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The Relationship Between Physicians' Ownership of Physical Therapy Services and Referral Patterns to Hospital-Based Outpatient Rehabilitation Centers

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

by

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TABLE OF CONTENTS

Page

Page

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

ABSTRACT

THE RELATIONSHIP BETWEEN PHYSICIANS' OWNERSHIP OF PHYSICAL THERAPY SERVICES AND REFERRAL PATTERNS TO HOSPITAL-BASED OUTPATIENT REHABILITATION CENTERS

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Background and Purpose

A debate over the practice of physician self-referral has been ongoing in health care since the 1980s. At issue is the practice of physicians who refer patients to facilities in which they share a financial interest, a phenomenon known as referral for profit. Physician investment or ownership interest in ancillary (e.g., physical therapy) services has been shown to have an impact on utilization rates, costs, access to care, and quality of care. What has not been identified in previous research is the influence of physicians' selective referral on competing clinics, particularly the hospital-based outpatient centers that share their health care markets. The purpose of this research was to examine the relationship between the emergence of orthopaedic physician owned physical therapy

services (POPTS) and changes in physical therapy referrals made to two groups of not-for-profit, hospital-based outpatient physical therapy (OPPT) centers in one health care market.

Methods

This study examined the referrals made by orthopaedic physicians to two large hospital systems in the Orlando, Florida, outpatient physical therapy market between 1999 and 2007. This study was conducted using existing proprietary databases maintained by the Orlando Regional Healthcare System (ORHS) and Florida Hospital System (FHS), as well as phone surveys conducted by the primary investigator. Information regarding the orthopaedic physicians' ownership status and the patients' payer types was combined into analyses to determine if physician status was related to the number of physical therapy patients from each payer type referred, or the number of total referrals made to the hospital-based outpatient physical therapy facilities.

Comparisons were made between physicians who became owners of physical therapy services during the study period and physicians who never became owners of physical therapy services. Mixed Linear Models (MLM) were used to test for the effects of physician ownership and the combined influence of physician ownership and payer type on referrals for OPPT. Point estimates and 95% confidence intervals were calculated for the mean differences between Group 1 and Group 3 physicians for changes in OPPT referrals over time. The analyses were conducted first with samples of physicians who met a minimum criterion of ten referrals within the first year of data included in the data sets. Use of this criterion resulted in a small pool of physicians who qualified for

inclusion in the testing. Data were compared between years 1 and 5 and then between years 1 and 2 versus 4 and 5. The criterion for physicians' inclusion was revised for post hoc analysis in an attempt to increase the sample size. All of the statistical tests were repeated in post hoc with the larger samples of physicians who met the minimum criterion of an average of ten referrals per year for years 1 and 2 rather than just the referral count for year 1.

Results

Overall, there was no statistically significant change in the total referrals as a result of a change in physicians' ownership status. Tests for the influence of payer type, physician group, and ownership status on referrals also revealed no significant differences between the two physician groups. Point estimates of the differences between Group 1 and Group 3 for changes in mean referrals supported the hypothesized relationships between physicians' ownership status and total referrals, referrals of commercially insured patients, and referrals of underinsured patients; however, the 95% confidence intervals for the point estimates were consistent with the non-significant MLM results. The hypothesized relationship between POPTS and referrals of Medicare patients was not supported in any of the analyses. In post hoc testing of the combined influence of payer type, physician group, and ownership status on referrals, a three-way interaction between physician group, payer type, and status was found ($p=0.034$, $\alpha \leq 0.05$). Including a larger sample size in the post hoc analyses led to outcomes that were different than those seen in the initial statistical tests.

Conclusion

This research outlines a novel approach to analyzing the influence of physician ownership and payer type on referral behaviors. The findings suggest that physicians' ownership of physical therapy services was not a predictor of their referrals to hospital-based OPPT services. Specifically, there was no significant effect of physician ownership of OPPT services on the total volume of referrals made to two hospital-systems' OPPT clinics. There also was no significant relationship between physician ownership, payer type, and referrals made to the hospital-based clinics. The theory predicting that POPTS physicians would work to eliminate market competition by reducing referral volumes and retaining patients with more lucrative reimbursement for their own practices was not supported. However, post hoc analysis with a larger sample size provided some evidence that a larger sample may have revealed the hypothesized relationships between physician ownership, payer type, and referrals for OPPT. Future research utilizing larger samples and data tracking physicians' OPPT referrals from their origins to their final dispositions are needed to clarify the relationships between physicians' ownership of OPPT services and the referrals they make for those services.

CHAPTER I: INTRODUCTION

A debate over the practice of physician self-referral has been ongoing in health care since the 1980s. At issue is the practice of physicians who refer patients to facilities in which they share a financial interest, a phenomenon known as referral for profit. The types of facilities that typically receive such referrals include, but are not limited to, specialty hospitals, imaging centers, clinical laboratories, medical equipment suppliers, orthosis and prosthesis suppliers, and rehabilitation centers. While it is legal for physicians to invest in ancillary services, some researchers suggest that ownership interest in these facilities or services may provide financial incentives for some physician investors to generate referrals and increase utilization beyond identified patient needs (Mitchell & Scott, 1992b, 1992c; Mitchell & Sunshine, 1992).

Health care markets have evolved out of atypical relationships between providers and consumers of goods and services, meaning that there is an uneven distribution of information between the patients and their health care providers. In particular, physicians are unique in that they may serve both as the patients' agent and the provider of services. As patient agent, the physician may recommend to a consumer that they pursue a particular treatment to reduce or eradicate disease or symptoms. If the physician is motivated to make recommendations based upon anything other than the patients' best interests, the physician may encourage them to pursue additional treatment even when

additional treatment is not needed. This is known as physician inducement of consumption of medical services. This behavior is possible in the health care market because the distribution of information between physicians and their patients is often imperfect. Typically, patients must rely on the physicians' recommendations for treatment, and most patients likely assume that the physicians are making these recommendations based upon the patients' welfare.

In most cases patients' reliance upon physicians' recommendations and referrals empowers physicians as gatekeepers to ancillary services such as physical therapy. Since the physician may also assume the role of provider of these services (e.g., via the ownership of a physical therapy practice), however, a potential conflict of interest arises. Self-referring physicians may have the financial incentive of enhanced income as a motivator to induce need for the services they provide or invest in, whether or not they produce additional health benefit to the patient.

Physicians may be motivated to invest in ancillary services for a variety of reasons. A 2005 report to Congress on physician-owned specialty hospitals suggests that physicians are motivated to own and participate in these facilities to increase their direct control of operations and to augment their incomes (MedPAC, 2005). A position statement generated by the American Academy of Orthopaedic Surgeons in 2004 supports POPTS stating that they give "…physicians a greater role in the physical therapy services provided to patients. In-office therapy allows therapists and physicians to work together as a team, exchanging information and sharing ideas. The frequency and immediacy of feedback allow for the fine-tuning of therapeutic protocols that serves to improve patient

outcomes"(American Academy of Orthopaedic Surgeons, 2004). Physicians' job satisfaction also has been closely tied to their professional autonomy and their compensation (Grembowski et al., 2003; Mitchell, Hadley, Sulmasy, & Bloche, 2000). However, managed care and changes in fee schedules have slowed the growth of physician incomes in almost all specialty areas (Medical Group Management Association, 2009; Tu & Ginsburg, 2006) (Appendix B: Part 1 and 2). Tu and Ginsburg reported that between 1995 and 2003, "…surgeons' real income declined by 8.2 percent" (Tu & Ginsburg, 2006). Managed care's capitated payment schemes provide set reimbursement for services for specific patient groups, irrespective of the quantity or intensity of care needed to achieve desired health outcomes. These payment rates are typically lower than the rates paid to physicians under traditional fee-for-service programs, meaning that each patient encounter has become less profitable (Shih & Singh, 2007). In addition, the numbers of underinsured or uninsured patients who continue to access the health care system are increasing, further reducing reimbursement to health care providers and institutions for the treatment they provide (U.S. Census Bureau, 2007).

Receipt of less revenue per patient may motivate physicians to increase the quantity or scope of services they render to patients in an attempt to supplement their incomes or to offset reductions from other causes (Bert, 2008; Duxbury, 2008; McGuire & Pauly, 1991; Nguyen, 1994). The loss of revenue under current payment schemes also may provide incentives for these practitioners to selectively self-refer patients with better insurance. As a result of the variations in insurance coverage, the same modality or procedure provided to one patient can prove more lucrative than when provided to another. Since

certain payer groups provide higher compensation than other groups, physicians motivated by income may choose to send patients with limited reimbursement or patients with less lucrative reimbursement to outside facilities while retaining patients with better reimbursement for their own practices (Ahern & Scott, 1992).

Payment schemes are not the only potential motivator for selective self-referral. Since one potential incentive for physicians to self-refer is increased income, these clinicians may target less complex patient populations for selective self-referral, because the costs of caring for these individuals are less than the costs of caring for more medically involved patients. Less complex patients are likely to require less of the physicians' time and services, allowing him or her to increase overall patient volumes for the services they provide, including physical therapy. If potential revenue exceeds the cost of production, however, physicians may wish to retain these patients for their own practices, because they would be able to charge for the additional services the patients received.

Though selective self-referral may prove beneficial to physicians who serve as both gatekeepers and providers of services, the consequences of such referral practices, if they exist, could prove detrimental to the outside providers of similar services. For example, hospitals that provide a broad spectrum of services may experience case mixes that are skewed toward patients who are more medically complex or who have little or no insurance (Accreditation Council for Graduate Medical Education, 2005). To promote financial stability, many hospitals provide or are expanding into other business lines, including pain management, cardiology, neurosurgery, imaging, and rehabilitation (MedPAC, 2006). Physicians are also expanding into these potentially more profitable

lines, leading to additional competition for patient resources (Bert, 2008; B. Hillman, Olson, Griffith, Sunshine, Joseph, Kennedy, Helson, et al., 1992; MedPAC, 2006; Mitchell, 2007; Mitchell & Scott, 1991, 1992a, 1992b; Scott & Mitchell, 1994).

The relationship between physician ownership and ancillary health care service utilization has been the focus of previous research. The body of evidence includes investigations of the relationship between physicians' ownership or investment interests and utilization of specialty hospitals (Government Accountability Office, 2003; Medicare Payment Advisory Committee, 2005, 2006), radiological services (Childs & Hunter, 1972; Government Accountability Office, 1994; B. Hillman et al., 1990; B. Hillman, Olson, Griffith, Sunshine, Joseph, Kennedy, Helson, et al., 1992; Mitchell, 2007; Mitchell & Scott, 1991, 1992c; Mitchell & Sunshine, 1992), laboratory services (Ahern & Scott, 1992; Danzon, 1982), and physical therapy services (Mitchell & Scott, 1992b; Swedlow, Johnson, Smithline, & Milstein, 1992). Specific to physical therapy, physicians' ownership interests have been shown to influence service utilization rates and costs for workers' compensation programs for outpatient physical therapy (Mitchell, 2007; Mitchell & Scott, 1992b; Mitchell & Sunshine, 1992; OIG, 1994; Olshin, Ciolek, & Hwang, 2002; Swedlow, et al., 1992). These studies are discussed in greater detail in the review of literature in Chapter II.

The present research examined the relationship between physician-owned physical therapy services and the community hospitals that share their health care markets. Prior to this, no research was found that examines the relationship between physician ownership interest and the patterns of referrals made to hospital-based outpatient rehabilitation

centers for physical therapy services. Based upon the available evidence, it is unclear if selective referral for physical therapy exists and is influencing current practice (American Hospital Association, 2005; Mitchell & Sass, 1995; Mitchell & Scott, 1991, 1992a, 1992b, 1992c; Mitchell & Sunshine, 1992). This dissertation focused on the question of whether orthopaedic physician owners of physical therapy service (POPTS) may be selecting patients within certain payer groups (e.g., Medicare or underinsured) to send to hospital-based outpatient physical therapy clinics and not selecting other groups (e.g., commercially insured) for referral to external providers of OPPT. Understanding the issue of selective referral may help guide policy development in order to safeguard patients, hospitals, and market competitors from the potential jeopardy inherent in physicians' self-referral practices.

The purpose of this study was to examine whether the emergence of orthopaedic physician owned physical therapy services (POPTS) in a health care market was related to changes in physical therapy referrals received by the hospital-based outpatient rehabilitation centers that share that market. For this research, databases from two large, hospital-based outpatient rehabilitation providers were used to track orthopaedic physicians' referral patterns from 1999 to 2007. The Orlando Regional Healthcare System (ORHS) and Florida Hospital System (FHS) provided access to their databases tracking the total numbers and types of referrals made to their physical therapy clinics. The ORHS data also included information on patients' insurance types, which allowed for the analysis of the influence of physician ownership status and patients' insurance types on referrals for hospital-based OPPT services.

CHAPTER II: BACKGROUND AND REVIEW OF THE LITERATURE

The following chapter is divided into five sections. The first section provides background information on the economics underlying selective self-referral. The second section is a literature review providing empirical evidence of the impact of self-referral. The Review of the Literature provides an exploration of the evidence regarding physician ownership interest and its relationship to ancillary health care service utilization and costs. Included are reports and articles that highlight issues pertaining to physicians' dual agency. The studies presented in this section are critiqued in order to identify gaps in the existing knowledge base and clarify the methodological and theoretical frameworks that were used to guide this research. The discussion begins with the introduction of the self-referring or **entrepreneurial** physician and examines the influence that physicians' ownership interest in ancillary services appears to have on health care utilization, access, and quality. These details are then tied to the specific research questions and hypotheses that guided this investigation.

The third section of this chapter clarifies public policy responses to physician self-referral practices. Prompted by escalating health care costs, policymakers and payers are more closely scrutinizing the entrepreneurial practices of physicians as a possible source of health care market inefficiencies. Included in this segment is a model of physicians' behaviors that helps to explain their entrepreneurial responses to market incentives,

including annexation of ancillary health care services. For this research, particular attention is paid to physicians with ownership interest in outpatient physical therapy services.

The fourth section is an overview of the background of the study setting, Orlando, Florida. The fifth and final section of this chapter presents the potential problems with self-referral that this study addressed.

Background on Physician Ownership Interest in Ancillary Services

Physician investment in health care services is not a new phenomenon, but recently, several issues are prompting policymakers and payers to more closely monitor physician investors' behaviors. Investigations of the influence of ownership interest on market competitors, service utilization, health care costs, and access to care have raised concern among policymakers and payers that physician ownership may be influencing the consumption of health care resources. Before exploring these concerns, however, a distinction between types of physician ownership interest must be made.

Among the many types of physicians' ownership arrangements is the joint venture practice. Joint venture practices provide ancillary services (e.g., physical therapy services) and are owned by physician investors (Mitchell & Scott, 1992b). Mitchell and Scott define a joint venture as "…any ownership or investment interest between referring physicians (or any health care professional who makes referrals) and a business providing health care goods or services" (Mitchell & Scott, 1992c, p. 27). Facility investments may include notes, bonds, debentures, and real property investment (e.g., landlord/tenant relationships) with the physician, their immediate family member, a trust, or another

entity related to the investor. These relationships partly tie physicians' incomes to the revenues of these facilities, providing incentives for the physicians to work to ensure their success.

