction is not English. It was noted during the analyses that in addition to all domestic medical schools, the medical schools on the subcontinent of India that had graduates included in this study use English as the language of instruction, according to the IMED (2005). Also notable was the fact that almost all of the medical schools located in South America use either the Spanish or Portuguese language for instruction, whereas many medical schools located in Africa or the Middle East teach in English, Arabic, or both.

In eastern Asia, most of the medical schools use the national language of the country that they are located within, such as Chinese in China or Japanese in Japan; however the medical schools located in the Philippines use English exclusively as the language of instruction. Similarly in Europe, most of the medical schools use the national language of the country that they are located within, although some use English (with the exception of Britain) as the second language of instruction.

Approximately half of the medical schools located in Central America or the various nations of the Caribbean use English as the language of instruction, presumably because of their many native-English speaking students. Table 13 shows the distribution of medical school language of instruction and as can be seen, 31,380 medical doctors attended a medical school where English was the language used for instruction.

Control Variables

The number of medical doctors with certification from the American Board of Medical Specialties (ABMS) was found to be surprisingly low. In sample 1 there were 151 medical doctors with ABMS certification and in sample 2, which is a subset of sample 1, there were 109. It is unknown whether these low figures resulted because of inadequate data capture by the FL DOH or whether they are true figures; however it is the statistic that resulted from analysis of the data. Regardless, any duly licensed medical doctor may practice in the State of Florida without AMBS certification.

The medical doctors who practice surgery, obstetrics, gynecology, psychiatry, emergency medicine, family medicine, or diagnostic radiology were grouped for study as control variables because previous studies indicated that practitioners of these specialties had higher malpractice rates than practitioners in other specialties. The number of medical doctors in both samples that practice these specialties are shown in Table 14.

Table 14. Study Samples by Specialty Practiced

Type of specialty practiced	Number of medical doctors in sample 1 and percentage	Number of medical doctors in sample 2 and percentage
Surgical specialties	6,137 (15.5%)	4,670 (18.3%)
Obstetrics & gynecology, psychiatry	3,389 (8.6%)	2,202 (8.6%)
Emergency medicine, family medicine, diagnostic radiology	6,517 (16.5%)	4,671 (18.3%)
All other specialties	23,516 (59.4%)	13,936 (54.8%)
Total	39,559 (100%)	25,479 (100%)

The demographic control variables of gender and race are grouped and shown in Table 15. As shown, men make up the majority of practicing medical doctors in the State of Florida. Furthermore, the racial composition of sample 1 wherein 64.7% of the medical doctors categorize themselves as white closely mirrors the racial composition of the general population of the State of Florida where non-Hispanic whites represent 63.1% of the population (Wikipedia, n.d.).

Table 15. Demographic Data of the Study Samples

Demographic variable	Number of medical doctors in sample 1 and percentage	Number of medical doctors in sample 2 and percentage
Gender		
Male	30,545 (77.2%)	19,861 (78.0%)
Female	9,014 (22.8%)	5,618 (22.0%)
Total	39,559 (100%)	25,479 (100%)
Race		
White	25,602 (64.7%)	20,449 (80.3%)
Non-white	13,957 (35.3%)	5,030 (19.7%)
Total	39,559 (100%)	25,479 (100%)

Results of Correlation Analysis

Table 16 shows a correlation matrix for the sample 1 study variables. The matrix shows numerical values, which are the Pearson correlation coefficients that quantify the degree of relationship between each set of variables as an r value, with r values of .10, .30 and .50 corresponding to small, medium and large correlations, respectively, according to Cohen's guidelines (Spatz, 2001).

According to Table 16, the dependent variables of discipline rate and discipline type show a very strong correlation of .932, which is not surprising since neither of these dependent variables would exist without the other. The reason for the strong correlation between these two dependent variables was mentioned previously on page 48.

Table 16. Correlation Matrix for Sample 1 Study Variables (N = 39,559)

Variable	Disc rate	Disc type	Domestic or foreign school	Med school language	Specialty certified or not	Surgical specialty	OB-GYN, psychiatry	EM, Fam-med, radiology	Gender	Race
Disc rate	1	.932**	.009	-.024**	.064**	.058**	.011*	-.003	.070**	.013*
Disc type	.932**	1	.010*	-.029**	.066**	.051**	.015**	-.001	.068**	.012*
Domestic or foreign school	.009	.010*	1	-.687**	-.010*	-.105**	-.004	-.067**	-.024**	-.437**
Med school language	-.024**	-.029**	-.687**	1	.010*	.059**	-.017**	.062**	-.025**	.220**
Specialty certified or not	.064**	.066**	-.010*	.010*	1	.003	-.003	.002	.000	.005
Surgical specialty	.058**	.051**	-.105**	.059**	.003	1	-.131**	-.190**	.160**	.107**
OB-GYN, psychiatry	.011*	.015**	-.004	-.017**	-.003	-.131**	1	-.136**	-.079**	-.011*
EM, Fam-med, radiology	-.003	-.001	-.067**	.062**	.002	-.190**	-.136**	1	-.028**	.020**
Gender	.070**	.068**	-.024**	-.025**	.000	.160**	-.079**	-.028**	1	.128**
Race	.013*	.012*	-.437**	.220**	.005	.107**	-.011*	.020**	.128**	1

*p < .05; **p < .01

Large correlation values between independent variables may raise the potential for multicollinearity. According to Kerr, Hall and Kozub (2003), two concerns result from correlation values between independent variables that are greater than 0.7: the independent variables may not be measuring separate constructs and the independent effect of each variable upon the dependent variables may be difficult to determine. As shown in Table 16, the correlation between the two independent variables is less than 0.7 at -0.687 therefore multicollinearity does not appear to be a concern. This moderately high correlation most likely occurred due to the coding schema where the 25,479 medical doctors who attended domestic medical schools were coded as 0 and the 31,380 medical doctors who attended medical schools where the English language is used for instruction were coded as 1.

The only other correlation figure to mention is .437 between Domestic or Foreign School and the Control variable Race. This correlation probably resulted because white medical doctors comprise the majority (80.3%) of the 25,479 medical doctors that attended domestic medical schools, which is a figure that closely approximates the figure of 25,602 medical doctors that categorize themselves as white.

The correlation matrix for the sample 2 study variables is found at Appendix B. The correlation matrix figures for the sample 2 study variables are similar to those for the same variables found in the correlation matrix for the sample 1 study variables. However, it should be noted from the correlation matrix for the sample 2 study variables found at Appendix B, that the independent variable of Gourman ranking of domestic medical school has no significant correlation with either of the dependent variables.

Logistic Regression Results

The statistical analysis of the categorical variables used in this study took the form of multinomial logistic regression, the only method available for such analysis since all the study variables are multinomial and categorical. The two dependent variables, discipline rate and discipline type each have three levels and were analyzed in four separate SPSS logistic regression models to determine the effects of the three independent (predictor) and control variables.

The purpose of a quantitative study such as this is to test hypotheses that have been formulated within a theoretical framework and that involve the study variables to determine whether or not a statistically significant relationship exists between the variables. The stated purpose of this study was to determine if certain aspects of a medical doctor's educational preparation to practice medicine might have some connection to the medical doctor receiving discipline from the Florida Board of Medicine as a result of some occurrence of medical malpractice. Logistic regression as a statistical technique creates an estimate of the probability that a certain outcome will result, such as whether a medical doctor is subject to discipline or not based on predictor variables pertaining to medical education; however in contrast to Ordinary Least Squares regression where actual changes in the dependent variables are calculated, logistic regression calculates changes only in the log odds of the dependent variable (Garson, 2008).

Logistic regression evaluates an entire regression model (with one dependent and one or more independent variables) via model-fitting criteria called the -2 log likelihood statistic that generates a Chi-Square statistic by comparing the alternate model to the null model (Chan, 2005). If the *p*-value, is less than 0.05, then the final model outperforms the null model and a relationship exists between the variables.

Upon confirmation of a relationship between the variables, Pseudo R-square values known as Naglekerke or Cox and Snell are generated. These values manifest between 0 and 1, with a greater value indicating the greater proportion of variation that is explained by the final model (Chan, 2005). Additionally, Likelihood Ratio Tests indicate the influence that each variable has on the logistic regression model. Finally, in logistic regression the odds ratio statistic gives an indication of whether each independent (or control) variable is having no effect, increasing the effect or decreasing the effect of the odds of the event (expressed as the dependent variable) occurring (Garson, 2008). These features of logistic regression as described above will next be shown as applied to the study variables.

Regression Statistics of Sample 1 for the Dependent Variable of Discipline Rate

Table 17 shows the model fitting information and the Pseudo R-Square for the multinomial logistic regression model that includes the dependent variable of discipline rate, the independent variables of domestic or foreign medical school and medical school language of instruction, and all control variables. As shown in Table 17, the final model outperforms the null model and is statistically significant ($p = .000$), which indicates that a relationship exists between the variables. The result of the model fitting information supports further investigation of relationships between the variables.

Table 17. Model Fitting Information and Pseudo R-Square for Discipline Rate (N = 39,559)

Model	-2 Log likelihood of reduced model	Chi-square ratio	Degrees of freedom	*p* value	Pseudo R-Square (Nagelkerke)
Final	468.079	486.156	16	.000	.036

The Pseudo R-square value that is associated with the multinomial logistic regression model for the dependent variable of discipline rate is .036. Thus the proportion of variance that is explained in the model that concerns the dependent variable of discipline rate is 3.6%.