Joint venture practice proponents contend that, because of the close working relationship between the physicians and the ancillary facilities, these practices provide economies of scale, increase the practice's ability to compete in the health care market, diversify physicians' investment risks, improve access to financing, improve quality, and provide access to underserved regions (Mitchell & Scott, 1992a). However, evidence suggests that these types of arrangements may provide a potential conflict of interest by increasing incentives to promote utilization and generate charges, which would eventually lead to improved physician investor incomes. In addition, physicians participating in these kinds of arrangements have been accused of purposely retaining patients with better reimbursement for their own practices via a captive referral system, subsequently limiting competition by other providers (Mitchell & Scott, 1992a). For the purposes of this research, this phenomenon will be termed **selective referral**.

Physician investors in joint venture practices tend to participate in ancillary services that they utilize regularly. For example, according to a survey of Florida physicians conducted by Mitchell and Scott in 1992, internal medicine physicians were likely to invest in clinical laboratory services (50.6%), diagnostic imaging (35.2%), durable medical equipment (36.1%), home health agencies (32.8%), radiation therapy (36%), and acute care hospitals (33.7%) (Mitchell & Scott, 1992a). Orthopaedists, on the other hand, were the most likely of all physician groups surveyed to own or participate specifically in

physical therapy (31.7%), services to which their patients' outcomes are closely tied (Mitchell & Scott, 1992a). In addition to these ownership trends, physician investors in joint venture practices have demonstrated a tendency to refer more often to the services they partly own and to serve lower proportions of Medicaid and uninsured patients, lending credence to the notion of selective referral patterns (Ahern & Scott, 1994).

Specific to physical therapy are physician owned physical therapy services, or POPTS. POPTS services are provided within physicians' offices or facilities, whether by the physicians themselves or by non-physician providers, physical therapists, and physical therapist assistants in their employ. As is true for joint venture practices, the ownership of POPTS practices is most common for orthopaedic providers. A 2003 survey of American Physical Therapy Association (APTA) Private Practice Section (PPS) members conducted by the Association mirrored the findings of Mitchell and Scott (1992). Survey results showed that 33% of POPTS participants identified were orthopaedists and that other providers (e.g., chiropractors, physiatrists, family practice physicians) were increasingly developing their own POPTS practices (Graham, 2003). This trend suggests there may be an incentive for referring practitioners to invest in ancillary services to which they make referrals.

The Economics of Self-Referral

Over the past few decades, government agencies and payer groups have attempted to curb the exponential growth of health care costs. One of the areas these groups have focused on is physicians' efficiency. In the 1980s, two significant payment changes began putting pressure on physicians to improve their efficiency in providing treatment.

These programs included Medicare reform and managed care programs that provided capitated or salaried fees (Ahern & Scott, 1992; Office of the Actuary, 2010). The rationale behind the imposition of the fee capitations was that reduced reimbursement would provide incentives for physicians to improve the efficiency of their patient care through the judicious application of tests and procedures. In spite of these policy and program changes, however, health care cost inflation continued, in part due to increased quantities of outpatient services being ordered (Gabel, Jajich-Toth, de Lissovoy, Rice, & Cohen, 1988). So why did these policies fail to curb spending? They failed, in part, because physicians responded to the financial incentives and price signals of the health care market.

Essential to understanding the issue of self-referral is the idea that physicians are potentially entrepreneurial, working to either maximize their practices' profitability or to achieve a desired income (Dobson & Haught, 2005). With few exceptions, the introduction of managed care practices has led to significant changes in most physicians' compensation patterns over the past 15 years. Many physician incomes have plateaued or declined relative to rates of inflation and costs of living. This is particularly true for physicians, such as orthopaedists, who provide specialty services. Trends on physician compensation through 2003 are included in Appendix B: Part 1 (Tu & Ginsburg, 2006). More recent data for physician incomes are also included in Appendix B: Part 2 (Medical Group Management Association, 2009). The decline in income, along with an erosion of professional autonomy, has led to reduced physician job satisfaction (Mitchell, et al., 2000; Warren, Weitz, & Kulis, 1998). Evidence suggests that, along with these changes

in compensation, physicians are exploring other means of improving their incomes, such as by increasing the scope of services provided or investing in other services. As a result, physicians' motivation to improve their incomes may sometimes be at odds with the efforts of payer groups to contain health care costs. Discounted fee schedules, capitated payments, salaried compensation arrangements, and evolving government policies are harbingers of the growing conflict between payers and entrepreneurial physicians over increasingly scarce health care resources.

A basic model of physicians' behaviors that highlights physicians' responses to financial incentives was proposed in 1991 by McGuire and Pauly. These researchers described the literal target income (LTI) model, which suggests that when profit margins are reduced (e.g., reduced fee payment schedules), physicians may induce the need for additional services in order to achieve their LTI or to maximize their profitability (McGuire & Pauly, 1991). Following their investigations, McGuire and Pauly concluded that large changes in profit margins, such as in the case of shrinking reimbursement, were predictive of physicians seeking a target income. In such a case, payers' total expenditures were likely to increase as a result of the increased demand for services induced by the physicians (McGuire & Pauly, 1991). The authors' evidence suggests that the LTI strategy may have been assumed by physicians in response to the fee-schedule policies of the 1980s.

Additional support for McGuire and Pauly's work came soon after their publication. In a working paper developed for the World Bank in 1994, Nguyen discussed how, in health care markets, volume increases may offset the savings produced by price controls.

The author utilized data from the U.S. Medicare program from 1989 and 1990, examining physicians' behavioral responses to fee reductions. The period from which he extracted his data highlighted the effects of the Omnibus Budget Reconciliation Act of 1989 (OBRA89) on physician behaviors. Nguyen concluded that providers, in particular physicians, will work to provide more health care goods and services to recapture the revenues that were lost as a result of the implementation of price controls (Nguyen, 1994). These findings are consistent with the model of physician behavior proposed by McGuire and Pauly (1991).

While it may be sufficient to explain the physicians' behaviors in the 1980s, McGuire and Pauly's model falls short in explaining other strategies that physicians may employ to improve their practice revenues. Trends in referral and utilization patterns also may serve as indicators of physicians' profit-maximizing strategies. For example, evidence for physicians increasing the scope of services may include their annexation of ancillary health care programs or facilities. Maximization of compensation may be evidenced by selective referral practices, where patients with poorer reimbursement are referred to outside clinics while patients with better reimbursement are retained in physician practices or joint ventures. Physicians are able to influence these factors because of their **gatekeeper** status.

Gatekeepers are able to control how many and what types of referrals are made to ancillary services, because they have a captive referral source. Federal and state laws and insurance regulations often mandate that patients receive a referral from a physician before they can access ancillary health care services. Subsequently, physicians are in

control of the referrals made to their own practices and to outside providers. Gatekeeper status may therefore have a significant impact on the health care industry's ability to function as a consumer-directed market, potentially leading to inefficiencies and imperfect competition.

Imperfect Competition

The economics literature describes a spectrum of market structures ranging from those that are perfectly controlled by one member (e.g., monopolies) to those markets in which all competitors are essentially equal (e.g., perfectly competitive markets). The following section provides a brief description of monopolistic competition and highlights the flaws that may result in market inefficiencies. This discussion is specific to health care and the production and consumption of ancillary services. This information is presented here because understanding the influence that physician ownership and gatekeeper status have on market dynamics may help in ascertaining if, why, and how selective referral occurs.

Monopolistic Competition

Monopolistically competitive markets share the following characteristics: there are many sellers of the product of interest, the products that each firm provides are or appear slightly different (meaning they are not readily substituted), and firms are able to freely enter or exit the market (Mankiw, 2004). In a monopolistically competitive environment, advertising or marketing is essential to firm survival. Providers of services must work to ensure that consumers are convinced of the differences between the quality of their products or services and those of their competitors (Mankiw, 2004).

When competing for business, providers who have direct access to consumers are afforded a distinct advantage. For example, a referring physician with gatekeeper status may recommend to a patient that he/she receive physical therapy. If the patient has no previous experience or preference for these services, the physician is able to influence the patient's pursuit of these services and choice of providers. The physician may either guide the patient to the physician's own ancillary services or to another competing clinic. As a function of their gatekeeper status, physicians are able to hold their referrals captive so that other providers who lack gatekeeper status are unable to equally compete for consumers. Other providers, who lack gatekeeper status, rely instead upon reputation and outcomes to lure patients into their practices. However, these strategies may prove ineffective if physicians are influencing their patients' choices of where to pursue their care.

According to the monopolistic competition model, charges for services are likely to increase as firms work to improve their profitability. The entrance of competitors into the market would drive down prices until they approached marginal costs. Therefore, it is in the best interest of the monopolistically competitive firm to limit the numbers and types of competitors who enter their market, making the existing market more closely resemble an oligopoly, where prices will likely exceed the marginal cost for service production. The phenomenon of profit maximization in a monopolistically competitive market is demonstrated in Figure 1 (Mankiw, 2004).

In order to maximize profitability in a monopolistically competitive market, a physician would need to decrease referrals to outside providers and retain referrals, and

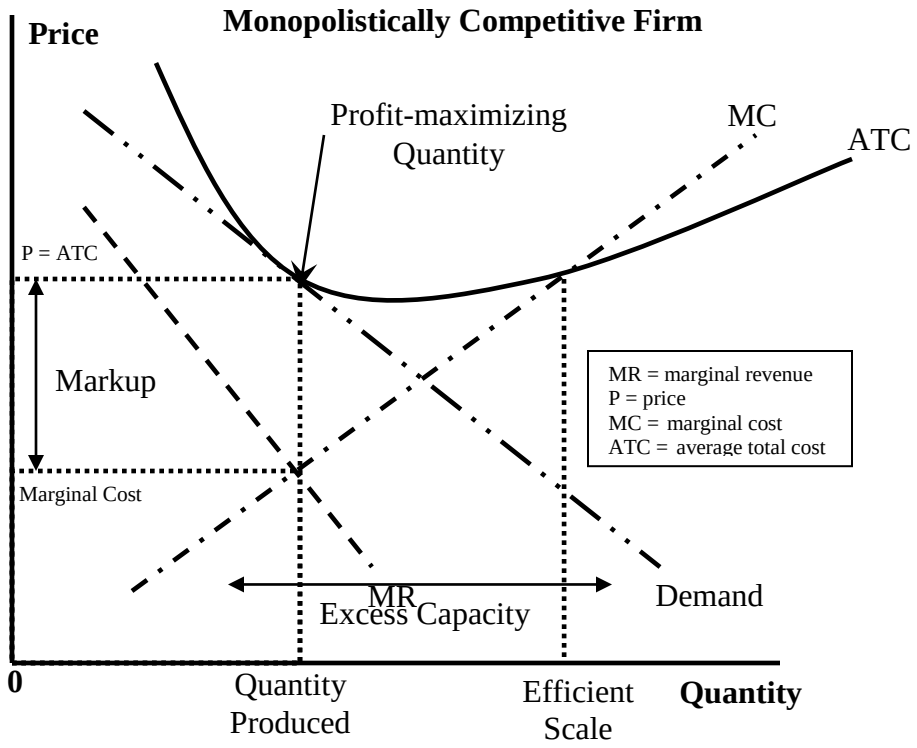


Figure 1. Graph of long-term monopolistic competition (Mankiw, 2004, p. 348).

subsequent revenue, for his or her own practice. However, only if the physicians' referrals generate payments that exceed production costs does their firm achieve a profit. Therefore, according to this model, monopolistically competitive physicians would be likely to selectively refer patients with poorer reimbursement, which may not cover costs of production, to outside providers while retaining cases with better reimbursement potential for their own practices or joint ventures.

To summarize, health care markets are not perfect, meaning that they are also inefficient. The relationships between payers, providers, and consumers are often muddied by competing interests. Ideally, health care would be produced in a perfectly competitive market, where societal welfare is maximized. Instead, it is produced in a climate where, increasingly, profit-maximization concerns may lead to providers taking

advantage of asymmetrical information. Physicians who serve as both gatekeepers and providers are able to steer patients toward particular goods or services, influencing both the quantities of services demanded and where they are purchased. Imperfect information subsequently leads to an imperfect marketplace, where competitors can and likely are being eliminated. Clearly understanding how and why physicians influence patients' health care choices is critical to understanding how they may affect health care utilization and market competition.

Physician Incentives

As a result of implementation of structured managed care and reduced physician fee reimbursement, physicians have seen a marked decline in their incomes and erosion of their professional autonomy (Mitchell, et al., 2000; Office of the Actuary, 2010; Tu & Ginsburg, 2006). This decline in income and professional autonomy has led to reduced physician job satisfaction (Mitchell, et al., 2000; Warren, et al., 1998). Constraints induced by legislation and the current health care market provide incentives to physicians to pursue more profitable ventures in order to improve their incomes and subsequently their job satisfaction. This situation has facilitated the emergence of the **entrepreneurial physician** (Dobson & Haught, 2005). In previous economics research, McGuire and Pauly (1991) speculated that in the presence of economic constraints (e.g., limited reimbursement for services), physicians will work to maximize their profitability through reducing costs of service delivery, increasing the scope of services provided, and increasing or maximizing the compensation for services that are delivered. It is

physicians' unique roles as both referral sources and providers of services that allow them to influence patients' choices and their utilization of health care services.

Agency

One of the concepts that may help to explain how physicians influence health care utilization is **agency**. Agency is a concept that has been used by scholars and researchers for decades as a means of exploring risk-sharing behaviors between individuals and groups. "Specifically, agency theory is directed at the ubiquitous agency relationship, in which one party (the principal) delegates work to another (the agent), who performs that work" (Eisenhardt, 1989, p. 58). For example, in referral for outpatient rehabilitation services, physicians and patients frequently have a relationship where the patient (principal) is delegating decision making to the physician (agent) (Folland, Goodman, & Stano, 2004a). Patients' knowledge about their conditions, the treatments needed to address their symptoms and impairments, and the types and locations of services available are generally superseded by the knowledge the physician possesses. As a result, the patients rely on their physicians for guidance pertaining to the types and quantities of care necessary to help them achieve optimal health outcomes. The physician is therefore contracted as the patients' agent, making recommendations on their behalf.

Agency theory highlights two problems that occur in principal (patient)/agent (physician) relationships. The first problem results from conflicting goals between the principal and agent (Eisenhardt, 1989). For example, a patient may seek care from a physician in order to attain a desired health outcome. Physicians motivated by self-interest (e.g., income), may alter their referral or treatment of patients so as to maximize

their revenues rather than making these judgments based solely upon the patients' best interests. If the patients have limited information as to what courses and quantities of treatment are best or appropriate, they are unable to monitor the behaviors of their physicians. Agency theory assumes that information (i.e., knowledge about health condition, impairments, and possible treatment(s) is a commodity which can be purchased by the principals (patients), allowing them to make informed decisions about their care (Eisenhardt, 1989). The more information the principal has, the less likely it is that the agent will be able to freely manipulate the parameters of their treatments.

A second problem that arises from principal/agent relationships comes from risk sharing. Agency theory makes three assumptions about human beings: that they are averse to risk, they are motivated by their own self-interests, and that they are boundedly rational (Eisenhardt, 1989). Agency theory assumes that individuals involved in principal/agent relationships will work to avoid risk when possible, generating contracts or agreements that help to ensure agents behave appropriately on behalf of principals. According to this theory, if agents and principals are given appropriate information, they will rationally work to promote their own self-interests. Positivist research of conflicting goals between agents and principals identifies the sources of conflict and the regulatory mechanisms designed to limit the self-serving behaviors of the agents (Eisenhardt, 1989). Additional information on the topic of agency theory is provided in the Theoretical Framework section (Chapter III) of this dissertation.

Supplier Induced Demand

If physicians are motivated by anything other than the patients' best interests, they may induce the demand for services by their recommendations, a phenomenon known as supplier induced demand (SID). "SID suggests that health care providers have and use their superior knowledge to influence demand, taking advantage of the 'information gap.' SID is possible through the physician's dual role as advisor to the patient and as the provider of services" (Folland, Goodman, & Stano, 2004b, p. 202). With SID, the physician, acting as agent on behalf of the patient, may encourage the patient to pursue services that may or may not yield additional benefit with regard to the patient's expected health outcomes (McGuire & Pauly, 1991). SID has not been demonstrated in previous research on the utilization of physical therapy services; however, utilization rates appear greater when physical therapy services are provided by physicians who have a financial interest in the services being rendered (Mitchell & Sass, 1995; Mitchell & Scott, 1992b, 1992c; Swedlow, et al., 1992). While SID may be a factor in selective referral practices, it was not the focus of the present research. The goal of this research was not to determine the appropriateness of the physical therapy referrals made by physicians but rather the types and quantities of referrals made by physicians with ownership interest.

From an economic perspective, the success of the agent relationship is dependent upon patients' trust that the agent is working only for their betterment and is not motivated by other factors, such as financial gain. "The problem for the principal is to develop a contract or relationship to ensure that the agent is acting in the principal's best interest" (Folland, et al., 2004a). Due to asymmetrical information and restrictions on access to

ancillary health care providers, such as physical therapists, patients must often rely upon physicians to make appropriate recommendations and referrals for these services. As professionals, the physicians, in turn, are expected to abide by ethical codes outlined by the American Medical Association and by legislation enacted at federal and state levels regarding the practice of self-referral. Improved patient access over the past two decades to medical information via public library resources, the news media, and the Internet could help to reduce the asymmetry of information between providers and the person(s) under their care, thereby helping to put in check some of the health care market's imperfections.

However, because information asymmetry exists between most patients and their physicians, patients may not be aware of the scope, quality, and types of health care resources available to them. In addition, they may not fully appreciate how physicians' investment interests can influence their care. The information asymmetry can only be reconciled by a physicians' full disclosure of information to the patient, pertaining not only to their care but to the physicians' interests, as well (Morreim, 1989). If physicians fail to disclose their investment interests, then their patients are unable to make fully informed decisions. This may affect both the quantity of services utilized by the patients and their choices of providers. For example, a physician may refer a patient directly to a particular clinic or provider instead of giving that patient a comprehensive list of providers from which they may independently choose. There are several reasons why a physician may choose to preferentially refer, such as familiarity with the clinicians providing the services, but it may also be to ensure that revenues from the patients'

treatments are retained by the physicians' practices. Even if they fully disclose their investment interests to their patients, however, the physicians may exert a social influence on the patients. Morreim explains how she anticipates that patients may respond to the physicians' disclosures of ownership interest:

> Once the patient realizes that this disclosure constitutes a warning, not a reassurance, his trust may be wounded. Yet it may be socially awkward for him to act accordingly. If he wishes to remain in the care of this physician, he may be reluctant to insult the physician's integrity by asking to be referred elsewhere or to harm his physician economically by "buying from competition"; or he may fear that his refusal to patronize the physician's facility may force the physician to raise his professional fees (Morreim, 1990, pg. 394).

Morreim's comments suggest that, even when financial arrangements are fully disclosed, a physician's ownership interest compromises his or her relationship with patients. For the fiduciary relationship between physicians and their patients to succeed, patients must rely upon physicians' integrity and willingness to disclose all pertinent information that may influence decisions about their care. Morreim argues that, "To meet this challenge, physicians must reinvigorate their long-held obligation to professional altruism to promote patients' interests, even above their own" (Morreim, 1989, pp. 393-394).

The issue of agency and the potential for abuses has been acknowledged by physician groups, including the American Medical Association (AMA). In 1986, the AMA's Council on Ethical and Judicial Affairs first issued "safeguards" to prevent abuses of self-

referral. In 1989 they refined these safeguards. Finally, in 1992, the Council revisited this topic, noting persistent self-referral practices in the physician community (Council on Ethical and Judicial Affairs, 1992). The Council concluded that self-referral should only be made "…if there is a demonstrated need in the community for the facility and alternative financing is not available" (Council on Ethical and Judicial Affairs, 1992, p. 2368). The AMA Council agreed, however, that it would not enforce restrictions on self-referral but rather leave that responsibility to state and federal government.

The behaviors of entrepreneurial physicians may have implications for both patients and for other providers who share the physicians' health care markets. If physicians are able to induce the demand for services, control the numbers and types of referrals generated, and exert an influence on where patients seek treatment, they have the capacity to eliminate their market competition. The economic consequences of entrepreneurial physicians' behaviors may, therefore, include a decrease in the quantities and types of services to which patients have access. Eventually, reduced access to essential health care services could influence patients' health outcomes.

Since physicians act as gatekeepers for referrals to physical therapy services, they are able to influence the numbers and types of patients their firms treat and those who are referred to other providers, such as hospital-based rehabilitation centers. In this manner, some physicians' monopolistically competitive behavior works to eliminate competitors who lack gatekeeper status from their market. Referral for profit activity subsequently results in market inefficiencies. Contractual arrangements between payers and particular facilities may help to reduce the impact of self-referral practice by funneling patients

toward certain providers, but the increased competition for and relative distribution of societal resources may eventually drive institutional providers such as the hospital-based centers out of the market.

The position of the American Hospital Association (AHA) is that physicians' abilities to choose the services they provide and the patients they serve are anti-competitive (AHA, 2005). In proceedings from its 2005 annual meeting, the AHA stated:

> Physician owners have at least three ways in which they can financially reward themselves by selectively referring or "cherry picking" patients. First, they can simply avoid treating uninsured, Medicaid and other patients for whom reimbursement is low. Second, they can selectively refer patients to different facilities, sending well-insured patients to the facilities they own and poorly insured or uninsured patients elsewhere, often to the local full-service community hospital. And third, they can selectively refer healthier, lower cost, lower risk patients to facilities they own, leaving more severely ill patients to be treated by local full-service community hospitals (AHA, 2005, p. 2).

It seems plausible that, if physicians practice selective referral and shuttle patients with poorer prognoses and reimbursement consistently to outside providers, without additional aid or subsidy, these providers will eventually be unable to achieve payment sufficient to cover their service costs. Subsequently, their patients may experience a negative impact on their access to care and on the quality and scope of services available in their communities.

Review of the Literature on Self-Referral

The following section provides a review of the empirical evidence pertaining to physician self-referral and ownership interest in ancillary services. The section starts with a discussion of the physician entrepreneur and highlights research pertaining to self-referral practices.

The Physician Entrepreneur

Economic principles suggest that entrepreneurial physicians can be expected to respond to financial incentives, working to either maximize their profits or achieve a target income (McGuire & Pauly, 1991). Previous research supporting this notion comes from Epstein, Begg, and McNeil (1986) who examined the influence of payment type on medical testing by internists. The study compared medical testing on patients with uncomplicated hypertension. This testing was ordered by 10 physicians in fee-for-service groups and 17 doctors in prepaid groups. The results suggested that the inherent financial incentives in fee-for-service insurance encouraged physicians to order more lucrative tests relative to capitated fee schedule insurance (Epstein, Begg, & McNeil, 1986). Fee-for-service practitioners ordered 50% more electrocardiograms and 40% more chest x-rays than prepaid doctors. Both of these tests were associated with higher profits (Epstein, et al., 1986). Still, we cannot determine from these data the physicians' motivations for ordering tests, and the generalizability of these results remained limited due to the study's sample size and the fact that possible differences between the groups of patients were not addressed.

Hillman, Pauly, and Kerstein (1989) examined the influence of financial incentives on physicians' operating performance in health maintenance organizations (HMOs). The authors used stepwise regression to analyze data from a survey of HMOs conducted between 1987 and 1988. A total of 595 HMOs were surveyed, with 337 responses (a response rate of 57%). The researchers examined the relationship between financial incentives and rates of hospitalization, numbers of outpatient visits, and the break-even status of the HMO. In the regression models the researchers also controlled for market-area characteristics that might have influenced the results. The authors found that capitation payments and salaries were related to lower hospitalization rates and outpatient visits. However, the authors warned that physicians' responses to incentives are complex and that it is likely that many of the factors influencing physicians' decision making were not included in the regression models (A. Hillman, Pauly, & Kerstein, 1989). The authors chose not to speculate on some of the other factors that may influence physicians' decision making. They also did not report on the issue of possible selection bias introduced by the 57% survey return rate.

Another study examined practice patterns of physicians who were provided bonuses based upon gross revenues generated for their practices (Hemenway, Killen, Cashman, Parks, & Bickness, 1990). Practice patterns of 15 physicians employed at different locations of a chain of ambulatory walk-in clinics were compared over two years (1984 to 1986). The study included 20 centers that were each staffed by two physicians who worked approximately 40 hours per week. In 1985, a new compensation plan was implemented that provided bonuses to doctors based upon the gross revenues they each

generated for the clinics. The facilities under investigation had both laboratory and x-ray facilities located on the premises. The investigators examined data on each physician's gross charges, number of patient visits, number of hours worked, numbers of x-rays ordered, and the number of laboratory tests ordered each month. Inflation was accounted for by price indexing. Each physician acted as his or her own control for the study. Paired t-tests and Wilcoxon signed-rank tests were utilized to determine the significance of the changes in the physicians' patterns of practice. Under the new payment system, the physicians who received bonuses increased laboratory testing by 23%, x-rays per visit by 16%, and charges by 20%. Their total volumes of patients also increased. Results indicated that monetary incentives may induce changes in physicians' practice and referral patterns, leading to increased utilization of office visits and diagnostic tests. Changes in rates of diagnostic testing and charges per patient exceeded national averages. Hemenway and colleagues explained that generalizability of these findings is limited, due to the small, homogeneous sample; however, the evidence apparently points toward the influence that compensation can have on physicians' practice patterns (Hemenway, et al., 1990).

These studies did not examine the degree to which physicians are aware of these factors and how they influence their practices. A 2006 pilot study investigated primary care physicians' perceptions about the influence of their patients' insurance types on their clinical decisions (Meyers et al., 2006). Twenty-five physicians from a Washington, D.C. practice-based research network participated in this study. The participants completed survey instruments after each patient encounter during two half-days of treatment

conducted in 2002. A total of 409 cards for 411 visits (99.5% response rate) were completed. The independent variable was the patient's insurance type, and the dependent variable was whether or not the physician perceived that the patient's insurance status had an effect on the physician's clinical decision making during that day's visit. The participants were also asked to rank on a visual analog scale to what degree they felt their patients' insurance influenced their clinical decisions. The authors reported that in 24% of patient encounters, the physicians perceived the influence of insurance on their clinical decisions and, as a result, altered their treatment strategies. The greatest degree of influence came in considering treatment for persons without insurance, with 41.6% of visits having been altered in some way by insurance concerns. Physicians were also more likely to speak to their patients about insurance when the insurance constraints limited their abilities to prescribe preferred methods of treatment (Meyers, et al., 2006). The generalizability of these findings is limited by a small sample size, the self-report structure of data collection, the lack of independent verification, and demographics of the patient population and physician group practice; however, it is a demonstration of the influence of insurance on the clinical decisions that physicians make on behalf of their patients. It is possible that insurance may have an even greater influence than what is reported here, because these results hinge on the physicians' awareness of these issues and willingness to report on them. The impact of the physicians' decisions on the patients' treatment or health outcomes was not reported.

Since entrepreneurial physicians theoretically will work to either maximize their profitability or to attain a target income, there is the potential for a conflict of interest

when they serve as both service provider and gatekeeper, a role known as dual agency. The conflict arises when physicians are motivated to generate referrals not just by their patients' well-being but also by the potential for enhancing their own incomes. Such a conflict has been known to alter the number and types of referrals that physicians generate to services in which they have a financial stake. The following section provides a summary of the evidence supporting the influence of physicians' ownership interest on utilization.

Utilization

One of the arguments in favor of physician ownership of ancillary services pertains to efficiency. Proponents of physician investments suggest that ownership interests allow physicians to better control service utilization and, subsequently, health care costs. It appears that ownership interest does indeed influence service utilization, but the evidence demonstrates that physicians' ownership interest is associated with increased utilization of ancillary services and subsequent increases in the cost of care (Childs & Hunter, 1972; Epstein, et al., 1986; B. Hillman, et al., 1990; Mitchell & Sass, 1995; Mitchell & Scott, 1992a, 1992b, 1992c; Scott & Mitchell, 1994; Swedlow, et al., 1992). For example, a 1972 study by Childs and Hunter analyzed claims data from an elderly California population to examine patterns of use of diagnostic x-ray among non-radiologist physicians and physicians who refer to radiologists outside of their offices. The authors were interested in the influence of physician characteristics on the patterns of utilization. The study was conducted over a six month period beginning in September of 1965 using a sample of residents from Alameda County, California. Approximately 7,300 residents

met the study's inclusion criteria. Claims from the subjects' medical care (about 120,000, per the researchers) during this period were reviewed. In addition, the subjects' demographic data were examined, along with files recording their physicians' characteristics (e.g., medical specialty and years in practice). These data were merged into individual service files for each subject. The files were then sorted into two groups based upon whether or not their physicians provided direct x-ray services (Group 1) or referred to outside providers for these services (Group 2). The two groups were relatively homogeneous, based upon the demographic data (Childs & Hunter, 1972).