Likelihood Ratio Tests indicate the contribution that each variable gives to the logistic regression model. The variables that contribute to the discipline rate model due to their *p* value being less than 0.05 are medical school language of instruction; not specialty certified or specialty certified; practicing a surgical specialty; practicing obstetrics, gynecology or psychiatry; practicing emergency medicine, family medicine or radiology; and gender. A higher Chi-square ratio for a particular variable indicates a greater loss of model fit if that variable is eliminated from the model; therefore the descending order of chi-square ratios of the statistically significant variables are gender; surgical specialty practice; not specialty certified or specialty certified; obstetrics, gynecology or psychiatry practice; medical school language of instruction; and emergency medicine, family medicine, or radiology practice.

The parameter estimates show the effect of each independent and control variable on the dependent variable using odds ratios. Table 18 shows the odds ratios and the *p* values for the independent variables of domestic or foreign medical school and medical school language of instruction, the control variables and the dependent variable of discipline rate. As can be seen, the variables that have a statistically significant effect ($p < 0.05$) on the dependent variable of discipline rate are the following variables: medical school language of instruction; not specialty certified or specialty certified; surgical specialty practice; obstetrics, gynecology or psychiatry practice; emergency medicine, family medicine, or radiology practice and gender.

Looking further at Table 18, the following results are indicated: attendance at a medical school where the language of instruction is not English increases the odds by 41% that the medical doctor will be disciplined once; not being ABMS certified decreases the odds by 88.5% that a medical doctor will be disciplined once; practicing a specialty other than surgery decreases the odds by 45.6% that a medical doctor will be disciplined once; practicing a specialty other than obstetrics, gynecology or psychiatry decreases the odds by 41.8% that a medical doctor will be disciplined once; practicing a specialty other than emergency medicine, family medicine or diagnostic radiology decreases the odds by 19% that a medical doctor will be disciplined once; and being a female medical doctor decreases the odds by 63.4% of being disciplined once. Table 18 also shows the following: not being ABMS certified decreases the odds by 87.6% that a medical doctor will be disciplined two or more times; and practicing a specialty other than surgery decreases the odds by 50.5% that a medical doctor will be disciplined two or more times.

In Table 18, if the *p* value for any independent or control variable is less than .05, it indicates that the independent or control variable has a statistically significant association with dependent variable. The Odds ratio columns show the odds ratios for the dependent variable of Discipline separated into physicians that have been disciplined once and physicians that have been disciplined two or more times. The columns represented by the headings of 95%

Confidence interval (lower bound) and 95% Confidence interval (upper bound) displays the lower and upper limits within which the odds ratios can fall to ensure that 95 out of 100 odds ratio computations do not result by chance. Because dummy variables are used, the parameter estimates of the baselines of the categorical variables are not shown.

Table 18. Parameter Estimates for Dependent Variable of Discipline Rate (N = 39,559)

Independent or control variable	Odds ratio Exp(B)		*p* value		95% Confidence interval for disciplined once		95% Confidence interval for disciplined 2 or more times	
Disc Rate (reference category is Never Disciplined)	Disciplined once	Disciplined 2 or more times	Disciplined once	Disciplined 2 or more times	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Intercept			.546	.003*				
Domestic or foreign medical school								
Domestic school	1.072	.849	.441	.401	.899	1.278	.579	1.244
Med school language								
Not English	1.410	1.353	.000*	.128	1.173	1.694	.917	1.998
Specialty certified or not								
Not certified	.115	.124	.000*	.000*	.078	.169	.054	.285
Specialty Practiced								
Non-surgery	.544	.495	.000*	.000*	.478	.620	.372	.659
Non–OB-GYN or psychiatry	.582	.813	.000*	.371	.490	.692	.517	1.279
Non-emergency medicine, family medicine or radiology	.810	.803	.005*	.205	.698	.939	.572	1.127
Gender								
Female	.366	.274	.000*	.000*	.307	.436	.173	.434
Race								
Non-white	.930	.995	.250	.971	.822	1.052	.753	1.314

*p < .05

Regression Statistics of Sample 1 for the Dependent Variable of Discipline Type

Table 19 shows the model fitting information and the Pseudo R-Square for the multinomial logistic regression model that includes the dependent variable of discipline type, the independent variables of domestic or foreign medical school and medical school language of instruction, and all control variables. As shown in Table 19, the final model outperforms the null model and is statistically significant (p = .000), which indicates that a relationship exists between the variables. The result of the model fitting information supports further investigation of relationships between the variables.

Table 19. Model Fitting Information and Pseudo R-Square for Discipline Type (N = 39,559)

Model	-2 Log likelihood of reduced model	Chi-square ratio	Degrees of freedom	*p* value	Pseudo R-Square (Nagelkerke)
Final	495.655	501.127	16	.000	.037

The Pseudo R-square value that is associated with the multinomial logistic regression model for the dependent variable of discipline type is .037. Thus the proportion of variance that is explained in the model that concerns the dependent variable of discipline type is 3.7%.

Likelihood Ratio Tests indicate the contribution that each variable gives to the logistic regression model. The variables that contribute to the discipline type model due to their *p* value being less than 0.05 are medical school language of instruction; not specialty certified or specialty certified; practicing a surgical specialty; practicing obstetrics, gynecology or psychiatry; practicing emergency medicine, family medicine or radiology; and gender. A higher Chi-square ratio for a particular variable indicates a greater loss of model fit if that variable is eliminated from the model; therefore the descending order of chi-square ratios of the statistically significant variables are gender; surgical specialty practice; not specialty certified or specialty certified; obstetrics, gynecology or psychiatry practice; medical school language of instruction; and emergency medicine, family medicine, or radiology practice.

The parameter estimates show the effect of each independent and control variable on the dependent variable using odds ratios. Table 20 shows the odds ratios and the *p* values for the independent variables of domestic or foreign medical school and medical school language of instruction, the control variables and the dependent variable of discipline type. As can be seen, the variables that have a statistically significant effect ($p < 0.05$) on the dependent variable of discipline type are the following variables: medical school language of instruction; not specialty certified or specialty certified; surgical specialty practice; obstetrics, gynecology or psychiatry practice; emergency medicine, family medicine, or radiology practice and gender.

Looking further at Table 20, the following results are indicated: attendance at a medical school where the language of instruction is not English increases the odds by 26% that the medical doctor will receive a lesser type of discipline; not being ABMS certified decreases the odds by 88.2% that a medical doctor will receive a lesser type of discipline; practicing a specialty other than surgery decreases the odds by 49.3% that a medical doctor will receive a lesser type of discipline; practicing a specialty other than obstetrics, gynecology or psychiatry decreases the odds by 38.7% that a medical doctor will receive a lesser type of discipline; practicing a specialty other than emergency medicine, family medicine or diagnostic radiology decreases the odds by 17.7% that a medical doctor will receive a lesser type of discipline; and being a female medical doctor decreases the odds by 64.9% of receiving a lesser type of discipline. Table 20 also shows the following: attendance at a medical school where the language of instruction is not English increases the odds by 134.9% that the medical doctor will receive a severer type of discipline; not being ABMS certified decreases the odds by 95.2% that a medical doctor will receive a severer type of discipline; practicing a specialty other than obstetrics, gynecology or psychiatry decreases the odds by 59.7% that a medical doctor will receive a severer type of discipline; and being a female medical doctor decreases the odds by 76.3% of receiving a severer type of discipline.

In Table 20, if the *p* value for any independent or control variable is less than .05, it indicates that the independent or control variable has a statistically significant association with dependent variable. The Odds ratio columns show the odds ratios for the dependent variable of Discipline separated into physicians that have received lesser types of discipline and physicians that have received severer types of discipline. The columns represented by the headings of 95% Confidence interval (lower bound) and 95% Confidence interval (upper bound) displays the lower and upper limits within which the odds ratios can fall to ensure that 95 out of 100 odds ratio computations do not result by chance. Because dummy variables are used, the parameter estimates of the baselines of the categorical variables are not shown.

Table 20. Parameter Estimates for Dependent Variable of Discipline Type (N = 39,559)

Independent or control variable	Odds Ratio Exp(B)		*p* value		95% Confidence interval for lesser discipline		95% Confidence interval for severer discipline	
Disc Type (reference category is Never Disciplined)	Lesser discipline	Severer Discipline	Lesser discipline	Severer Discipline	Lower bound	Upper bound	Lower bound	Upper bound
Intercept			.485	.001*				
Domestic or foreign medical school								
Domestic school	1.014	1.152	.877	.520	.853	1.205	.749	1.771
Med school language								
Not English	1.260	2.349	.013*	.000*	1.051	1.512	1.535	3.595
Specialty certified or not								
Not certified	.118	.105	.000*	.000*	.080	.175	.048	.228
Specialty Practiced								
Non-surgery	.507	.760	.000*	.095	.447	.576	.550	1.049
Non–OB-GYN or psychiatry	.613	.590	.000*	.007*	.513	.732	.403	.864
Non-emergency medicine, family medicine or radiology	.823	.737	.011*	.064	.709	.956	.534	1.018
Gender								
Female	.351	.354	.000*	.000*	.294	.420	.237	.530
Race								
Non-white	.938	.950	.311	.715	.828	1.062	.723	1.250

*p < .05

Regression Statistics of Sample 2 for the Dependent Variable of Discipline Rate

Table 21 shows the model fitting information and the Pseudo R-Square for the multinomial logistic regression model that includes the dependent variable of discipline rate, the independent variable of Gourman ranking of domestic medical school and all control variables. As shown in Table 21, the final model outperforms the null model and is statistically significant (*p* = .000), which indicates that a relationship exists between the variables. The result of the model fitting information supports further investigation of relationships between the variables.