Four chest x-ray procedures were identified and studied, comprising 38% of the total x-ray procedures performed during the study period (Childs & Hunter, 1972). These included a complete series, postero-anterior and lateral views, single posterior-anterior views, and fluoroscopy. A total of 1,220 x-ray procedures were analyzed. Compared to physicians who referred to radiologists, non-radiologist physicians who owned or invested in in-office x-ray equipment were twice as likely to order these services for their patients, despite trends which suggested they had limited knowledge of best radiological practice (e.g., ordering less complex or inappropriate tests). One-fifth of all non-radiologists were providing direct x-ray services, and utilization rates among Group 1 physicians' patients were 65% higher than for the Group 2 physicians' patients ($P<0.001$). This difference held true across physician specialties and years of experience. Results suggested that younger physicians and specialists were also more likely to order these tests. The authors concluded that non-radiologists who have financial interest in

radiologic services are more likely to utilize these services than those who refer to radiologists (Childs & Hunter, 1972).

One drawback to this research was the fact that other variables that may influence physicians' behaviors were not included in the study, such as practice variation produced by individual training and clinicians' fears of litigation. The authors argued that patterns of x-ray utilization did not seem to vary by patient characteristics and that, statistically, physicians' utilization of these services was best explained by physicians' ownership interest (Childs & Hunter, 1972). Perhaps another statistical method, such as regression followed by analysis of covariance (ANCOVA), might have helped the authors to determine what percentage of the variance in utilization patterns was accounted for by the physicians' ownership interest.

In an unpublished government report from 1989, the Office of the Inspector General (OIG) analyzed laboratory and diagnostic testing services data from two health surveys of eight states (OIG, 1989). Results indicated that Medicare patients of physicians who have a financial interest in laboratory services were 45 % more likely to receive clinical lab services and that they were 34 % more likely to receive these services from facilities in which the physicians invested. Patients of physician investors in diagnostic imaging were 13 % more likely to receive these services than the overall population (OIG, 1989; Scott & Mitchell, 1994).

Comparable conclusions were drawn in a 1990 study that examined the frequency and costs of imaging examinations provided in physician offices relative to those who referred patients to radiologists outside of their offices (B. Hillman, et al., 1990). The

authors purchased access to a database containing insurance claims data for 403,458 employees and dependents of several large American corporations. The insurance coverage provided comprehensive outpatient imaging services without co-payments. Private insurance claims data from 65,517 outpatient procedures and 6,419 physicians were analyzed for this study. Four clinical presentations were selected for study based upon frequency of their management in outpatient clinics: acute upper respiratory symptoms, pregnancy, low back pain, and (in men) difficulty urinating. The corresponding imaging tests selected for study were chest radiography, obstetrical ultrasound, radiography of the lumbar spine, and excretory x-rays or ultrasonography. Claims data collected between January 1, 1986 and June 1, 1988 were included. Episodes were excluded if the only physician involved was a radiologist. Physicians were classified as self-referring, radiologist-referring, and physicians who did not utilize radiological services.

To estimate the frequency of imaging, the authors employed this physician categorization and upward- and downward-biased estimations of imaging frequency. The correct adjustment for the frequencies, however, remained uncertain because of the possible variation in utilization patterns not explained by ownership interest. Analyses focused on differences in proportions of patient care episodes involving imaging, the charges for each of these individual procedures, and the average imaging charges per episode of care. The results indicated that doctors who owned radiologic equipment were 4.0 to 4.5 times more likely to order tests than radiologist-referring physicians ($p<0.0001$ for all four procedures) and that the costs associated with some of these tests were

significantly greater for self-referring clinics ($p<0.0001$ for chest radiography, obstetrical ultrasonography, and lumbar spine radiography). The more frequent and costlier imaging procedures provided by self-referring physicians resulted in costs 4.4 to 7.5 times greater per episode of care (B. Hillman, et al., 1990).

Differences among specialties were also apparent with rates ranging from 3.0 to 17.1 times higher, depending upon the specialty and patient's clinical presentation ($p<0.01$). The authors suggested that the growth in cost and frequency of testing may not have been tied to any additional health benefit for the patients (B. Hillman, et al., 1990). The strength of this study is derived not only from the numbers of patients and physicians included but also its emphasis on particular clinical situations and episodes of care, which allowed the investigators to focus on the influence of ownership. The potency of the authors' argument regarding the influence of physician ownership interest is increased, because results were uniformly sustained across patients' clinical presentations and physicians' specialties. However, the authors were not able to draw inferences about the physicians' motivation to increase utilization of these services.

In 1992, Hillman and colleagues assessed differences in physicians' utilization and charges for diagnostic imaging based upon whether or not the physicians were self-referring (B. Hillman, Olson, Griffith, Sunshine, Joseph, Kennedy, Nelson, et al., 1992). As before, the authors developed episodes of care from a medical claims database for each of 10 common clinical presentations. The authors examined the frequency of imaging referrals, the mean cost of imaging per episode of care, and the charges associated with the self-referring or outside referring physicians. Confirming previous

results, the authors found that self-referring physicians generated 1.7 to 7.7 times more referrals for imaging studies ($p<0.01$ for all 10 clinical presentations) and that self-referral was associated with increased utilization of imaging services by all physician specialty groups. Mean charges were 1.6 to 6.2 times greater for self-referring physicians. The researchers concluded that self-referring physicians who operate diagnostic imaging equipment in their offices perform these types of examinations more frequently and at a greater cost (B. Hillman, Olson, Griffith, Sunshine, Joseph, Kennedy, Nelson, et al., 1992). Again, the authors were not able to draw inferences about the physicians' motivation to increase utilization of these services, nor were they able to conclude anything about whether or not these procedures were unnecessary for achieving optimal patient outcomes.

In a study of the costs and rates of use in the California Workers' Compensation System, a large database of workers' compensation claims from October 1990 to June 1991 was examined to determine the frequency and cost of physical therapy, psychiatric evaluation, and magnetic resonance imaging in self-referring and outside-referring physician practices (Swedlow, et al., 1992). The study evaluated the cost per case, the frequency of physical therapy initiation, the cost and frequencies of psychiatric testing, and the medical appropriateness of ordered magnetic resonance imaging (MRI). Results indicated that physicians who self-referred were 2.3 times more likely to make referrals for physical therapy, and the mean cost per case was lower for this group. In their sample, 91% of all physical therapy was performed by providers who were self-referring. The authors failed to speculate on the reasons why the costs per case were less. One

possibility is that the patients' severity of injuries may have played a role in these costs, though this factor was not accounted for in the study. In addition to the apparent differences in physical therapy service utilization, psychiatric services were 26.3 % costlier in the self-referring group ($3,222± 1,451 vs. $2,550± 742, P< 0.01). Finally, 38% of MRI scans requested by self-referring physicians were deemed inappropriate. The authors concluded that, overall, self-referral leads to increased costs of medical care covered by workers' compensation in each of the services they studied (Swedlow, et al., 1992).

These findings were corroborated by work conducted in 1989 under mandate from the Florida Legislature (Florida Chapter Law 89-354) on behalf of the Florida Health Care Cost Containment Board (Mitchell & Scott, 1991). For this study, surveys were developed to obtain financial, ownership, and utilization data from Florida health care providers regarding the fiscal year 1989 from 10 different types of health care facilities. Questionnaires were designed to obtain information on freestanding facilities to which physician owners could refer but in which they did not practice. Over 3,500 freestanding health care facilities were surveyed. Overall, the response rate was 82.4%, with a disproportionate number of non-responders being involved in joint venture practices. It is possible therefore, that selection bias may have influenced the study results.

For this study, joint ventures were defined as "…any ownership or investment interest between referring physicians (or any health care professional who may make referrals) and freestanding facilities or businesses providing physical therapy services" (Mitchell & Scott, 1992c). From their results, the authors estimated that at least 40% of physicians

involved in patient care in Florida invest in joint venture health care facilities and refer patients to these facilities (Mitchell & Scott, 1991). In addition, none of the joint venture facilities were located in rural or medically underserved areas, suggesting that the potential benefit of geographic proximity to services and new technologies was not being realized in these areas.

The authors analyzed effects of joint venture status on access, costs, charges, and utilization patterns in acute care hospitals, nursing homes, ambulatory surgery centers, durable medical equipment providers, home health agencies, radiation therapy centers, clinical laboratories, diagnostic imaging, and physical therapy rehabilitation facilities. The authors tested the null hypothesis that there were no differences (or that differences were beneficial to consumers) in average values for joint venture and nonjoint venture facilities. The authors controlled for the type of service provided and geographic factors. Joint venture relationships had no apparent negative effects on access, costs, charges, and utilization for acute care hospitals and nursing homes. Some issues with surgical centers, durable medical equipment suppliers, home health agencies, and radiation therapy centers were found, but the analysis of the impact of physician ownership was not conclusive. The results did, however, indicate that ownership status had a negative effect on access, cost, charges, and utilization in clinical laboratory, diagnostic imaging, and physical therapy centers (Mitchell & Scott, 1991).

Mitchell and Sunshine (1992) used the Florida data to investigate the consequences of physicians' ownership of health care facilities that provide radiation therapy. The types of diagnoses treated at these facilities were not specified in their report. The authors looked

at the effects of ownership on access, use of services, costs, and quality. Data from Florida joint ventures were compared with data from non-joint venture facilities in Florida and with the rest of the United States, due to the disproportionate number of physician joint ventures represented in Florida. The results showed that no joint venture facilities were located in inner-city or rural locations, though 11% of free-standing or hospital-based facilities were located in these regions. Costs and frequency for radiation therapy in free-standing facilities were 40 to 60% higher in Florida, though clinicians spent 18% less time with each patient. On average, joint venture facilities charged $173.00 per treatment versus nonjoint facilities that charged $116.00 per treatment. The average revenue for joint venture facilities was over $5,000.00 per patient and for nonjoint ventures it was $4655.00. No further health benefit from the additional services was apparent. Mortality rates among the patients in Florida were comparable to the national average. The authors concluded that joint ventures do not add value to quality and access to care while increasing costs substantially (Mitchell & Sunshine, 1992). It is unclear whether the level of mortality is the only or best outcome measure for health outcomes for the patients seen at these centers, since the diagnostic categories of the patients served at these clinics were not provided for the study.

Mitchell and Scott (1992) also used the Florida survey data to examine the influence of physician ownership of physical therapy services on utilization, charges, profits, and service characteristics. A total of 313 eligible clinics were surveyed. There were 262 respondents to the survey. The majority of non-respondents (32 of 51) were joint venture arrangements. Data from 19 centers were not analyzed, because they only provided

occupational therapy and speech therapy. Another 62 facilities were excluded for reasons including: lack of utilization/financial information, they operated less than three-fourths of the sample year, they rendered fewer than 1000 patient visits in the sample year, they treated only children, or they were owned by a not-for-profit.

The authors compared a sample of 43 joint venture PT only clinics, 75 nonjoint venture PT only clinics, 26 joint venture comprehensive rehabilitation facilities, and 37 nonjoint venture comprehensive rehabilitation facilities. Physician practices providing physical therapy within their practices were not surveyed. Approximately 40 % of the rehabilitation/physical therapy facilities that completed the research questionnaire had an ownership relationship with physicians who served as referral sources. The rehabilitation facilities were classified into two groups: physical therapy services only and comprehensive rehabilitation facilities providing multiple disciplines. The ownership categories were: joint venture (with one or more physician owners) and nonjoint venture (no physician owners).

The authors first compared physician joint venture rehabilitation facilities with the comprehensive outpatient rehabilitation facilities (CORF) on several variables. These included the number of visits per patient, the average revenue per patient, the percent operating income, the percent markup for services, the profits per patient, the time a licensed therapist spent with the patient per visit, and the time both licensed and unlicensed medical workers spent with the patient per visit. The results indicated that on average the number of visits per patient were 39 to 45% higher (14.3 versus 10.3; p=0.0005), gross revenues were 30 to 40% higher ($1318.00 versus $937.00; p=0.05),

and mark-up was greater (69.0% versus 23.4%; p=0.006) in joint venture facilities. These facilities also tended to generate much of their revenue from patients with well-paying insurance. Joint venture comprehensive rehabilitation facilities generated significantly more revenues from Blue Cross and commercial insurers (44% versus 24.8%; $p<0.05$) and from managed care payers (8.4% versus 1.7%; $p<0.05$) than the nonjoint venture CORF's. Nonjoint venture CORF's generated more revenue from Medicare (40% versus 20.5%; $p<0.05$) and self-pay patients (8.4% versus 1%; $p<0.05$). The study also found that PTs and PTAs employed in non-joint ventured facilities spent on average approximately 60% more time with patients than their joint ventured counterparts and that joint ventures had fewer licensed clinicians per patient on average (Mitchell & Scott, 1992b).

For the PT only clinics, about 53% of patients treated at joint venture PT clinics were referred by physicians who had an investment interest in those facilities. Nonjoint venture PT clinics received significantly more of their revenues from Medicare patients than joint venture PT clinics (22.6% versus 15.5 %; $p<0.05$). The nonjoint venture PT clinics also generated more of their revenue from commercially insured patients as opposed to the joint ventured clinics (48% versus 37%; $p<0.05$). The joint ventured clinics generated a larger share of their revenues from workers compensation patients (nearly 31 %), and nonjoint ventured clinics generated 20 % from patients with workers compensation insurance ($p<0.05$) (Mitchell & Scott, 1991). The authors stated, "For these three types of health care facilities, we found that joint venture facilities cream-skim patients with good

insurance and treat relatively few patients with limited ability to pay" (Mitchell & Scott, 1992c, p. 38).

Joint venture PT only clinics provided an average of 7967 visits per year compared to the 5344 visits for nonjoint venture PT clinics (p=0.0005). The patients who received PT at the joint venture clinics also received more visits than patients who were treated at nonjoint ventured PT facilities (16 versus 11.2 per patient; p=0.0005). This increase in visits translated to an increase in revenue, where joint ventured facilities generated $839.00 per patient on average in comparison to the $640.00 generated by the nonjoint ventured PT clinics (p=0.001). Mitchell and Scott concluded that utilization rates and charges were significantly higher for joint venture practices relative to similar nonjoint venture counterparts (Mitchell & Scott, 1992c).

Although joint venture PT only facilities spent less on wages for licensed physical therapists (32.7 % versus 47.6 %; p=0.0005), their clinics saw far more patients per day (averaging 20 patients per day as opposed to 12 patients per day for nonjoint ventured clinics). Time per visit with a licensed physical therapist was less for joint ventures than nonjoint ventures (28.5 minutes versus 49.0 minutes; p=0.0005). The time per visit with other licensed medical workers was also less for joint ventures (37.4 minutes versus 60.1 minutes; p=0.0005). The authors stated, "These findings suggest that nonlicensed workers are substituted for licensed workers in the provision of physical therapy services in joint venture facilities" (Mitchell & Scott, 1991, p. IX-5).