Table 21. Model Fitting Information and Pseudo R-Square for Discipline Rate (N = 25,479)

Model	-2 Log likelihood of reduced model	Chi-square ratio	Degrees of freedom	*p* value	Pseudo R-Square (Nagelkerke)
Final	310.850	304.646	14	.000	.036

The Pseudo R-square value that is associated with the multinomial logistic regression model for the dependent variable of discipline rate is .036. Thus the proportion of variance that is explained in the model that concerns the dependent variable of discipline rate is 3.6%.

Likelihood Ratio Tests indicate the contribution that each variable gives to the logistic regression model. The variables that contribute to the discipline rate model due to their *p* value being less than 0.05 are: not specialty certified or specialty certified; practicing a surgical specialty; practicing obstetrics, gynecology or psychiatry; and gender. A higher Chi-square ratio for a particular variable indicates a greater loss of model fit if that variable is eliminated from the model; therefore the descending order of chi-square ratios of the statistically significant variables are gender; not specialty certified or specialty certified; surgical specialty practice; and obstetrics, gynecology or psychiatry practice.

The parameter estimates show the effect of the independent and control variables on the dependent variable using odds ratios. Table 22 shows the odds ratios and the *p* values for the independent variable of Gourman ranking of domestic medical school, the control variables and the dependent variable of discipline rate. As can be seen, the variables that have a statistically significant effect ($p < 0.05$) on the dependent variable of discipline rate are the following variables: not specialty certified or specialty certified; surgical specialty practice; obstetrics, gynecology or psychiatry practice; and gender.

Table 22. Parameter Estimates for Dependent Variable of Discipline Rate (N = 25,479)

Independent or control variable	Odds ratio Exp(B)		*p* value		95% Confidence interval for Disciplined once		95% Confidence interval for Disciplined 2 or more times	
Disc. rate (reference category is Never Disciplined)	Disciplined once	Disciplined 2 or more times	Disciplined once	Disciplined 2 or more times	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Intercept			.637	.006*				
Gourman ranking of domestic medical school								
Gourman score 3.03 to 3.99	.957	.855	.515	.336	.838	1.093	.621	1.177
Specialty certified or not								
Not certified	.115	.099	.000*	.000*	.072	.181	.039	.249
Specialty practiced								
Non-surgery	.580	.579	.000*	.003*	.496	.678	.402	.836
Non–OB-GYN or psychiatry	.580	.818	.000*	.505	.466	.722	.452	1.478
Non-emergency medicine, family medicine or radiology	.881	.839	.174	.419	.733	1.058	.548	1.284
Gender								
Female	.330	.228	.000*	.000*	.262	.416	.119	.436
Race								
Non-white	.959	1.074	.640	.729	.807	1.141	.719	1.603

*$p < .05$

Looking further at Table 22, the following results are indicated: not being ABMS certified decreases the odds by 88.5% that a medical doctor will be disciplined once; practicing a specialty other than surgery decreases the odds by 42% that a medical doctor will be disciplined once; practicing a specialty other than obstetrics, gynecology or psychiatry decreases the odds by 42% that a medical doctor will be disciplined once; and being a female medical doctor decreases the odds by 67% of being disciplined once. Table 22 also shows the following: not being ABMS certified decreases the odds by 90.1% that a medical doctor will be disciplined two or more times; practicing a specialty other than surgery decreases the odds by 42.1% that a medical doctor will be disciplined two or more times; and being a female medical doctor decreases the odds by 77.2% of being disciplined two or more times.

In Table 22, if the *p* value for any independent or control variable is less than .05, it indicates that the independent or control variable has a statistically significant association with dependent variable. The Odds ratio columns show the odds ratios for the dependent variable of Discipline separated into physicians that have been disciplined once and physicians that have been disciplined two or more times. The columns represented by the headings of 95% Confidence interval (lower bound) and 95% Confidence interval (upper bound) displays the lower and upper limits within which the odds ratios can fall to ensure that 95 out of 100 odds ratio computations do not result by chance. Because dummy variables are used, the parameter estimates of the baselines of the categorical variables are not shown.

Regression Statistics of Sample 2 for the Dependent Variable of Discipline Type

Table 23 shows the model fitting information and the Pseudo R-Square for the multinomial logistic regression model that includes the dependent variable of discipline type, the independent variable of Gourman ranking of domestic medical school and all control variables. As shown in Table 23, the final model outperforms the null model and is statistically significant (*p* = .000), which indicates that a relationship exists between the variables. The result of the model fitting information supports further investigation of relationships between the variables.

Table 23. Model Fitting Information and Pseudo R-Square for Discipline Type (N = 25,479)

Model	-2 Log likelihood of reduced model	Chi-square ratio	Degrees of freedom	*p* value	Pseudo R-Square (Nagelkerke)
Final	308.907	316.588	14	.000	.037

The Pseudo R-square value that is associated with the multinomial logistic regression model for the dependent variable of discipline type is .037. Thus the proportion of variance that is explained in the model that concerns the dependent variable of discipline rate is 3.7%.

Likelihood Ratio Tests indicate the contribution that each variable gives to the logistic regression model. The variables that contribute to the discipline rate model due to their *p* value being less than 0.05 are: not specialty certified or specialty certified; practicing a surgical specialty; practicing obstetrics, gynecology or psychiatry; and gender. A higher Chi-square ratio for a particular variable indicates a greater loss of model fit if that variable is eliminated from the model; therefore the descending order of chi-square ratios of the statistically significant variables are gender; not specialty certified or specialty certified; surgical specialty practice; and obstetrics, gynecology or psychiatry practice.

The parameter estimates show the effect of the independent and control variables on the dependent variable using odds ratios. Table 24 shows the odds ratios and the p values for the independent variable of Gourman ranking of domestic medical school, the control variables and the dependent variable of discipline type. As can be seen, the variables that have a statistically significant effect ($p < 0.05$) on the dependent variable of discipline type are the following variables: not specialty certified or specialty certified; surgical specialty practice; obstetrics, gynecology or psychiatry practice; and gender.

Table 24. Parameter Estimates for Dependent Variable of Discipline Type (N = 25,479)

Independent or control variable Disc. rate (reference category is Never Disciplined)	Odds ratio Exp(B)		*p* value		95% Confidence interval for lesser discipline		95% Confidence interval for severer discipline	
	Lesser discipline	Severer discipline	Lesser discipline	Severer discipline	Lower bound	Upper bound	Lower bound	Upper bound
Intercept			.517	.001*				
Gourman ranking of domestic medical school								
Gourman score 3.03 to 3.99	.922	1.069	.233	.685	.808	1.053	.775	1.474
Specialty certified or not								
Not certified	.111	.121	.000*	.000*	.070	.174	.044	.337
Specialty Practiced								
Non-surgery	.532	1.109	.000*	.644	.456	.620	.715	1.721
Non–OB-GYN or psychiatry	.640	..468	.000*	.001*	.509	.804	.296	.742
Non-emergency medicine, family medicine or radiology	.856	.986	.095	.950	.713	1.027	.636	1.528
Gender								
Female	.325	.262	.000*	.000*	.257	.410	.144	.476
Race								
Non-white	.977	.967	.793	.875	.823	1.161	.635	1.472

*$p < .05$

Looking further at Table 24, the following results are indicated: not being ABMS certified decreases the odds by 88.9% that a medical doctor will receive a lesser type of discipline; practicing a specialty other than surgery decreases the odds by 46.8% that a medical doctor will receive a lesser type of discipline; practicing a specialty other than obstetrics, gynecology or psychiatry decreases the odds by 36% that a medical doctor will receive a lesser type of discipline; and being a female medical doctor decreases the odds by 67.5% of receiving a lesser type of discipline. Table 24 also shows the following: not being ABMS certified decreases the odds by 87.9% that a medical doctor will receive a severer type of discipline; practicing a specialty other than obstetrics, gynecology or psychiatry decreases the odds by 53.2% that a medical doctor will receive a severer type of discipline ; and being a female medical doctor decreases the odds by 73.8% of receiving a severer type of discipline .

In Table 24, if the *p* value for any independent or control variable is less than .05, it indicates that the independent or control variable has a statistically significant association with dependent variable. The Odds ratio columns show the odds ratios for the dependent variable of Discipline separated into physicians that have been disciplined once and physicians that have been disciplined two or more times. The columns represented by the headings of 95% Confidence interval (lower bound) and 95% Confidence interval (upper bound) displays the lower and upper limits within which the odds ratios can fall to ensure that 95 out of 100 odds ratio computations do not result by chance. Because dummy variables are used, the parameter estimates of the baselines of the categorical variables are not shown.

Hypothesis Testing

This study explored hypotheses. These six hypotheses and the findings regarding these hypotheses are shown below.

Graduation from Domestic or Foreign Medical Schools and Discipline Rate

1) The graduates of foreign medical schools have higher rates of discipline than the graduates of domestic medical schools.

Finding: Graduation from either domestic or foreign medical schools did not have a statistically significant effect on rates of discipline; therefore this hypothesis is not supported.

Graduation from Domestic or Foreign Medical Schools and Discipline Type

2) The graduates of foreign medical schools have more severe types of discipline than the graduates of domestic medical schools.

Finding: Graduation from either domestic or foreign medical schools did not have a statistically significant effect on types of discipline; therefore this hypothesis is not supported.

Medical School Language of Instruction and Discipline Rate

3) The graduates of medical schools where the instruction is not in the English language will have higher disciplinary rates than graduates of medical schools where the instruction is in the English language.

Finding: Attendance at a medical school where the language of instruction is not English increases the odds by 41% that the medical doctor will be disciplined once; therefore this hypothesis is supported.

Medical School Language of Instruction and Discipline Type

4) The graduates of medical schools where the instruction is not in the English language will have more severe types of discipline than graduates of medical schools where the instruction is in the English language.

Finding: Attendance at a medical school where the language of instruction is not English increases the odds by 134.9% that the medical doctor will receive a severer type of discipline; therefore this hypothesis is supported.

Medical School Rank per *The Gourman Report, 8th Edition* and Discipline Rate

5) The graduates of lower ranked domestic medical schools (based on *The Gourman Report, 8th Edition* rankings) have correspondingly higher rates of discipline and graduates of higher ranked medical schools have correspondingly lower rates of discipline.

Finding: Medical school rankings based on *The Gourman Report, 8th Edition* did not have a statistically significant effect on rates of discipline; therefore this hypothesis is not supported.

Medical School Rank per *The Gourman Report, 8th Edition* and Discipline Type

6) The graduates of lower ranked domestic medical schools (based on *The Gourman Report, 8th Edition* rankings) have correspondingly more severe types of discipline and graduates of higher ranked medical schools have correspondingly less severe types of discipline.

Finding: Medical school rankings based on *The Gourman Report, 8th Edition* did not have a statistically significant effect on types of discipline; therefore this hypothesis is not supported.

Table 25 summarizes the findings regarding the six hypotheses that were tested in this study

Table 25. Summary of Hypotheses Testing

Hypothesis	Study finding	Basis for finding
H1: The graduates of foreign medical schools have higher rates of discipline than the graduates of domestic medical schools.	H1 not supported	Graduation from either domestic or foreign medical schools did not have a statistically significant effect on rates of discipline
H2: The graduates of foreign medical schools have more severe types of discipline than the graduates of domestic medical schools.	H2 not supported	Graduation from either domestic or foreign medical schools did not have a statistically significant effect on types of discipline
H3: The graduates of medical schools where the instruction is not in the English language will have higher disciplinary rates than graduates of medical schools where the instruction is in the English language.	H3 supported	The language of instruction used at medical school did have a statistically significant effect on rates of discipline
.H4: The graduates of medical schools where the instruction is not in the English language will have more severe types of discipline than graduates of medical schools where the instruction is in the English language.	H4 supported	The language of instruction used at medical school did have a statistically significant effect on types of discipline
H5: The graduates of lower ranked domestic medical schools (based on *The Gourman Report, 8th Edition* rankings) have correspondingly higher rates of discipline and graduates of higher ranked medical schools have correspondingly lower rates of discipline.	H5 not supported	Medical school rankings based on *The Gourman Report, 8th edition* did not have a statistically significant effect on rates of discipline
H6: The graduates of lower ranked domestic medical schools (based on *The Gourman Report, 8th Edition* rankings) have correspondingly more severe types of discipline and graduates of higher ranked medical schools have correspondingly less severe types of discipline	H6 not supported	Medical school rankings based on *The Gourman Report, 8th edition* did not have a statistically significant effect on types of discipline

Research Questions

As a result of this study, the six research questions are answered as follows:

1) Graduation from a foreign medical school does not increase the odds that the Florida Board of Medicine will discipline the medical doctor who has graduated from a foreign medical school.

2) Graduation from a foreign medical school does not increase the odds that the medical doctor who has graduated from a foreign medical school will experience more severe types of discipline if disciplined by the Florida Board of Medicine.

3) Graduates of medical schools where the classes are not conducted in the English language have their odds increased by 41% that they will be disciplined once.

4) Graduates of medical schools where the classes are not conducted in the English language have their odds increased by 134.9% that they will receive a severer type of discipline if disciplined by the Florida Board of Medicine.

5) Graduation from a lower ranked domestic medical school as ranked by *The Gourman Report, 8th Edition* does not increase the odds that the Florida Board of Medicine will discipline the medical doctor who graduated from that particular school.

6) Graduation from a lower ranked domestic medical school as ranked by *The Gourman Report, 8th Edition* does not increase the odds that the medical doctor who has graduated from that particular school will experience more severe types of discipline if disciplined by the Florida Board of Medicine.

Serendipitous Results

In addition to the findings mentioned above, it was also found that several control variables had statistically significant effects on the dependent variables. These unanticipated results involving control variables are described below.

Unanticipated Results Involving the Control Variable of Specialty Certification

It was found that not being ABMS certified decreases the odds by 88.5% that a medical doctor will be disciplined once. Additionally, by averaging the results from each regression model, it was found that not being ABMS certified decreases the odds by 88.8% that a medical doctor will be disciplined two or more times; not being ABMS certified decreases the odds by 88.5% that a medical doctor will receive a lesser type of discipline; and not being ABMS certified decreases the odds by 91.5% that a medical doctor will receive a severer type of discipline. Oddly, these findings stand in contradiction to several other studies that found that not being ABMS certified increases the odds of receiving discipline (Adamson et al., 1997; Khaliq et al., 2005; Kohatsu et al., 2004). This finding may have erroneously resulted from the unusually low number of ABMS certified medical doctors who were included in this study.

Unanticipated Results Involving the Control Variable of Surgical Specialty Practice

It was found that practicing a specialty other than surgery decreases the odds by 42% and 45.6% that a medical doctor will be disciplined once, and that practicing a specialty other than surgery decreases the odds by 42.1% and 50.5% that a medical doctor will be disciplined two or more times. Additionally, practicing a specialty other than surgery decreases the odds by 46.8% and by 49.3% that a medical doctor will receive a lesser type of discipline. These findings support several previous studies (Charles et al., 1992; Hickson et al., 2002; Sloan et al., 1989; Waters et al., 2003), which found that practicing surgery increases the chances of medical error or may increase susceptibility to malpractice lawsuits

Unanticipated Results Involving the Control Variable of OB-GYN/Psychiatry Practice

It was found that practicing a specialty other than obstetrics, gynecology or psychiatry decreases the odds by 41.8% and 42% that a medical doctor will be disciplined once, and that practicing a specialty other than obstetrics, gynecology or psychiatry decreases the odds by 36% and by 38.7% that a medical doctor will receive a lesser type of discipline. It was also found that practicing a specialty other than obstetrics, gynecology or psychiatry decreases the odds by 53.2% and by 59.7% that a medical doctor will receive a severer type of discipline. These findings also comport with previous literature showing an increased risk when practicing surgery (Khaliq et al., 2005; Kohatsu et al., 2004).

Unanticipated Results Involving the Control Variable of Family Practice, Diagnostic Radiology, or Emergency Medicine Practice

It was found that practicing a specialty other than emergency medicine, family medicine or diagnostic radiology decreases the odds by 19% that a medical doctor will be disciplined once, and that practicing a specialty other than emergency medicine, family medicine or diagnostic radiology decreases the odds by 17.7% that a medical doctor will receive a lesser type of discipline.

Unanticipated Results Involving the Control Variable of Gender

It was found that being a female medical doctor decreases the odds by 63.4% and by 67% of being disciplined once and being a female medical doctor decreases the odds by 64.9% and by 67.5 of receiving a lesser type of discipline. Also, being a female medical doctor decreases the odds by 73.8% and by 76.3% of receiving a severer type of discipline. Furthermore, being a female medical doctor decreases the odds by 77.2% of being disciplined two or more times. These findings hold with the literature that male physicians are disciplined more often than female physicians (Khaliq et al., 2005; Kohatsu et al., 2004).

Summary of Findings

The results of the statistical analysis of the two samples of Florida medical doctors licensed by and practicing in the State of Florida were not entirely different from the results that were anticipated based on previous literature. These results are summarized below.

Summary of Descriptive Data

The 39,559 medical doctors who made up study sample 1 consisted mostly of graduates of domestic medical schools; however the graduates of foreign medical schools represented slightly more than one-third of these practicing medical doctors. The domestic medical schools attended by two-thirds of the population include 131 different medical schools that are ranked by *The Gourman Report, 8th Edition* as Acceptable Plus (45 schools), Good (31 schools), Strong (35 schools) and Very Strong (20 schools). The Gourman scores ranged from 3.03 to 4.93 with a mean score of 3.91. Most of the domestic trained medical doctors (8,346) attended medical schools that are ranked in the “Strong” category by *The Gourman Report, 8th Edition*.