For both the comprehensive rehabilitation facilities and the PT only clinics, Mitchell and Scott concluded that utilization, charges per patient, and profits are greater in joint

ventured physical therapy arrangements while the amount of time spent with each patient is less (Mitchell & Scott, 1992b). The authors took steps to ensure that their results were valid by examining competing explanations for their findings. They were able to rule out the influence of regional demographics by examining Medicare diagnosis related group discharges and comparing them to national averages. Although18% of the Florida population was elderly at the time of this study (as opposed to the 12.5% national average), this demographic did not appear to influence the demand for physical therapy services. Discharges per 1000 beneficiaries were actually lower in their sample. The authors also considered the influence of occupational injury rates and discovered that Florida's rates were also lower than national averages, suggesting that these were not sufficient explanations for the apparent differences between joint ventured and nonjoint venture facilities (Mitchell & Scott, 1992b).

Scott and Mitchell (1994) reexamined the Florida data to investigate how ownership of clinical laboratories affected physicians' utilization of these services, charges, and facility profitability. For comparison, laboratories were grouped into three categories: general purpose labs, specialty service labs owned by pathologists, and all other specialty service labs. Joint venture and non-joint venture labs were compared based upon utilization, charges, and profitability. Data from 52 general purpose laboratories were analyzed. The authors reported that utilization rates were significantly higher for laboratories with referring physician owners (3.2 procedures in joint venture laboratories as compared to 2.1 in non-joint venture laboratories). Similarly, gross revenue per patient and average net revenue per patient were higher (26%) in the joint venture settings, with

an average mark-up of 39.8% in joint venture labs relative to 16.6% in non-joint ventures (Scott & Mitchell, 1994).

It is important to note that these studies were conducted only in Florida and may not be generalizable to other health care markets; however, the large sample size bolsters the researchers' arguments. Also, because the researchers were relying on clinicians self-reporting, they were unable to ensure the integrity of the data they were provided. Finally, a follow-up with joint ventured practices may have helped to reduce some of the potential issues of selection bias that may have influenced the results. Since these data were also used for additional studies, the same limitations regarding generalizability, selection bias, and data integrity applied to each.

The studies conducted by Mitchell and colleagues provide insight into the growing issues of physician ownership and self-referral. However, as mentioned previously, there are concerns regarding selection bias that may have influenced the authors' findings, as well as an inability of the authors to confirm the integrity of the data they were provided. In addition, patient characteristics not accounted for in the research may have influenced the physicians' decision making. It is therefore difficult to ascertain the physicians' motivators. It would be beneficial to replicate the work of Mitchell and her colleagues with contemporary providers to investigate if, under the latest government and payer policies, physicians respond any differently to financial incentives than their predecessors.

In more recent work, Mitchell published a report examining the prevalence of physican self-referral for diagnostic imaging in 2004 (Mitchell, 2007). She and her

colleagues conducted this study using billing records from a large insurance carrier in California which serves upwards of 5.8 million people. For this study, the researchers correlated physician-specific information with their billing for radiological services. The researchers also used phone follow-up surveys to ascertain physicians' ownership interest in these services. The research showed that approximately 33% of physicians who billed for radiological services were non-radiologists who were small to medium-sized physician groups and who were involved in self-referral. The majority of the self-referring physicians who billed for magnetic resonance imaging (MRI) (61%) and computed tomography (CT) scans (64%) had lease, time-share, or pay-per-click arrangements rather than having the diagnostic equipment within their practices. Seventy percent of self-referring physicians utilizing positron emission tomography (PET) scans had these machines on site. This study documented the prevalence of physician ownership arrangements despite public policy efforts to curb self-referral practices. Unfortunately, the study is limited to one state, and the data set primarily included patients too young to be protected by the federal self-referral laws established for Medicare beneficiaries (Mitchell, 2007).

Another example of tailored referral behavior in today's health care markets comes from the study of specialty hospitals. Specialty hospitals are physician-owned hospitals that provide care for patients with specific diagnoses. These types of facilities are not new to the health care landscape, but rapid growth in the number of these facilities in recent years has raised questions among health care providers and policymakers. The

most recent growth in the number of specialty hospitals has included facilities that focus on cardiac care, orthopaedics, and surgery (MedPAC, 2005).

Advocates of specialty hospitals argue that these facilities provide improved satisfaction for their patients and physicians, improved patient outcomes, improved efficiency of care delivery, and increased incentive for competing hospitals to enhance their own quality of care in response to the specialty hospitals' competition (MedPAC, 2005). Detractors of these facilities suggest that they selectively self-refer the most profitable patients and fail to share the burden of caring for the communities' poor or uninsured patients (MedPAC, 2005).

Researchers working on behalf of Centers for Medicare and Medicaid Services (CMS) have begun to provide evidence on the performance and impact of specialty hospitals. In 2003, as a part of the Medicare Prescription Drug, Improvement, and Modernization Act (MMA), the Medicare Payment Advisory Commission received a mandate from the Congress to compare specialty hospitals' performance to hospitals that share the same or similar health care markets. Thus far, in response to this mandate, MedPAC has examined Medicare and Medicaid claims data from 2002 and 2004. The researchers have concluded that specialty hospitals exhibit higher costs per day (up to 20% higher) with shorter lengths of stay, that they tend to treat patients who have fewer co-morbidities and better reimbursement, and that they tend to treat significantly fewer patients with Medicaid insurance (up to four times less likely) than community hospitals that share their markets (MedPAC, 2005, 2006). Findings regarding the impact of specialty hospitals on the Medicare margins of community hospitals have shown that, while

specialty hospitals do appear to be selectively referring patients, the changes in hospitals' margins have been absorbed by their cost-shifting and expansion into more lucrative service lines, including rehabilitation (MedPAC, 2006). The MedPAC researchers suggested that the negative impact on community hospitals is likely to increase as the numbers of specialty hospitals multiply and existing facilities expand their own service lines (MedPAC, 2006). One of the major concerns of patients, policymakers, and providers is how these changes in the market may influence communities' access to care.

Selective Referral

A report generated in 2002 for the CMS investigating the utilization of outpatient therapy services provides some evidence of the phenomenon of selective referral and its impact on institutional facilities (Olshin, et al., 2002). An institution may be operationally defined as an established organization or foundation dedicated to one cause. In the case of hospitals, their institutional objective is to provide health care to persons in their communities. In their report, Olshin and colleagues concluded that overall, "Outpatient therapy services are shifting toward non-institutional provider settings" (Olshin, et al., 2002, Executive Summary, p. 13). Though their study demonstrated a global shift toward non-institutional providers (e.g., private practices, physician offices, and joint ventures), certain special populations continued to be consistently referred to hospital-based centers and remained dependent upon these systems for their care. These included women, minorities, and the elderly, all persons for whom care tended to be more involved and costly. The authors also highlighted the issue that fee schedules markedly affect

payments to institutions, which in turn affects the demographic groups that rely upon these institutions for their care (Olshin, et al., 2002).

In 2006, Ciolek and Hwang's report to CMS reinforced these findings. Their study found that, between January 2003 and June 2005, hospitals' share of outpatient rehabilitation services had diminished beyond what had been reported previously. For example, the number of hospital-based outpatient rehabilitation facilities decreased 4.9% from 5,601 in 2000 to 5,326 in 2004, while physical therapy private practitioners increased 190.5% (from 11,602 to 33,704), and non- physician providers increased 51.7% (from 588 to 892) (Ciolek & Hwang, 2006). The data from this report reflect the shift of outpatient rehabilitation patients away from hospital-based providers to private practices owned by physical therapists, physicians, and/or non-physician providers. Interestingly, between 2000 and 2004, the number of physician providers of physical therapy services decreased from 34,803 to 32,205 (-7.5%) (Ciolek & Hwang, 2006).

It seems unlikely that physicians who are motivated by the desire for increased autonomy and financial gain would abandon ownership of physical therapy services, leading to an overall decrease of the physician providers of these services. A competing explanation for these CMS statistics may be a change in their data collection process. Beginning in 2003, CMS began to issue physical therapy private provider (PTPP) numbers to therapists employed by or under contract with health care providers who billed Carriers insurance. Prior to this, therapists who were employed by or contracted with physicians and non-physician providers had used the physicians' identifier for billing purposes. Subsequent to the CMS changes, PT providers employed by physicians

were now represented as private providers, though these persons may not have held any ownership in the PT practices (Ciolek & Hwang, 2006). This information sheds new light, then, on the dramatic increase in the number of private physical therapy practitioners (PTPP) from 2000 to 2004. These numbers may be a reflection of true PT private practice growth and/or the growth of POPTS and joint ventures. The latter explanation would be more consistent with the trends of escalating PT service provision by non-physician providers as well (e.g., physician assistants, nurse practitioners, and clinical nurse specialists). These providers are increasingly sharing the workload of physicians, treating patients and generating revenue at a lower cost to the physician practices while increasing the volume of patients seen. Since these clinicians practice under the supervision of a physician, the fees they generate lead to increased income for their practices and the providers who share ownership interest.

In a 2006 report to the Congress, the Medicare Payment Advisory Commission (MedPAC) highlighted the selective referral practices of physicians in specialty hospitals. According to MedPAC reports, the physicians who practiced in these facilities tended to treat patients who had fewer co-morbidities and who had better insurance (MedPAC, 2006). While representatives from competing hospitals contended that favorable selection of patients was being motivated by financial concerns, specialty hospital physicians expressed that they were practicing "responsible medicine" by referring complex patients to the community hospitals where consulting specialists are more readily available (MedPAC, 2006). In either case, the end result appeared to be the relegation of patients

who required more costly care and had poorer funding sources to the community hospitals.

Access and Quality

Proponents of POPTS and joint venture practices suggest that physician-ownership helps to facilitate care in underserved areas by allowing doctors to provide a full-spectrum of services (Mitchell & Sass, 1995; Mitchell & Scott, 1991, 1992a, 1992b, 1992c; Mitchell & Sunshine, 1992). Though the opportunity to provide these services in rural areas exists, the distribution of physicians remains most heavily concentrated in urban and suburban environments, excluding inner city facilities (Ahern & Scott, 1994). This suggests that the incentives current policies provide for joint ventured physicians to serve typically underserved populations are not effective. Using data from the Florida Health Care Cost Containment Board survey, Ahern and Scott found that joint ventured physicians were more likely to not treat in underserved areas or to see patients with Medicaid reimbursement (Ahern & Scott, 1994). Their findings suggested that physicians were selecting the populations they serve and that typically underserved persons were consistently deselected. Questions regarding the referral patterns of physicians who own ancillary services are also raised by findings from the 2002 CMS study on outpatient therapy utilization (Olshin, et al., 2002). As stated previously, the results of this study suggested that more patients with Medicare reimbursement are referred to hospitals for their care than to POPTS or joint venture practices.

In addition to issues of access to care, concerns regarding the utilization patterns and quality of care provided by physician owned and joint venture practices have also been

raised- specifically in POPTS (Mitchell & Scott, 1992c). A 1994 study conducted by the Office of the Inspector General (OIG) on behalf of the United States Department of Health and Human Services (U.S.D.H.H.S.) examined the nature and extent of outpatient physical therapy services provided to Medicare beneficiaries in physicians' offices relative to those provided in other outpatient settings (OIG, 1994). A stratified random sample of 300 beneficiary cases was selected for study, comprised of 100 cases from independently practicing physical therapists' offices and 200 cases from physicians' offices. Results of the study indicated that four out of five cases reimbursed as physical therapy in physicians' offices did not represent true physical therapy services, because they tended not to be restorative or complex and not to have treatment plans, goals, or objective evaluations (OIG, 1994). In contrast, independently practicing physical therapy clinics routinely had plans of care, goals, objective evaluations, and restorative interventions. The OIG recommended that the CMS conduct focused medical reviews, increase physician education activities, and translate guidelines for physical therapy across all practice settings (OIG, 1994).

In 2002, the Office of the Inspector General revisited the topic, initiating work with CMS to determine if physical therapy services provided in physicians' offices were meeting program requirements. The researchers reviewed a random sample of claims for physical therapy services submitted by physicians' offices from January 1 to June 30, 2002, 2003, and 2004. The researchers requested complete medical records from each of the physicians for each of the sample claims submitted during this time period. Four requests for records were made, and 54 (79%) of the physician offices responded. The

researchers contracted licensed physical therapists to conduct a more comprehensive review of the physical therapy services that were billed based upon the CMS coverage requirements and guidelines. When the requested medical records were not submitted, the individual cases were referred to the appropriate Medicare carrier for resolution under 42 CFR § 424.5(a)(6) (Wright, 2006).

The researchers analyzed Medicare Part B physical therapy claims and examined the total allowed amounts of physicians' physical therapy, physical therapy per physician and beneficiary, geographic dispersion of physical therapy services billed to Medicare, and relationships between the physicians. They also conducted personal interviews with a sample of Medicare Part B carriers who had previously conducted their own reviews of physicians' physical therapy claims (Wright, 2006).

According to the OIG findings, physical therapy billed directly by physicians' offices during 2002 to 2004 was $158 million of the total $528 million spent on physical therapy by the Centers for Medicare and Medicaid Services. In the random sample of 70 physical therapy line items billed by physicians in the first six months of 2002, Wright and colleagues found that 91% of the physical therapy items billed by physicians did not meet program requirements. In fact, 26% of these services were deemed by the reviewers to be medically unnecessary, and 34% were undocumented. Plans of care were incomplete or absent in 57% of the cases examined, and, because of incomplete plans of care, the reviewers had difficulty or were unable to review the quality of the therapy services provided. Most of the medical records failed to indicate the skill level of the person or persons who rendered the therapy services. Only thirty-three percent of cases provided

any documentation regarding who provided the services. Overall, the researchers estimated that Medicare had made $136 million in improper payments in the first six months of 2002 alone (Wright, 2006). Analysis of data from 2002 to 2004 showed "…aberrances in physicians' billing patterns and unusually high volumes of claims"(Wright, 2006, p. 1). Criteria for review, including medical necessity, plans of care, and other documentation, were applied in a standardized manner. The authors did not report on the possibility of self-selection bias for respondents and non-respondents; however, their review of the claims data was consistent with the processes conducted by Medicare carriers.

Growth in the number and diversity of physician owned facilities and joint ventures provides evidence that physicians respond to market incentives, annexing health care services and engaging in selective referral to recapture lost revenue (Graham, 2003; McGuire & Pauly, 1991; Miller, 2004; Mitchell, 2007; Nguyen, 1994). These behaviors may result in the long-term erosion of the financial security of the hospital-based providers that rely in part on referrals from these physician entrepreneurs. If physicians are consistently sending patients with poorer or no reimbursement to these institutions, the institutions will likely be unable to continue to serve their communities' rehabilitation needs. As a result, the quality of the services being provided may suffer unless public policy changes or significant subsidization is provided.