Of the 39,559 medical doctors in sample 1 that were studied, 8,179 attended medical schools where the language of instruction was not English. On the other hand, 31,380 medical doctors or 79.3% of the population attended a medical school where English was the language used for instruction.

The number of medical doctors with certification from the American Board of Medical Specialties (ABMS) was found to be surprisingly low at 151 in sample 1. It is unknown whether this low figure resulted because of inadequate data capture by the FL DOH or whether it is a true figure.

Of the specialties practiced, surgical specialties are practiced by 6,137 medical doctors; obstetricians, gynecologists, and psychiatrists contribute 3,389 to the total; and practicing medical doctors and emergency medicine specialists, family medicine practitioners, and diagnostic radiologists account for 6,517 practicing medical doctors. The remaining 23,516 medical doctors practice other specialties.

Men are in the majority of medical doctors in sample 1 at 77.2%. The racial composition of sample 1 consists of 64.7% of the medical doctors categorizing themselves as white, a figure that closely mirrors the racial composition of the general population of the State of Florida where non-Hispanic whites make up 63.1% of the population

In sample 1, the dependent variables of discipline rate and discipline type showed no differentiation regarding frequency of appearance and these variables had a very strong correlation of .932, which is not surprising since neither of these dependent variables would exist without the other. Only 1,821 medical doctors or 4.6% of the 39,559 medical doctors in sample 1 have experienced disciplinary action by the Florida Board of Medicine.

Summary of Correlation Data

In sample 1, a moderately strong correlation of -.687 was found between the independent variables of Domestic or Foreign School and Medical School Language, due to the coding schema where 25,479 medical doctors who attended domestic medical schools were coded as 0 and 31,380 medical doctors who attended medical schools where the English language is used for instruction were coded as 1. Another correlation figure was .437 between Domestic or Foreign School and the Control variable of Race. This moderate correlation may have resulted because the majority of the 25,479 medical doctors who attended domestic medical schools are white, closely approximating the 25,602 medical doctors in the population who are white.

Summary of Regression Results

The statistical analysis of the categorical variables used in this study took the form of logistic regression because all the study variables were categorical. The two dependent variables, discipline rate and discipline type, were analyzed in separate SPSS logistic regression models and model fit was analyzed first.

Regarding the dependent variable discipline type, it was found that the final models outperformed the null models and were statistically significant ($p < .000$), which indicated that a relationship exists between one or more of the independent variables and the dependent variable of discipline rate. For the dependent variable of discipline type, it was found that the final models also outperformed the null models and was statistically significant ($p < .000$), which likewise indicated an existing relationship between one or more of the independent variables and the dependent variable of discipline type. Therefore, the results of the model fit testing supported further investigation relationships between the variables.

Next, pseudo R-square values were determined for both dependent variables. It was found that the proportion of variance that was explained in the models that included the dependent variable of discipline rate was 3.6%. Very similarly, the proportion of variance that was explained in the models that included the dependent variable of discipline type was also slightly less than 3.7%.

Further testing took place using Likelihood Ratio Tests to indicate the contribution that each variable gave to the logistic regression model. The variables found to contribute to the discipline rate models due to their p value being less than 0.05 were medical school language of instruction; having specialty certification or not; practicing a surgical specialty; practicing obstetrics, gynecology, or psychiatry; practicing emergency medicine, family medicine, or radiology; and gender. The variables found to contribute to the discipline type models due to their p value being less than 0.05 were medical school language of instruction; having specialty certification or not; practicing a surgical specialty; practicing obstetrics, gynecology, or psychiatry; practicing emergency medicine, family medicine, or radiology; and gender.

The final logistic regression testing determined the odds ratios of the significant variables in the models for each dependent variable. The variables that displayed statistically significant effects on the dependent variable of discipline rate ($p < 0.05$) included the independent variable of medical school language of instruction and the following control variables: not specialty certified/specialty certified; surgical specialty practice; OB-GYN/psychiatric practice; family practice, diagnostic radiology and emergency medicine practice and gender.

The variables that displayed statistically significant effects on the dependent variable of discipline type ($p < 0.05$) included the independent variable of medical school language of instruction and the following control variables: : not specialty certified/specialty certified; surgical specialty practice; OB-GYN/psychiatric practice; family practice, diagnostic radiology and emergency medicine practice and gender.

Summary of Hypothesis Testing

Of the six hypotheses that were proposed, all but two were not supported by the findings. The four hypotheses that were not supported include:

- The graduates of foreign medical schools have higher rates of discipline than the graduates of domestic medical schools.
- The graduates of foreign medical schools have more severe types of discipline than the graduates of domestic medical schools.
- The graduates of lower ranked domestic medical schools (based on *The Gourman Report, 8th Edition* rankings) have correspondingly higher rates of discipline and graduates of higher ranked medical schools have correspondingly lower rates of discipline.
- The graduates of lower ranked domestic medical schools (based on *The Gourman Report, 8th Edition* rankings) have correspondingly more severe types of discipline and graduates of higher ranked medical schools have correspondingly less severe types of discipline.

The two supported hypotheses include:

- The graduates of medical schools where the instruction is not in the English language will have higher disciplinary rates than graduates of medical schools where the instruction is in the English language,
- The graduates of medical schools where the instruction is not in the English language will have more severe types of discipline than graduates of medical schools where the instruction is in the English language.

Summary of Serendipitous Results

Several findings were unanticipated but consistent with the literature: Practicing surgery not only increases the odds of being disciplined but also increases the odds of experiencing a more severe type of discipline; practicing obstetrics, gynecology, or psychiatry increases the odds of being disciplined; and male medical doctors have increased odds of being disciplined (Charles et al., 1992; Hickson et al., 2002; Khaliq et al., 2005; Kohatsu et al., 2004; Sloan et al., 1989; Waters et al., 2003). Unexpectedly, it was found that not being ABMS certified decreases the odds of being disciplined, a finding contrary to the literature (Adamson et al., 1997; Khaliq et al., 2005; Kohatsu et al., 2004) and therefore possibly erroneous due to incomplete archival data.

CHAPTER FIVE: CONCLUSIONS

This study sought to explore certain characteristics of the medical education of physicians that might indicate whether graduates of either foreign medical schools or certain domestic medical schools might be subjects of disciplinary actions from state sanctioned Boards of Medicine and if disciplined, the severity of the discipline that is imposed. As described in Chapter Two, other inferential studies have been completed with a similar purpose as this study; however the need for further study of factors involved in the education and training of medical doctors, which could predispose them to practicing medicine below the expected standard with the accompanying results of sub-par practice, such as discipline or lawsuits, was warranted. As stated previously, the cost of medical error is not only expressed in financial terms but also in the physical and psychological damage to patients and their families.

This study is distinguished from other similar studies in several ways. First, by the use of archival data that provided the disciplinary actions rendered against medical doctors by a state Board of Medicine and next, by measuring disciplinary actions in two dimensions: number of times disciplined and the severity of discipline. Last, this study included the novel hypothesis that graduates of medical schools wherein classes are not conducted in the English language will fare worse regarding imposition of disciplinary action when compared to graduates of medical schools wherein instruction is given in English. Significantly, it was found that graduates of medical schools where the instruction is not in the English language have greater odds of receiving discipline once and receiving more severe types of discipline than graduates of medical schools where the instruction is in English. It is therefore hoped that the results gained through the use of these novel approaches will contribute to the existing body of literature concerning this important topic.

Conclusions Based on the Results

As the result of this study, it is concluded that statistically significant relationships do not exist between attending either domestic or foreign medical schools and either of the two dependent variables of discipline rate or discipline type. A statistically significant relationship was not found between a domestic medical school's ranking based on *The Gourman Report, 8th Edition* and either of the two dependent variables of discipline rate or discipline type.

However, it is concluded that a statistically significant relationship does exist between attendance at a medical school where the language of instruction is not English and discipline rate, in that the odds are increased by 41% that a medical doctor will be disciplined once. It was also concluded that attendance at a medical school where the language of instruction is not English increases the odds by 26% that the medical doctor will receive a lesser type of discipline, and attendance at medical schools where the instruction is not in the English language increases the odds by 134.9% that the medical doctor will receive a severer type of discipline.

This research resulted in the following findings for which there were no hypotheses. It was found that not being ABMS certified decreases the odds that a medical doctor will be disciplined. This finding contradicts several other studies (Adamson et al., 1997; Khaliq et al. 2005; Kohatsu et al., 2004) and may be erroneous due to the low number of ABMS physicians included in the study.

A medical doctor who does not practice a surgical specialty has the odds decreased for receiving discipline. Non-surgeons have decreased odds of being given a lesser form of discipline such as a citation, a reprimand, a fine, a practice limitation or obligation, or being placed in a probationary status. These findings support previous studies (Charles et al., 1992; Hickson et al., 2002; Sloan et al., 1989; Waters et al., 2003).

It was found that not practicing obstetrics, gynecology, or psychiatry decreases the odds that a medical doctor will be disciplined, a finding also supported by other studies (Khaliq et al., 2005; Kohatsu et al., 2004). Female medical doctors have decreased odds of being disciplined. This finding also holds with the literature that male physicians are disciplined more often than female physicians (Khaliq et al., 2005; Kohatsu, et al., 2004).