Background on Public Policy Pertaining to Self-Referral

This section provides a discussion of the federal and state policy responses to physician self-referral. In addition, the contribution of payment policies for hospitals and

physicians is reviewed. As stated previously, the government's initial cost-containment efforts and private insurers' capitated fees failed to achieve the desired result of cost containment. Instead, physicians' responses to the payment changes included increased service utilization, as was predicted by McGuire and Pauly's model of physician behavior (1991). Subsequently, policymakers looked to other sources of health care system inefficiencies to promote cost savings. One suspected source of inefficiency was the practice of self-referral, which was already being investigated as a cause of over utilization and inefficient care delivery. New federal and state legislation was prompted by reports from the Office of Inspector General, other agencies, and independent researchers that suggested self-referral may encourage excessive use of designated health services, leading to waste of public resources (Ahern & Scott, 1992; Childs & Hunter, 1972; GAO, 1994; B. Hillman, et al., 1990; B. Hillman, Olson, Griffith, Sunshine, Joseph, Kennedy, Helson, et al., 1992; Mitchell & Sass, 1995; Mitchell & Scott, 1992b, 1992c; Mitchell & Sunshine, 1992; Office of Inspector General, 1994; OIG, 1989; Olshin, et al., 2002; Scott & Mitchell, 1994).

In response to the findings of this research, and in an attempt to curtail the practice of physician self-referral, Congress passed the Ethics in Patient Referral Act, a bill sponsored by Congressman Pete Stark that was subsequently known as the Stark Law ("Omnibus Reconciliation Act," 1989). This law prohibited physicians from referring patients with Medicare reimbursement to clinical laboratory services in which they have a financial arrangement. Section 1877 of this law was amended in 1990 to clarify reporting procedures and definitions, as well as to provide additional exceptions to the rules.

Members of the Health Care Financing Administration (HCFA), which has since been renamed the Centers for Medicare and Medicaid Services (CMS), commented that Stark laws merely provided a threshold for acceptable financial relationships between physicians and the entities to which they make referrals. Although the original Stark Law addressed issues of abuse of laboratory services, it failed to reduce the financial burden and issues of over-utilization associated with other ancillary services (Memel & Grosvenor, 2003).

As a consequence of these policy shortfalls, the Stark Law was amended in 1993 with the passage of the Omnibus Budget Reconciliation Act and its Comprehensive Physician Ownership and Referral Act, known as Stark II ("Omnibus Budget Reconciliation Act," 1993). This new amendment expanded the list of designated health services, in addition to laboratory services, where physician self-referral would be prohibited and uncompensated by federal programs to include the following: a) physical therapy; b) occupational therapy; c) durable medical equipment and supplies; d) prosthetics, orthotics, and prosthetic devices; e) radiology; f) home health services and supplies; g) parenteral and enteral nutrients, equipment, and supplies; h) outpatient prescription drugs; and i) inpatient and outpatient hospital services ("Criminal penalties for acts involving Federal health care programs," 1993). This legislation also extended the restrictions on self-referral to include the Medicaid program, but it did not extend to commercial payers. Legal exceptions to these laws were made in the cases of physicians practicing in rural areas and for those practices that provided designated health services in physicians' offices incident to the physicians' seeing the patient for a procedure or office visit.

Additional statutory amendments were made to the laws in 1994, finalizing the list of ten designated health services and altering reporting requirements and compliance dates. After final regulations were promulgated by HCFA and public comments were received, the first phase of the final rule was published in the Federal Register on January 4, 2001, including the aforementioned changes to the original legislation. The new laws were gradually phased in, in order to allow affected financial arrangements between physicians and their partners to be restructured. The Stark II laws have been in effect since 1995, with Phase I being implemented in 2002 and Phase II in 2004.

The self-referral law, as explicated by the U.S. Department of Health and Human Services in 2001, "…prohibits physicians from referring Medicare patients for certain health services to entities with which the physicians or their immediate family members have a financial relationship" (U.S. Department of Health and Human Services, 2001). The Stark laws restrict self-referral for profit activity, though physicians are still able to self-refer for targeted services under certain conditions. In order to legally self-refer, the physicians' compensation must be the same or less than it would be if the services were provided by a facility or group that did not have a financial relationship with the physician (U.S. Department of Health and Human Services, 2001). In other words, physicians are allowed to self-refer for targeted services, as long as the cost to society is not greater than it would be if they referred to outside providers. The government's means of tracking this information is through database research, where information on average costs, numbers and types of treatments, and outcomes is utilized to help determine remuneration for services. Though the CMS database captures information on

the numbers and types of codes billed and paid for services rendered under federal programs, it fails to capture data on other potential costs of these policies, including reduced access to services for special populations.

In addition to providing restrictions on self-referral practices, legislation has been designed to affirm the federal government's expectations that health care services will be provided in an efficient manner, based upon the best available evidence ("Social Security Act," 1993). Efficiency, in this instance, may be better understood as economies of scale. Economists suggest that economies of scale are achieved in health care delivery when costs are minimized and health benefits are maximized (Folland, Goodman, & Stano, 2004c). If physicians provide services that are costly, or that do not produce additional health benefits for their patients, they sacrifice economies of scale. Since health care costs are increased when physicians induce the need for services, and, because these services may not produce additional health benefits for the patients, reduced economies of scale result from physicians' inducement of demand for health care services. Inducement is therefore deleterious to efficiency.

The impact of the Stark legislation on health care costs and self-referral practices has not yet been ascertained. It is important to note that the Stark laws do not apply to physicians who opt out of the Medicare and Medicaid programs. These physicians are not bound by Section 1877 of the Act and may therefore refer to entities in which they have a financial relationship, unless state law prohibits such practice. As a result, the liability statutes outlined in Stark I and II have developed in conjunction with federal and state-level intent-based anti-kickback, self-referral, patient brokering, and fee-splitting

legislation. The federal laws, including the criminal and civil statutes, are outlined in Appendix C.

Federal anti-kickback laws prohibit "…any knowing and willful solicitation or receipt of remuneration in return for the referral or furnishing of any item or service for which payment may be made under a federal health care program, unless a 'safe harbor' applies" ("Criminal penalties for acts involving Federal health care programs," 1993, Public Law 1320a-7b, Section 1128B). State laws also address the issue of physician kickbacks. Unlike the federal self-referral and anti-kickback laws, which apply only to patients with Medicare or Medicaid reimbursement, state laws apply to all patient populations, regardless of their payer source. However, because they are intent-based, these anti-kickback laws are difficult to enforce, and burden of proof lies with the government at what is conceivably great expense (Prom et al., 2002). This is because enforcement of states' intent-based legislation requires evidence that those persons or firms found in violation of the laws knowingly and willfully intended to disobey the laws [42 USC § 1320a – 7b(b)(2)]. In contrast, the Stark laws are more readily enforceable, with the consequences of lawbreaking manifest in, among other punishments, denial of payment for services ("Civil monetary penalties," 1993).

Legal Exceptions

The language of the Stark laws as written provides limited protection from some of the potential negative consequences of self-referral practices. Amendments to this legislation have resulted in several loopholes that are being exploited. For example, an exception to the rules promulgated by HCFA "…generally permits physicians to refer to

entities with which they have a compensation relationship, as long as compensation paid to the physician is no more than would be paid to someone who provided the same services but was not in a position to generate business for the entity" (U.S. Department of Health and Human Services, 2001, p. 1). Specific to rehabilitation, physicians and physical therapists may share financial interests in a practice if the relationship is of fair market value and is independent of the number of referrals generated by the physician investor ("Ethics in Patient Referral," 1993). In these joint ventures or physician-owned practices, compensation arrangements must be set in writing, signed by both parties, and must not violate state anti-kickback statutes. In-office ancillary services (e.g., physical therapy services) may be provided in physicians' offices with the following three qualifications: a) direct supervision, as outlined by applicable Medicare and Medicaid payment coverage rules; b) building requirements, where the physician or group must furnish services unrelated to the designated health service in the same building; and c) billing requirements, where billing codes for services are submitted under the physician's license number ("Ethics in Patient Referral," 1993). This exception provides physician investors with the opportunity to invest in ancillary services if the care they provide costs essentially the same as it would at another provider. However, this exception fails to account for the potentially increased societal costs associated with physicians' selectively referring patients who are more medically complex or who have poorer or no reimbursement to institutional providers.

Safe Harbors

Other exceptions to the Stark and anti-kickback legislation pertain to provision of designated health services in rural or medically underserved areas. In order to encourage development of physician practices in rural and underserved environments, and to foster comprehensive care in these communities, exception is given for self-referral to joint owned designated health services by physicians in these regions ("Ethics in Patient Referral," 1993). Rural practices and practices in underserved areas are excluded from the anti-kickback legislation, falling instead under the provisions of the federal legislation's **safe harbors**.

Including the rural exception, there are currently 22 designated **safe harbors**, which may be described as certain payment and business practice schemes that exist in exception to the anti-kickback laws. The list of safe harbors was published in the Federal Register in 1999. For the purposes of this research, it is important to note that physicians' investments in small health care joint ventures, including physical therapy services, are considered exceptions under these safe harbors. Though physical therapy is only one of ten designated health services included in the Stark legislation, it is the focus of this dissertation and is therefore the service highlighted throughout the remainder of this paper. In addition to joint venture investments, the safe harbor exceptions also provide for physical therapists and physicians to have contractual space and equipment rental arrangements that are based on fair market value, set out in writing and signed, that cover all the premises and equipment rented by the physical therapist and the intervals for its

use, that cover the terms of the rental agreement, and that provide for reasonable aggregate rental charges and spaces (Table 1) ("Ethics in Patient Referral," 1993).

Table 1. Federally designated safe harbors.

Safe Harbors
a) Investments in large publicly held health care companies
b) Investments in small health care joint ventures
c) Space rental
d) Equipment rental
e) Personal services and management contracts
f) Sales of retiring physicians' practices to other physicians
g) Referral services
h) Warranties
i) Discounts
j) Employee compensation
k) Group purchasing organizations
l) Waivers of Medicare Part A inpatient cost-sharing amounts
m) Investments in underserved areas
n) Practitioner recruitment in underserved areas
o) Obstetrical malpractice insurance subsidies for underserved areas
p) Sales of practices to hospitals in underserved areas
q) Investments in ambulatory surgical centers
r) Investments in group practices
s) Referral arrangements for specialty services
t) Cooperative hospital service organizations
u) Shared risk arrangements

Current health care legislation governing self-referral affords distinct advantages to physicians who invest in POPTS, because, as mentioned previously, these policies only partially limit physicians' abilities to selectively self-refer patients. In the current medical model, physicians tend to control the referrals made to physical therapy services. Though some control over referrals practices is exerted by individual states and federal law, if an entrepreneurial physician investor wishes to maximize his or her profitability, he or she may relegate the costliest or least lucrative patient cases to competing providers of ancillary services, such as hospital-based centers, while retaining the most lucrative

patient cases for their own practices or facilities. Policy, as it is written, does not prevent physicians from discriminately referring. In fact, it may be indirectly encouraging these practices.

State Legislative Efforts and Self-referral

The Stark laws only apply to federally funded programs. In addition, this legislation does not address the issue of physicians' selective referral, nor is there an established means of identifying this practice. Subsequently, individual states have developed legislation designed to protect the public's interest, helping to preserve health care resources under all payment schemes, be they public or private.

Though physicians are the focus of federal legislation governing self-referral, the practitioners to whom they refer must also be considered in policy development. In the case of physical therapists (PT), several states have developed practice acts that govern the relationship PTs may have with their referral sources. For example, in Delaware, the Physical Therapy Practice Act prohibits physical therapists from dividing, transferring, assigning, rebating, or refunding fees received for professional services with any person who refers a patient or with relatives or business associates of the referring person ("Physical Therapy Practice Act," 2002). The therapist also cannot receive a payment or compensation that has monetary value from the referring provider. The rules suggest that a physical therapist engaged in these acts may have their license suspended or revoked ("Physical Therapy Practice Act," 2002). Similar physical therapy legislation has been enacted in Arizona (Ariz. Rev. Stat. Ann. § 32-2044), Arkansas (Ark. Code Ann. § 17-93-308), Florida (Fla. Stat. Ann. § 486.125), Louisiana (La. Rev. Ann. § 37:2413), South

Carolina (S.C. Code Ann. § 40-45-10), Tennessee (Tenn. Code Ann. § 63-13-312), and Wyoming (Wyo. Stat. § 33-25-11). Since the proposed research will utilize data from the Florida region, the specifics of Florida law governing physicians' self-referral practices will be highlighted in this review.

Florida Law

To protect patients and payers beyond the scope of existing federal law, Florida lawmakers have enacted legislation governing physicians' self-referral practices, with particular focus on financial arrangements and kickbacks. This legislation takes many forms and comes in response to studies demonstrating a relationship between physicians' ownership interest, service utilization rates, and health care costs (Mitchell & Sass, 1995; Mitchell & Scott, 1991, 1992b, 1992c; Mitchell & Sunshine, 1992; Scott & Mitchell, 1994; Swedlow, et al., 1992). The Patient Self-Referral Act (Fla. Stat §456.053) is essentially analogous to the Stark legislation and restricts self-referral to each of the ten designated health services. Florida's Anti-Kickback statutes [Fla. Stat §409.920(2)], Patient Brokering Act (Fla. Stat §817.505), and Fee-Splitting laws (Fla. Stat §458.331) are roughly equivalent to the Federal Fraud and Abuse laws ("Civil monetary penalties," 1993). The Florida laws apply to physicians' conduct regardless of their patients' payer sources. Details of the Florida Statutes are included in Appendix D to facilitate comparison with federal laws.

In a report by the ad hoc Legislation Committee of the Florida Bar Association (2002), members critiqued the Florida laws to determine if they address the issue of patient self-referral and if they are superfluous to preexisting federal legislation. According to the

committee, while the federal and state laws are roughly analogous, they "…are in numerous instances inconsistent" (Prom, et al., 2002, Summary of Findings, p. 3). The committee found that the Florida Anti-Kickback Law (Fla. Stat §456.054) was overbroad, failing to include the safe harbors that were outlined in federal laws [42 USC s. 1320a-7b(b)]. The Patient Brokering Act (Fla. Stat §817.505) was found to be duplicative of the federal laws with regards to health care items or services that are federally funded. Both the federal and state laws apply to ownership interest in facilities to which physicians refer their patients; however, Florida law does not apply to arrangements outside of investment interests (i.e., employment or independent contractor arrangements). The scope of services addressed by each of the laws is also different. The federal act applies only to designated health services reimbursed under federal programs, while under the Florida laws, all health care services are subject to its provisions, regardless of the patients' payer source. The ad hoc committee concluded that the fee-splitting prohibitions (Fla. Stat §458.331) fail to operationally define "fee-splitting", leaving too much room for interpretation by the Florida Board of Medicine (Prom, et al., 2002). The committee made suggestions for the revision of the existing Florida legislation. These revisions have not yet been fully incorporated into new legislation, though changes have been made to Florida's Medicaid anti-kickback laws. These laws now include language that addresses individual physicians' knowledge about and willingness to break the law, establishing the intent-based nuance of the state legislation (Appendix D).