The results of this study, although limited in scope, provide an overall indication that comprehensive factors in the backgrounds of medical doctors do have an effect, albeit minimally, on the disciplinary records of physicians. Because of the diversity of the Florida study population; these results can be generalized to all medical doctors nationwide.

Study Results and Applicability to the Theory of Human Error

Allnut's (1982) theory of human error identifies five steps during which incoming stimuli or information is processed to determine a response: (1) sensation is experienced via one or more of human sensory apparatuses such the eyes, ears, or touch; (2) perception occurs when the sensation is conveyed to the brain and the meaning is interpreted; (3) attention to the stimulus is given when a message passes through a decision channel that is influenced by the person's long-term memory, which can process only single pieces of information at a time while other pieces of information are waiting in the short-term memory storage to pass through the decision channel; (4) a cognitive decision is then made, and (5) a responsive action takes place. This theory as extrapolated to the context of medical error involves the patient's condition providing the stimuli for the physician's physical senses followed by the search for association with a previous experience or experiences from short term memory to assist in the perception of the situation. A medical doctor then has to assemble and interpret the perception through a single decision channel and perform decision-making analysis based upon long-term memory. Then, a responding course of action is undertaken.

It was theorized that during the information-processing sequence a medical doctor uses long-term memory to arrive at a decision, and the appropriateness of the decision is influenced by educational background, including the many facets that make up medical education, such as quality and pedagogical venue, including language. This study's finding that some physicians have greater odds of being given severer types of discipline depending upon the language used for instruction at medical school supports this theory. In contrast, however, this study did not find a relationship between educational quality and location of the medical school with either discipline rate or type. It is acknowledged that long-term memory in the form of the specific language used for any learning process may influence information processing. It is possible that unknown factors such as cultural background or learning ability are lurking variables that may be partly responsible for this result.

Additionally, other factors that are part of the individual makeup of any medical doctor, some of which are the control variables in the study, including ABMS certification, specialty practiced, gender, and race, may also contribute to the medical doctor's life experiences and are thus part of long-term memory. The unanticipated findings lend some support to the theory of human error such that these integral components of a physician's background, particularly gender and race, may affect long-term memory and hence, the decision-making process when practicing medicine.

Referring back to Figure 1, the significant result found by this study that receiving instruction in a language other than English during the study of medicine can cause the physician to receive more severe types of discipline may indeed be a function of long term memory thereby supporting the decision making sequence as depicted in Figure 1. This study's other significant predictor variables that were found to increase a physician's odds of receiving discipline, including practicing surgery, psychiatry, obstetrics and gynecology or being a male physician also support the theoretical framework as depicted in Figure 1 by supporting the premise that personal factors, which comprise the backgrounds of physicians may affect their long term memory and hence, the quality of their decision making process.

Limitations, Strengths and Weaknesses of the Study

This study has several limitations, including general limitations and data limitations. Also, weaknesses and strengths have been identified. These limitations, weaknesses, and strengths are described in this section.

General Limitations

The innate differences as to intelligence, personality, attitude, and physical capabilities of individual medical doctors are variables that cannot be controlled because data regarding these variables are not available or are inaccessible due to reasons of confidentiality. Likewise, data regarding the cultural demeanors or communication styles of the physicians were not available and the effect of such was not determined. Additionally, any individual medical doctor's practice setting or location, such as a solo, group, or hospital based practice, which may be located in a rural or urban area of the state, is not available in the data and therefore the effects of such cannot be determined. Also prohibited from use as study variables are confidential tests scores such as the United States Medical Licensing Examination (USMLE).

Data Limitations

The archival data used for this study were obtained from the Florida Department of Health (FL DOH) and were compiled and aggregated by public employees over a time period of at least 56 years (1952–2008). This recordkeeping regarding Florida's medical doctors began prior to the advent of computers and electronic data keeping, and the data have been converted at different points in time to multiple electronic formats. In essence, this database is always being updated as new physicians are added and as old physicians retire or expire. Therefore, it is assumed that any large body of data that is continually updated and changed over a lengthy period of time and that undergoes repeated format transformations is likely to contain inaccuracies and errors. Data errors that are specific to this study could include (1) errors regarding demographic data, including recording the wrong gender or race; (2) errors regarding type of specialty practiced and ABMS certification; for example, the data provided by the FL DOH listed only 151 medical doctors as ABMS certified, a figure that appears to be inordinately low and may be erroneous data; (3) errors regarding medical school attended; and, very importantly, (4) errors regarding the recording of disciplinary actions taken against physicians.

Another data limitation for which the scope of effect on the results will remain unknown is that the most recent version of *The Gourman Report, 8th Edition* was used as the sole source of the data pertaining to domestic medical school rankings. Previous editions of this difficult-to-obtain publication were not available. Therefore the possibility exists that the results may have been different had the rankings of domestic medical schools from different editions of *The Gourman Report* been averaged for use in this study.

A third data limitation concerns the use of the current International Medical Education Directory (IMED) to obtain data regarding languages currently used for instruction in medical schools worldwide. The possibility exists that medical schools may change the language of instruction at any time. Therefore the single use of the current IMED listings regarding language of instruction does not encompass any language of instruction change that may have occurred at any medical school in the past.

The final limitation concerns the fact that the archival data used has been compiled over a time period of 56 years, and during this period of time the members that make up the Florida Board of Medicine have changed and the standards of care of medical practice have changed as well. This change of standards may be caused by many factors, including the evolution of the science of medicine, societal change, and changing legal standards.

Therefore, past members of the Florida Board of Medicine may have taken disciplinary action against physicians regarding medical mistakes or physician indiscretions that later members of the Board might not consider as disciplinable offenses. In regard to this study, the data used regarding discipline may not be consistent over time and could cause inaccurate results.

Strengths of the Study

Data regarding large samples of actively licensed medical doctors currently practicing in the State of Florida were analyzed, thereby ensuring maximization of the statistical power of the results. Due to this large, diverse and microcosmic study population, it is assumed that the results of this study could certainly be generalized to the physician population of the United States and possibly to the physician population of the world.

The cleaning and coding of the raw, archival data involved a lengthy and painstaking process, which should have ensured accurate and complete operationalization of the variables and, hence, good measurement of the theoretical concepts. This detailed process should therefore lend validity to this study that is limited only by the quality of the raw, archival data that were received. Study reliability should also be enhanced because of this process.

Weaknesses of the Study

This study was limited in scope and complexity due to the use of nominal data. The low incidence of disciplinary actions may have resulted in low pseudo R-square values. Additionally, the analysis of Gourman rankings of medical schools may have caused inaccurate results because foreign schools that are not ranked by *The Gourman Report, 8th Edition*, were included in this category of independent variable. Furthermore, this study did not control for the age of the physicians, which is a factor shown to influence the outcome of the physician's practice (Charles et al., 1992; Kohatsu et al., 2004).

Implications for Public Policy

The requirements to be licensed and practice as a medical doctor in the State of Florida are specified by both Florida Statutes and Florida Administrative Codes. Changes to these legally enacted requirements involve legal processes that may or may not be based on scientific precepts.

The results of this study imply that the educational preparation of physicians in the form of the language used during their medical education may contribute to how well they practice medicine and whether they will be subject to discipline by the Florida Board of Medicine. Changing the requirements regarding the licensing of medical doctors, whether based on empirical studies such as this one or not, entails legal processes and possibly legislative enactments. Nevertheless, public policymakers should be answerable to the public that they serve, and any policy that measurably improves the quality of any component of the healthcare system, including the services that physicians provide, should be implemented forthright.

The Florida Board of Medicine has received criticism from the Washington, DC, consumer advocate group Public Citizen for having a low discipline rate for the year of 2007. According to Public Citizen's research, Florida ranks 31st among the 50 states and the District of Columbia by having only 2.89 serious disciplinary actions per every 1,000 medical doctors based upon a total licensed physician figure of 53,566 (Wolfe & Resnevic, 2008).

In comparison, the descriptive results of this study show that 4.6% or 1,821 medical doctors out of the study population of 39,559 medical doctors have been disciplined by the Board. Of the 1,821 medical doctors who were disciplined, 0.7% or 283 medical doctors were subject to serious discipline, including suspension of medical license, voluntary license surrender in lieu of disciplinary action, and permanent license revocation. This figure produces a discipline rate of 7.15 serious disciplinary actions per every 1,000 medical doctors, which is higher than Public Citizen's rate for the year of 2007 but is based only on the 39,559 Florida medical doctors used for this study and not the total number of Florida licensed physicians (active, inactive, out-of-state, etc.) listed in 2007. Also, this study includes serious discipline incurred by physicians who received their medical licenses from February 6, 1973, until June 27, 2005.

During the period of July 1, 2006, through June 30, 2007, the Florida Department of Health's Division of Medical Quality Assurance completed 2,060 investigations regarding complaints made against Florida licensed medical doctors, and 87 Florida medical doctors had their medical licenses suspended, surrendered, or revoked (Florida Department of Health Division of Medical Quality Assurance Annual Report, July 1, 2006 - June 30, 2007). Therefore, based on these figures, approximately 4% of the 2,060 investigations during this one-year period resulted in medical doctors incurring serious disciplinary action from the Florida Board of Medicine.