In spite of Florida's efforts, "…few (if any) physicians have been disciplined directly for violation of Florida laws prohibiting patient self-referral/anti-kickback so that the cost

of enforcing these laws is minimal compared to the costs incurred by health care professionals to obtain legal advice as to relationships and activities" (Prom, et al., 2002, Summary of Findings, p. 3). Part of the reason for the lack of enforcement appears to be the complexity and sometimes contradiction in the wording of the legislation. In the opinion of the Florida Bar ad hoc committee members, these laws "…are not enforced, because few, if any on the enforcement side fully understand them" (Prom, et al., 2002, Summary of Findings, p. 3).

In summary, the legislation pertaining to physicians' self-referral practices at the federal and state levels is complex. With the addition of numerous safe harbors and exceptions, the legislation may have become diluted, resulting in policies that fail to adequately curb the practice of physician self-referral for profit.

Reimbursement and the Financial Health of Hospitals

The amount of reimbursement a facility receives for the health care services it provides helps to determine its financial viability. Recent decades have witnessed dramatic changes in how providers are reimbursed for health care services. Some of these changes in reimbursement, alluded to previously in reference to Olshin and colleagues (2002), stem from the altered CMS payment structure developed for the Balanced Budget Act (BBA) ("Balanced Budget Act," 1997). Unlike physician offices that provide physical therapy services, hospitals and comprehensive outpatient rehabilitation facilities (CORFs) have been subjected to substantial fee changes and increase in the paperwork burden associated with revisions made to the CMS Prospective Payment System (PPS) ("Balanced Budget Act," 1997). These changes serve as financial and administrative

obstacles for these institutions, and their influence on the economic viability of these institutions must be considered among other factors when examining institutional revenues and facility closures.

Payment Policies and Their Consequences

In the late 1990s, as the federal deficit grew and budgetary concerns came to the forefront, government officials more closely examined the cost-effectiveness of the health care being rendered under the Medicare and Medicaid programs. At the time, the fastest growing areas in health care were outpatient services, including ambulatory surgery and ancillary health care (e.g., rehabilitation). As part of the Balanced Budget Refinement Act (BBRA), Congress requested a CMS study on utilization patterns of outpatient services covered by Medicare following implementation of the BBA and BBRA (Olshin, et al., 2002). The study analyzed claims data from the entire universe of more than 15 million outpatient therapy claims per calendar year from 1998, 1999, and 2000. Results showed that, following imposition of therapy fee schedules for institutional providers, the number of outpatient therapy patients dropped 2.5%, in spite of growth in the number of Medicare eligible beneficiaries (Olshin, et al., 2002). In calendar year 2000, when these fee schedules were suspended, the number of outpatient therapy patients increased by 3.6%, which was consistent with national trends. However, the number of patients being treated in comprehensive outpatient rehabilitation facilities (CORFs) and other institutions remained reduced due to the new fee schedule payment methodology, highlighting the influence of reimbursement on service utilization patterns. In particular, patients who were more likely to be treated at institutions (i.e., women,

elderly, and minorities) had more significant payment reductions, which was consistent with the reductions in institutional provider payments (Olshin, et al., 2002). These persons who received treatment at institutions also tended to be the highest cost users of outpatient services and were likely to surpass their outpatient therapy payment caps. These patients might, therefore, be selected for referral to hospital-based PT clinics once outpatient benefits have been exhausted. Non-institutional providers of therapy services (e.g., private or corporate physical therapy practices, physician joint ventures, and POPTS) tended to treat less complex orthopaedic conditions, relative to the costly and complex patients treated by institutional providers (Olshin, et al., 2002). The authors of this study suggested that payment policy changes, such as the Medicare fee schedule, may affect a disproportionate number of at-risk individuals who require more costly outpatient services than the general population (Olshin, et al., 2002).

It seems reasonable that the impact of fee schedules, regulations, and paperwork burden on institutional providers may reduce the numbers and types of services these facilities are able to offer to certain patient populations. However, reduced remuneration and numerous administrative obstacles are not the only issues facing these institutional providers. If patients are also being selectively referred to institutions by physicians who then retain patients with better reimbursement for their own practices, the institutions' economic viability may be further compromised. An unforeseen corollary of current policy may be an increased incentive for physicians to selectively self-refer patients with better reimbursement and to shuttle all other patients to institutional providers. Drastic changes in hospital-based facilities' case mixes may subsequently result in their inability

to recover revenues from other more lucrative insurance compensation arrangements, a phenomenon known as cost shifting.

Cost Shifting

Developments in health care financing have renewed policymakers' interest in providers' cost-shifting. Ginsburg described the phenomenon of cost shifting where "…changes in administered prices of one payer lead to changes in prices charged to other payers" (Ginsburg, 2002, W3-473). In order to examine cost shifting, economists assume that the provider or facility is working to maximize profits. Ginsburg argued that when you examine health care organizations, particularly large not-for-profit ones, profit maximization is not a good working assumption. He stated that profit maximization is often counter to the mission of these facilities and that hospitals and physicians are expected to provide a standard level of care, regardless of their patients' ability to pay (Ginsburg, 2002). Ginsburg observed that when the bulk of private payers reduce compensation for services and become aligned more closely with federal compensation programs, the health care providers' ability to price discriminate is reduced or eliminated. In this case, the facilities and providers lose their market power, the ability to manipulate the terms that dictate their ability to provide their services. When these providers no longer have market power, and the payers cannot be swayed to adjust their fee schedules, no provider cost shifting can occur. Ginsburg suggested that this will "…limit providers' ability or willingness to provide uncompensated care, and, over time, reduce providers' capacity to provide services" (Ginsburg, 2002, W3-474). To paraphrase, reduced reimbursement for services serves as a disincentive for institutions to continue providing

care to patient populations with the greatest need. This is counter to the mission of safety-net providers who work to ensure adequate health care for all members of their communities. For these providers, a reduction or elimination of services is likely to result from their insolvency. When services are eliminated, the community's access is restricted, particularly for those individuals who depend upon the hospitals for their care.

Background on the Study Setting

Orlando, Florida, served as the backdrop for this study of the relationship between the emergence of POPTS and the numbers and types of referrals received by two groups of hospital-based outpatient rehabilitation centers that share their health care market. Due to the growing numbers of persons with publicly funded insurance (e.g., Medicare and Medicaid) in the region, Orlando was well-suited for an investigation of the relationship between current federal and state health policies governing physician self-referral and the survivability of hospital-based outpatient rehabilitation providers. In this section, the market forces affecting the hospital-based outpatient physical therapy providers in Orlando, Florida, are highlighted. A description of the demographic and economic characteristics of the Orlando region, with a comparison to national, regional, and state level data is also incorporated, and the rationale for the selection of this region for this research is explicated.

Florida

The U.S. Census Bureau's South region, comprising 16 states and the District of Columbia, is leading the nation in population growth, with a projected population increase of 52.4%, or nearly 43 million, by 2030 (Appendix E) (U.S. Census Bureau,

2005). The South Atlantic region, in particular, is expected to increase its population by 32.0% overall within this time frame. Florida accounts for the greatest percentage of this growth, with population estimates for 2030 nearing 28.7 million (an estimated 79.5% increase) (U.S. Census Bureau, 2005). Florida experienced a 16% increase in its population between April 1, 2000 and July 1, 2009 and was home to 18,537,969 people according to the 2009 census (U.S. Census Bureau, 2010).

The Orlando, Florida, metropolitan statistical area (MSA) is also one of the largest and fastest growing in the state, encompassing three counties: Orange, Osceola, and Seminole. The U.S. Census Bureau ranked Osceola County 16th in the list of fastest growing counties in the nation, while Orange County was ranked the 35th largest county in the nation (U.S. Census Bureau, 2005). Between April 1, 2000, and July 1, 2004, Orange, Osceola, and Seminole counties' growth rates exceeded their state's average (see Table 2). In effect, the Orlando region is among the fastest growing in a state that is among the fastest growing in the nation. Not only is the Florida census growing, however, it is also changing demographically.

According to census data from 2004, in Orange, Osceola, and Seminole counties, the majority of the citizens are Caucasian (U.S. Census Bureau, 2006). The second largest demographic group consists of persons of Hispanic or Latino origins, though this group is the fastest growing in the region. The third largest group consists of black or African-American persons. These trends are consistent with the make-up of the Florida population in general, except for higher concentrations of Hispanic or Latino persons in

Orange and Osceola Counties and Caucasian persons in Osceola and Seminole Counties (Table 2).

Table 2. Florida census information: population estimates, race, income, and poverty levels.

2004 Population Estimate Percentages (Δ 2000 to 2004)	Caucasian (Δ 2000 to 2004)	Latino/Hispanic (Δ 2000 to 2004)	Black/African -American (Δ 2000 to 2004)	2003 Median Household Income (Δ 2000 to 2003)	2003 Persons Below Poverty Level (Δ 2000 to 2003)
Orange County 1,023,023 (↑ 14.1%)	52.7% (↓ 15.9%)	22.2% (↑ 3.4%)	20.5% (↑ 2.3%)	$40,604 (↓ $707)	13.2% (↑ 1.1%)
Osceola County 231,578 (↑ 34.3%)	51.9% (↓ 25.3%)	36.1% (↑ 6.7%)	9.7% (↑ 2.3%)	$38,954 (↑ $740)	13.1% (↑ 1.6%)
Seminole County 401,619 (↑ 10.0%)	72.1% (↓ 10.3%)	13.2% (↑ 2.0%)	10.6% (↑ 1.1%)	$49,199 (↓ $127)	9.1% (↑ 1.7%)
Florida 17,789,864 (↑ 11.3%)	62.8% (↓ 15.2%)	19.0% (↑ 2.2%)	15.7% (↑ 1.1%)	$38,985 (↑ $166)	13.0% (↑ 1.5%)

Each of the three counties of the Orlando region has a higher percentage of persons who are minors and relatively fewer elderly persons, when compared to state averages. The make-up of Orange, Osceola, and Seminole counties with regards to sex is congruent with state averages. Available data on median household incomes and the relative percentages of persons below poverty level show that Seminole County appears to be relatively more affluent than Orange and Osceola counties, as well as Florida on the whole. At last report (2003), median household income for the Orlando region exceeded the state averages, and poverty levels were lower than state averages. Still, median

household incomes in this region have declined since the last census, and poverty levels have increased (Table 3).

Table 3. Florida census information: citizen age and sex.

Region	Persons Under Five Years Old (2004)	Persons Under 18 Years Old (2004)	Persons 65 Years Old and Older (2004)	Female Persons (2004)
Orange County	7.5%	26%	9.6%	50.3%
Osceola County	7.2%	26.4%	11.0%	50.3%
Seminole County	6.1%	24.6%	10.7%	50.8%
Florida	6.3%	23%	16.8%	51.0%

A correlate with the 2000 to 2003 increasing poverty levels in this region may be the numbers of Medicaid enrollees, which have increased in two of the three Orlando counties. Data on Medicaid enrollees in the three counties are included in Table 4.

Table 4. Numbers and percentages of Medicaid enrollees by Florida county and year.

Year	Orange	Osceola	Seminole
2004	130,192 (13.2%)	40,490 (18.4%)	29,489 (7.5%)
2006	168,503 (16.1 %)	35,859 (14.7%)	49,369 (12.1%)

The number of Medicaid enrollees has grown in the last few years, and the Orlando Metropolitan Statistical Area (MSA) has seen a dramatic increase in its unemployment rates with current estimates for the Orlando region at 11.8% (Bureau of Labor Statistics, 2011). Since more citizens in the Orlando region are currently employed or retired without benefits, there is an increasing demand for federally funded health care services (e.g., Medicare and Medicaid). Estimates from the U.S. Census Bureau reported between

13.3 and 18.7% of Orlando residents were uninsured (U.S. Census Bureau, 2007). This suggests that either employers are not able to provide adequate health insurance for their employees and their families or that there are increasing numbers of impoverished persons or children currently living in or migrating to the region.

Managed Care in Orlando

Several plausible explanations for changes observed in the hospitals' rehabilitation market should be considered when investigating the influence of physicians' self-referral activities on hospital-based outpatient physical therapy providers. One of the alternative explanations for changes in referrals is managed care penetration. Managed care provides for an intermediary between the patient and the physician, allowing companies such as insurers, health maintenance organizations, or physician-hospital networks to exert an influence over the numbers and types of procedures performed or requested by participating physicians (Shih & Singh, 2007). The intent of these arrangements is to maximize profitability while maintaining a standard of care that leads to satisfactory patient outcomes.

Managed care organizations are motivated to reduce health care costs, because lowered costs allow these companies to retain a greater proportion of subscriber fees as profit. Managed care companies influence not only the quantities of services their patients receive but also at which facilities they receive them. This influence is a result of exclusive contracts that allow managed care companies to negotiate lower fees in exchange for channeling their subscribers to certain providers (Shih & Singh, 2007). The result for providers is a likely decrease in per patient revenue but a relatively steady

influx of new patients. Subsequently, providers may have the opportunity to recover lost revenue if the total volume of patients is increased and costs of care are minimized.

Over the past four decades, the influence of managed care on health care markets has been substantial, but some of these organizations, particularly health maintenance organizations (HMO), appear to be losing their dominance. Data from 2000 to 2005 reflect a significant decline in the penetration of HMOs into Orlando's three-county area (Fig. 2). For this dissertation, HMO penetration was calculated by using data from Florida's Agency for Health care Administration (AHCA) and Florida's Office of Insurance Regulation (FOIR), including Florida residents' enrollment in HMOs from 2000 to 2005 (Agency for Health Care Administration, 2007; Florida Office of Insurance Regulation, 2007). HMO enrollment for each Orlando county was determined from these data. County population data were derived from the U.S. Census Bureau's archived state and county quick facts information (U.S. Census Bureau, 2006). Enrollment data were divided by the population for the county for each year and multiplied by 100 to yield a percentage or penetration value. These data are represented in Figure 2. The graph shows a downward trend in HMO penetration for all three Orlando counties.

The influence of managed care organizations depends not only on their market penetration but also their facility contracts. From the data presented in Figure 2, it would seem likely that the number of HMO contracts available to facilities, such as hospitals, should have decreased between 2000 and 2005 and that the relative proportions of HMO clients seen by those facilities should have also decreased as the managed care companies' penetration of the market declined.

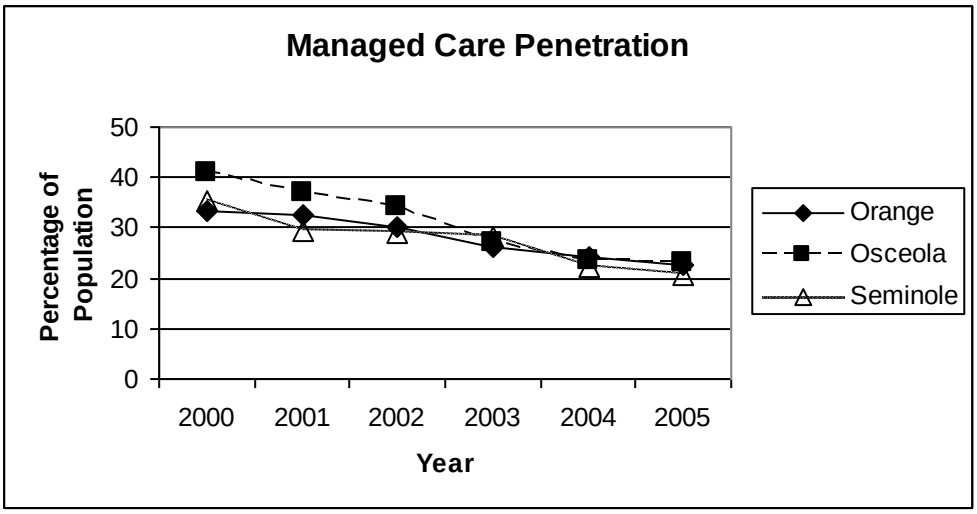


Figure 2. Penetration of HMOs in Orlando.