Although there should never be a quota regarding the incidences when a Board of Medicine should apply disciplinary actions to the population of medical doctors and knowing the quantity of physicians to target for disciplinary action is untenable, the point to be made is that periodic policy review by Boards of Medicine should be undertaken to ensure that the taking of any disciplinary actions against physicians is fair, objective, and impartial. Public Citizen's research included several recommendations that they believe will enable Boards of Medicine to improve the job of disciplining physicians:

(1) Sufficient funding of Board activities by channeling license fees to the Board instead of being used for general revenue purposes;

(2) Maintaining the appropriate number of employees to support Board activities;

(3) Investigating physicians proactively instead of just investigating complaints;

(4) Using all available sources, such as law enforcement agencies or medical insurance providers to initiate investigations of alleged wrongdoing or incompetence by physicians;

(5) Maintaining Board independence from medical societies and state agencies; and

(6) Applying the appropriate legal standard of proof when making decisions about physician discipline (Wolfe & Resnevic, 2008).

Regarding the finding that medical doctors who received their medical training in medical schools where the instruction was not in English, the policy implications may be somewhat clearer. Perhaps upon a foreign medical school graduate's initial application for licensure as a Florida physician, it could be determined if the applicant graduated from a medical school where the instruction is not in the English language. Thereafter, applicants in this category could become licensed on a probationary basis for a limited period of time while they are monitored by experienced physicians who periodically review their performance. Upon successful completion of a probationary period, the physician would achieve normal licensure status. This would be a preventive method to reduce the possibility of patient harm and the Florida Board of Medicine should explore the options available in this realm.

Although this study focused on a small and specific area of the healthcare delivery system, that of physician educational preparation as it relates to physician error, improvement in any facet of the healthcare delivery system is warranted and desired. It may need to be realized that the possibility of empirically defining the background characteristics that a physician must possess to practice medicine without making errors is limited (as it may never be possible to predict which pilots will make in-flight errors or predict which persons will commit crimes) and that a systems approach to error prevention, such as that used in the field of aviation, should be pursued.

The etiology of medical errors must be understood in the context of risk avoidance. Wan and Connell (2003) explain the necessity of risk adjustment and how healthcare quality can be monitored using such techniques. The Agency for Healthcare Research and Quality (AHRQ) also offers methodologies to reduce medical errors (AHRQ, 2000).

According to Kohatsu et al. (2004), physician deficiencies should be identified early through a systematic approach with subsequent remediation to promote reduced opportunities for errors to occur. Leape (2004) believes that medical students should be taught about human error, systems failures, and system analysis. Clearly, public policymakers have numerous options to consider when formulating policy that concerns the delivery of medical services by physicians.

Recommendations for Future Research

This study was based on Allnut's (1982) theory of human error and in particular that a person's long term memory influences the decision-making process and, hence, the appropriateness of actions taken based on the decisions that are made. It was hypothesized that the quality of the medical school learning process may influence a medical doctor's long-term memory and therefore her or his decision-making process when practicing medicine. Most significantly, it was suggested by the results of this study that physicians practicing in Florida who attended medical schools where English was not used for instruction do not perform as well as those who attended schools where English was used for instruction and that this inferior performance manifested as a greater likelihood of being subject to more severe types of disciplinary actions.

It is recognized that this finding regarding medical school language of instruction could be caused by many variables that were not included in this study and that this study gives a hint about other research that could give insight into the factors involved. The suggestions for future research fall into the categories of research that would expand the scope of this study and research that would further explore the findings of this study.

Recommendations for Research That Expands the Scope of This Study

This study could be replicated but with the study variables or data expanded in the following ways:

(1) Obtain similar archival data from other states to compare and contrast the results from different states. For instance, the analysis completed by the consumer advocate group Public Citizen identified the ten states with the lowest rates of serious physician disciplinary actions and the ten states with the highest rates of serious disciplinary actions (Wolfe & Resnevic, 2008). A future study could include the disciplinary data from states in both of these categories along with Florida (ranked 31st out of 51) to explore the influence of medical education as it relates to Medical Board disciplinary action.

(2) Expand the independent variable category of domestic or foreign medical school to include geographic regions of the world such as Asia, Africa, etc., or expand this category further to perform an analysis based on the countries where the medical schools are located.

(3) Expand the independent variable category of medical school language of instruction by using each different language as listed in the International Medical Education Directory (IMED) as separate independent variables such as English, Spanish, French, Russian, Chinese, etc.

(4) Expand the control variable category of surgical specialty to include the different categories of surgical specialties such as thoracic surgery, orthopedic surgery, plastic surgery, etc.

(5) Expand the control variable category of race to include the ethnic group as listed by the physician in the data.

(6) Expand the control variable category of specialty certified to include physicians that do not become recertified in their specialty to explore the impact of being recertified or not recertified on disciplinary involvement.

(7) Capture data regarding the communication styles of physicians to understand the relationship with discipline.

(8) Add the years as a practicing physician to explore the impact of experience on disciplinary involvement.

(9) Explore the mode of practice, such as solo or in a hospital; and the location of practice, such as rural, suburban or urban on disciplinary involvement.

(10) If available, obtain USMLE scores to determine their relationship to discipline.

Recommendations for Research That Further Explores the Findings of This Study

Additional research could be undertaken that could further explore some of the hypotheses and findings of this study. This would include the following recommendations for additional research:

(1) Research that would explore the effect of different medical schools' curriculum and other instructional factors on the disciplinary records of the graduates since wide variation may exist between the curriculum, the method of pedagogy, the medical school's resources, the medical school's culture, and overall quality of instruction. Other researchers have called for studies regarding medical school curricula and culture as possible variables that have impact on whether the graduates are alleged to have committed malpractice (Waters et al., 2003).

(2) Research could be undertaken where medical schools are be sorted into variable categories based on whether or not training is offered in such subjects as communication skills, medical ethics, genetics, palliative care, and pain management (Noah, 2005). Therefore, some indication might be gained regarding the efficacy of such training to minimize the disciplinary records of graduates.

(3) The resources possessed by different medical schools may determine whether or not the school is able to offer the latest pedagogical technology such as realistic high-tech procedural simulators, virtual reality, or realistic high-tech interactive patient simulators (Ziv et al., 2000). A study could be developed to determine if there is any association between a medical school's financial resources and the disciplinary records of the graduates.

(4) Teherani et al. (2005) found that having a record of discipline in medical school for unprofessional behavior was associated with later Medical Board disciplinary action for

graduates. Papadakis et al. (2005) found that disciplinary action taken against physicians was strongly associated with unprofessional behavior by those physicians while students in medical school. Therefore, research involving different medical schools' rates of disciplinary action against students could determine if any relationship exists between medical school disciplinary rates and the disciplinary records of the graduates.

(5) The impact on physician discipline of cultural factors should be explored, particularly if the physician and patient do not share similar cultural backgrounds.

Summary

This study explored characteristics of the medical education of physicians to find if there was any association between graduates of foreign or domestic medical schools and amount or type of disciplinary actions from the Florida Board of Medicine. Consequently, a relationship between the language used for instruction in medical school and the disciplinary records of the medical school's graduates was found. Several unanticipated findings included the following: Practicing surgery not only increases the odds of being disciplined but also increases the odds of having imposed a more severe type of discipline. Practicing obstetrics, gynecology, psychiatry, emergency medicine, family medicine or diagnostic radiology increases the odds of being disciplined, and male medical doctors have increased odds of being disciplined. Also unanticipated was the finding that not being ABMS certified decreases the odds of being disciplined, a finding that may be in error due to inherent inaccuracy of the archival data.

This study is unique because the data used for the dependent variables were derived from disciplinary actions against medical doctors by the Florida Board of Medicine and by measuring the disciplinary actions in two dimensions: number of times disciplined and the severity of discipline. This study also explored the novel hypothesis that graduates of medical schools where classes are not taught in the English language encounter greater and more severe disciplinary action when compared to graduates of medical schools where instruction is in English.

The indication that some physicians have greater odds of being given severer types of discipline depending upon the language used for instruction at medical school lends support to Allnut's (1982) theory of human error, which is the theory upon which this study was based. Hence, during the information-processing sequence a medical doctor uses long-term memory to arrive at a decision, and the appropriateness of the decision is influenced by educational background, including the language that the physician used to study medicine.

The archival data used for this study were obtained from the Florida Department of Health (FL DOH) and may have contained inaccuracies in demographic data as well as disciplinary and other data. Another data limitation would include use of only *The Gourman Report, 8th Edition* as the sole source of data pertaining to domestic medical school rankings. Two other limitations inherent in the data were identified.

Strengths of the study would include that large samples of actively licensed medical doctors currently practicing in the State of Florida were analyzed ensuring statistical power and that this microcosmic study population fairly well assures that the results of this study could certainly be generalized to the physician population of the United States. Validity and reliability were enhanced due to extensive data cleaning and accurate operationalization of the variables.

Weaknesses of the study include the use of nominal variables and not controlling for the age of the physician population.

The implications for public policy as a result of this research include perpetual reexamination of physician licensing and disciplinary policies by governmental entities, particularly Boards of Medicine. Additionally, several recommendations were proposed by Wolfe & Resnevic (2008) that would assist Boards of Medicine to improve the task of disciplining physicians.

Finally, several recommendations were listed for continuing research or developing new research regarding the relationship between medical education and the disciplining of physicians.

These recommendations included ways that this study could be replicated with the expanded study variables or data and suggested research that would further explore some of the hypotheses and findings of this study.

The performance of physicians is a crucial component of our healthcare system. It is hoped that this study contributes to the body of literature concerning this very important aspect of the healthcare system.

APPENDIX A: GOURMAN RANKINGS OF DOMESTIC MEDICAL SCHOOLS

Gourman Score	Graduates included in study	Graduates as percent of study	Domestic medical school name
3.03	254	.6	Universidad Central Del Caribe, Puerto Rico
3.04	223	.6	Ponce School of Medicine, Puerto Rico
3.05	23	.1	Mercer University
3.06	40	.1	Morehouse School of Medicine
3.07	86	.2	Wright State University
3.08	427	1.1	Hahnemann University
3.09	17	.0	Texas A & M University
3.1	111	.3	University of South Alabama
3.11	56	.1	East Tennessee State
3.12	122	.3	Eastern Virginia
3.13	41	.1	Marshall University
3.14	44	.1	East Carolina University
3.15	77	.2	Northeastern Ohio Universities
3.16	15	.0	University of South Dakota
3.17	19	.0	University of North Dakota
3.18	83	.2	Uniformed Services University of the Health Sciences
3.2	16	.0	University of Nevada
3.21	82	.2	University of South Carolina
3.22	513	1.3	University of Puerto Rico
3.23	145	.4	Medical College of Wisconsin
3.24	55	.1	University of Massachusetts
3.25	15	.0	University of Hawaii
3.26	128	.3	University of Medicine and Dentistry of New Jersey at Piscataway
3.27	44	.1	Texas Tech University Health Sciences Center
3.28	46	.1	Southern Illinois University
3.29	32	.1	University of New Mexico
3.3	198	.5	Howard University
3.31	290	.7	University of Health Sciences Chicago
3.32	144	.4	Medical College of Ohio
3.33	334	.8	Medical College of Georgia
3.34	233	.6	Virginia Commonwealth University

Gourman Score	Graduates included in study	Graduates as percent of study	Domestic medical school name
3.35 (average of scores: 3.26 and 3.43)	133	.3	University of Medicine and Dentistry of New Jersey at Piscataway or Newark (location of attendance undetermined)
3.36	79	.2	Rush Medical College
3.37	152	.4	Meharry Medical College
3.39	123	.3	University of Mississippi
3.4	199	.5	Medical University of South Carolina
3.41	1329	3.4	University of South Florida
3.42	35	.1	University of Arizona
3.43	204	.5	University of Medicine and Dentistry of New Jersey at Newark
3.45	103	.3	University of Arkansas
3.46	57	.1	University of Texas at Houston
3.47	139	.4	West Virginia University
3.48	127	.3	University of Oklahoma
3.49	379	1.0	Jefferson Medical College
3.5	487	1.2	New York Medical College
3.62	315	.8	University of Tennessee at Memphis
3.63	18	.0	Louisiana State University at Shreveport
3.64	95	.2	University of Vermont
3.65	190	.5	University of Kentucky
3.66	92	.2	University of Nebraska
3.67	294	.7	University of Alabama
3.68	302	.8	Louisiana State University at New Orleans
3.69	84	.2	State University of New York Health Science Center at Syracuse
3.7	207	.5	University of Cincinnati
3.71	536	1.4	State University of New York Health Science Center at Brooklyn
3.72	94	.2	Pennsylvania State University
3.73	137	.3	University of Texas Health Science Center at San Antonio
3.74	75	.2	University of Texas at Galveston
3.75	59	.1	University of Missouri at Kansas City
3.76	126	.3	University of Texas at Dallas

Gourman Score	Graduates included in study	Graduates as percent of study	Domestic medical school name
3.77	77	.2	Michigan State University
3.78	2492	6.3	University of Miami
3.79	292	.7	University of Maryland
3.8	1737	4.4	University of Florida
3.81	34	.1	University of Utah
3.82	227	.6	Albany Medical College
3.83	31	.1	Oregon Health Sciences University
3.84	39	.1	Mayo Medical School
3.85	57	.1	University of Colorado
3.86	131	.3	Creighton University
3.87	120	.3	University of Kansas
3.88	79	.2	University of Connecticut
3.89	167	.4	Mount Sinai
3.9	161	.4	Case Western Reserve
3.97 (average of scores: 3.75 and 4.19)	25	.1	University of Missouri at Columbia or Kansas City (location of attendance undetermined)
3.98 (average of scores: 3.69, 3.71, 4.15 and 4.36)	53	.1	State University of New York at Syracuse, Brooklyn, Stony Brook or Buffalo (location of attendance undetermined)
4.14	72	.2	Brown University
4.15	217	.5	State University of New York at Stony Brook
4.16	13	.0	University of Saskatchewan
4.17	344	.9	Temple University
4.18	301	.8	Wayne State University
4.19	95	.2	University of Missouri at Columbia
4.2	39	.1	University of Southern California
4.22	31	.1	Dartmouth Medical School
4.24	194	.5	St. Louis University
4.25	152	.4	Loyola University of Chicago; University of Sherbrooke
4.26	209	.5	University of Louisville
4.28	230	.6	Albert Einstein College
4.29	157	.4	Loma Linda University

Gourman Score	Graduates included in study	Graduates as percent of study	Domestic medical school name
4.3	215	.5	University of Pittsburgh
4.31	383	1.0	Emory University
4.32	199	.5	Bowman Gray
4.33	155	.4	Baylor College of Medicine; Dalhousie University
4.34	11	.0	University of California at Irvine
4.35	229	.6	George Washington University
4.36	202	.5	State University of New York at Buffalo
4.37	334	.8	Ohio State University; Memorial University of Newfoundland
4.38	309	.8	Georgetown University
4.39	37	.1	University of Washington
4.4	142	.4	University of Iowa
4.41	324	.8	University of Illinois at Chicago
4.42	115	.3	University of Wisconsin
4.43	357	.9	Indiana University; University of Calgary
4.44	241	.6	Boston University
4.45	9	.0	University of California at Davis
4.46	241	.6	Tufts University; University of Alberta
4.47	182	.5	University of North Carolina at Chapel Hill
4.48	213	.5	University of Virginia; University of Western Ontario
4.49	18	.0	University of California at San Diego
4.51	29	.1	University of Ottawa
4.57	27	.1	University of Manitoba
4.6 (average of scores: 4.34, 4.45, 4.49, 4.81 and 4.90)	34	.1	University of California at Davis, Irvine, Los Angeles, San Diego or San Francisco (location of attendance undetermined)
4.62	320	.8	New York University; Université Laval
4.65	179	.5	State University of New York Health Science Center at Brooklyn
4.68	125	.3	University of Rochester; Queen’s University
4.7	439	1.1	Tulane University
4.71	132	.3	University of Minnesota
4.73	190	.5	Northwestern University
4.74	14	.0	McMaster University

Gourman Score	Graduates included in study	Graduates as percent of study	Domestic medical school name
4.76	167	.4	Washington University
4.78	280	.7	Duke University; University of Montreal
4.81	59	.1	University of California at Los Angeles
4.82	267	.7	University of Michigan
4.84	145	.4	Cornell University
4.85	44	.1	Stanford University; University of British Columbia
4.86	197	.5	Columbia University
4.88	89	.2	University of Chicago
4.89	125	.3	Yale University
4.9	121	.3	University of California at San Francisco; University of Toronto
4.91	389	1.0	University of Pennsylvania McGill University
4.92	178	.4	John Hopkins University
4.93	154	.4	Harvard Medical School
Total graduates of domestic medical schools	25,479	64.4	
Total graduates of foreign medical schools	14,080	35.6	
Grand total	39,559	100.0	

APPENDIX B: CORRELATION MATRIX FOR SAMPLE 2 STUDY VARIABLES

Variable	Disc rate	Disc type	Gourman ranking of med school	Specialty certified or not	Surgical specialty	OB-GYN, psychiatry	EM, Fam-med, radiology	Gender	Race
Disc rate	1	.936**	.000	.073**	.053**	.011	-.006	.071**	.014*
Disc type	.936**	1	-.002	.072**	.045**	.018**	-.007	.070**	.014*
Gourman ranking of med school	.000	-.002	1	-.002	-.062**	.034**	.028**	-.072**	-.081**
Specialty certified or not	.073**	.072**	-.002	1	.003	.000	.003	.000	.000
Surgical specialty	.053**	.045**	-.062**	.003	1	-.146**	-.224**	.163**	.069**
OB-GYN, Psychiatry	.011	.018**	.034**	.000	-.146**	1	-.146**	-.089**	-.031**
EM, Fam-med, Radiology	-.006	-.007	.028**	.003	-.224**	-.146**	1	-.027**	-.024**
Gender	.071**	.070**	-.072**	.000	.163**	-.089**	-.027**	1	.170**
Race	.014*	.014*	-.081**	.000	.069**	-.031**	-.024**	.170**	1

N = 25,479
*p < .05; **p < .01

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