While many Orlando region HMOs are experiencing a decline in their enrollment, federal managed care enrollment continues to climb. Figures 3 and 4 provide a summary of Medicaid and Medicare HMO enrollment for all three Orlando counties. Again, this information is based upon reports from the Florida Office of Insurance Regulation (Florida Office of Insurance Regulation, 2007). Over 2000 to 2005, Medicaid managed care enrollment escalated from 8.9% of all managed care contracts to 32.5% (Florida Office of Insurance Regulation, 2007). These data suggest an increasing demand for HMO services associated with impoverished individuals. Medicare HMO enrollment decreased over the same time period (Figure 4).

The Orlando Physical Therapy Market

The Orlando region contains approximately one hundred outpatient facilities providing physical therapy services. These services were identified through the phone book and Internet, the Physical Therapy Provider Network (PTPN) group, and a 2002

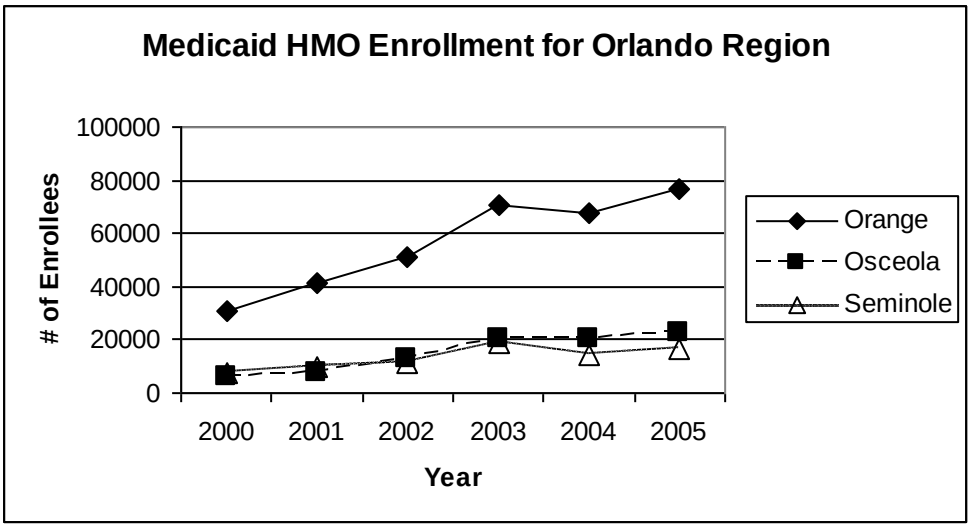


Figure 3. Medicaid HMO enrollment for Orlando region.

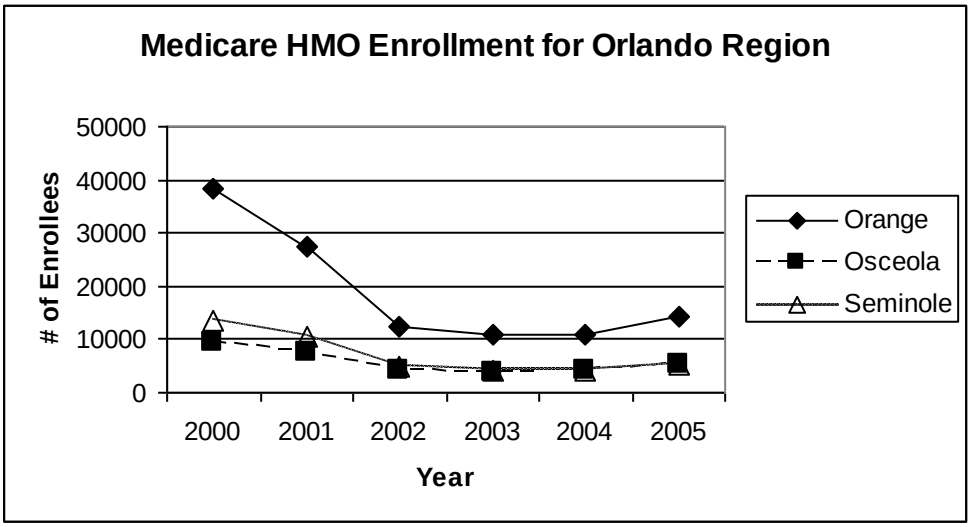


Figure 4. Medicare HMO enrollment for Orlando region.

Orlando Regional Healthcare System (ORHS) market survey of physical therapy providers. The facilities identified included hospital-based outpatient rehabilitation centers, physician-owned physical therapy (PT) practices, corporately owned physical therapy providers, and physical therapy private practices. The list of PT providers, current as of January 1, 2009, is included in Appendix F.

In order to support its population's health care needs, the Orlando region relies upon a hospital safety-net to provide health care services to those individuals who have little or no insurance. The Institute of Medicine (2000) defines safety net providers as "…providers that organize and deliver a significant level of health care and other related services to the uninsured, Medicaid, and other vulnerable patients" (Institute of Medicine, 2000). These providers are legally mandated or have adopted as their mission an open door, offering access to services regardless of patients' abilities to pay (Institute of Medicine, 2000). Though they receive some limited government subsidization for their efforts, these safety-net providers must function within an increasingly competitive market, while continuing to absorb revenue losses associated with participation in the federally-funded health care programs and indigent care. As market competition intensifies, the balance between meeting the safety-net organization's mission and maintaining its economic viability becomes more tenuous (Ernst & Young & HCIA-Sachs, 2002).

Orlando Regional Healthcare System. ORHS is a not-for-profit hospital system that has been serving the greater Orlando area since 1918. This hospital system cares for upwards of 2 million Florida residents and 6,000 international patients each year (ORHS, 2006). ORHS is one of two safety-net providers in its region, and it serves over 3,800 outpatient physical therapy patients annually (Jagger, 2005, personal communication). As part of their mission, and as mandated by federal law, not-for-profit hospitals such as ORHS serve uninsured persons and provide communities with uncompensated care. Specifically, the ORHS mission is, "To improve the health and quality of life of the

individuals and communities we serve" (ORHS, 2006). For the uncompensated care they provide, safety-net facilities like ORHS receive support through Medicaid and subsidies from state and local governments. However, the support often falls short of the costs of providing care. As reported by the American Hospital Association, hospitals received 82 cents for every dollar spent in caring for charity care and Medicaid patients in 2000 (AHA, 2002). In their 2006 Community Benefits report, ORHS shareholders recorded a $91,678,591 Medicaid/Medicare shortfall and a total value of costs in excess of payment of $124,954,591 (Orlando Regional Healthcare System, 2006). Since no endowment funds or philanthropic ventures are tied to the outpatient rehabilitation services provided by ORHS, the only remuneration received for services comes from federal, state, or private insurance programs and privately paying patients (Jagger, 2005, personal communication).

At present, ORHS supports seven outpatient physical therapy (OPPT) clinics. During the period of 1999 to 2005, ORHS was operating eleven OPPT clinics, but four of the clinics were closed during that time due to a reported lack of referrals and increased competition from POPTS and other physical therapy providers (Jagger, 2005, personal communication).

Florida Hospital System. The second and only other not-for-profit system in the Orlando region is the Florida Hospital System (FHS). Founded in 1908 by the Adventist Church, FHS is the oldest and largest system of health care providers in central Florida serving over 1,000,000 people per year (Florida Hospital System, 2007). FHS currently supports 14 OPPT clinics. During the period of 1999 to 2007, FHS had 13 OPPT clinics;

however, according to hospital officials, they closed two of their facilities due to loss of contracts and increased market competition (Moore, 2007, personal communication). In their 2006 Community Benefits report, FHS administrators recorded $125,787,447 in unreimbursed care for patients with Medicaid or self-payment (Florida Hospital System, 2006). They also recorded $83,513,184 in unreimbursed care for patients on Medicare (Florida Hospital System, 2006). No endowments were associated with these programs.

Market Penetration of POPTS and Joint Ventures

There are many reasons why the outpatient physical therapy market share for ORHS and FHS may be changing. One possible contributor to this market shift is the emergence of POPTS practices in the region. In these practices, physicians and their employees may serve both as providers of rehabilitation services and gatekeepers of referrals for these services. It is plausible, under these circumstances, that competing providers of rehabilitation services may experience a reduction in referrals received from these practices due to a captive referral source, though this has not been explored in previous research (Ahern & Scott, 1992).

A second explanation for the changes reported by the hospital administrators could be an overall reduction in the number of persons referred for physical therapy services by practitioners in the region. This is an unlikely competing phenomenon, however, because the overall population in the territory is growing rapidly and becoming demographically skewed toward a cohort that would be expected to utilize physical therapy services more frequently than the average consumer (i.e., more elderly persons) (Ciolek & Hwang, 2006).

A third possibility may be the emergence of other competitors in the region. As stated previously, nearly 100 physical therapy providers have been identified in the Orlando region, and this number does not include providers of alternative medical services that sometimes serve as adjuncts or substitutes for physical therapy services, such as chiropractic or massage therapy services. It is possible that the overall changes in referral patterns observed by the hospital administrators are a result of referrals being sent to these other providers, rather than to the physician owned physical therapy practices. It was therefore critical to this research that the timing of the entrance of these competitors into the market was elucidated. Surveying the development of these market competitors yielded some pertinent data that helped to clarify the relationship POPTS practices have with other providers in the surrounding rehabilitation markets.

Some additional factors in the utilization of physical therapy services may include the introduction of new technologies or therapies that attract clients or referrals. There also may be changes in insurers' policies that limit or expand coverage for these services.

The Problem

The evidence to date suggests that physician investment or ownership interest in ancillary (e.g., physical therapy) services may have a negative impact on utilization rates, costs, access to care, and the quality of care rendered (Ahern & Scott, 1992; Aronovitz, 1994; Childs & Hunter, 1972; GAO, 1994; B. Hillman, et al., 1990; B. Hillman, Olson, Griffith, Sunshine, Joseph, Kennedy, Nelson, et al., 1992; Mitchell & Sass, 1995; Mitchell & Scott, 1992b, 1992c; Mitchell & Sunshine, 1992). The literature supports the notion that physician ownership interest in ancillary services consistently leads to

increased health care costs. It is important to note, however, that the majority of the studies on this topic were conducted in the 1990s. What has not been identified in previous research is the influence of physicians' selective referral on hospital-based outpatient centers who share their health care markets. Of particular concern are safety net hospital providers because of the financial exposure they experience serving the uninsured and underinsured. When payer case-mixes become skewed toward insurance programs that provide less reimbursement for services, facilities such as ORHS and FHS are less able to recover lost revenue through cost-shifting to payers with higher reimbursement rates. This may lead to budgetary shortfalls that could potentially impact the solvency of some of the providers' programs. The purpose of this research was to examine the relationship between the emergence of orthopaedic POPTS and joint venture practices and changes in physical therapy referrals made to two groups of safety net, not-for-profit, hospital-based OPPT centers in one health care market.

One of the difficulties in trying to understand the POPTS practice phenomenon is the lack of concrete data. Neither the Centers for Medicare and Medicaid Services (CMS) nor third-party payer databases capture information regarding the referral patterns of POPTS or joint venture clinics, nor is there an established mechanism for identifying selective referral practices. Physician referral records are proprietary and are not readily available for study by health policy researchers.

For this research, two proprietary databases assembled and maintained by two safety net hospital systems were utilized. These databases included claims data, market data, and financial data from the period of 1999 to 2007. Access to these types of databases

was critical for this study, because it captured the essence of the hospital-based outpatient rehabilitation facilities' performances in an evolving health care market. Details regarding the design and methodology of this study are outlined in the Methods section (Chapter IV) of this dissertation.

Research Questions and Significance

This research was a retrospective analysis of the two hospital system databases using an ex post facto design and an analysis of phone survey data from orthopaedic physician and physical therapy providers in the Orlando region. The research questions that were developed for this study are:

1. Does the number of referrals per physician made annually to hospital system OPPT clinics change as a result of orthopaedic physicians' transition to POPTS practices?
2. Does the number of commercially insured patient referrals made to the hospital system OPPT clinics change as a result of orthopaedic physicians' transition to POPTS practices?
3. Does the number of Medicare insured patient referrals made to hospital system OPPT clinics change as a result of orthopaedic physicians' transition to POPTS practices?
4. Does the number of underinsured patient referrals made to hospital system OPPT clinics change as a result of orthopaedic physicians' transition to POPTS practices?

Understanding the influence of POPTS practices on hospital-based OPPT clinics is essential for policymakers who design regulations regarding physician self-referral practices. Rehabilitation services account for a growing proportion of the scope of physician self-referred services and overall health care spending. The amount of Medicare's annual spending on rehabilitation services has increased from $1 billion in 2000 to $4.27 billion in 2004 (Ciolek & Hwang, 2006; Olshin, et al., 2002). In an era of budget crises and exorbitant health care costs, various opportunities to improve efficiency should be explored. Future demand for rehabilitation services is likely to increase as the American population continues to age, and most of these persons are likely to participate in federally funded insurance programs. This research provides a mechanism for understanding the influence of orthopaedic POPTS and joint venture practices on market competitors.

CHAPTER III: THEORETICAL FRAMEWORK

This section provides a summary of the theoretical constructs that were used to guide this investigation. In this chapter, relationships between physicians' compensation, their referral patterns, competing providers who share their health care markets, and the health outcomes for the communities they serve are hypothesized. The theoretical constructs presented here are based upon the economics principles outlined in the Review of the Literature (Chapter II).

Theoretical Framework

Several theories have addressed the dynamics of health care markets, but the mechanisms behind the phenomenon of physician selective referral and its impact on other providers have not been sufficiently studied. Of particular interest to the present research is the relationship between physician ownership interest and referral patterns for physical therapy services made to two groups of hospital-based outpatient rehabilitation centers. For the purposes of this study, there are two forms of physician ownership interest in physical therapy services. These are joint ventures and physician owned physical therapy services (POPTS). In these practices, physicians serve not only as the patients' representative to the health care system but also as a provider or owner of services. This dual role, known as dual agency, places physicians in a unique position to

influence the quantities and types of health care services their patients consume (Folland, et al., 2004a).

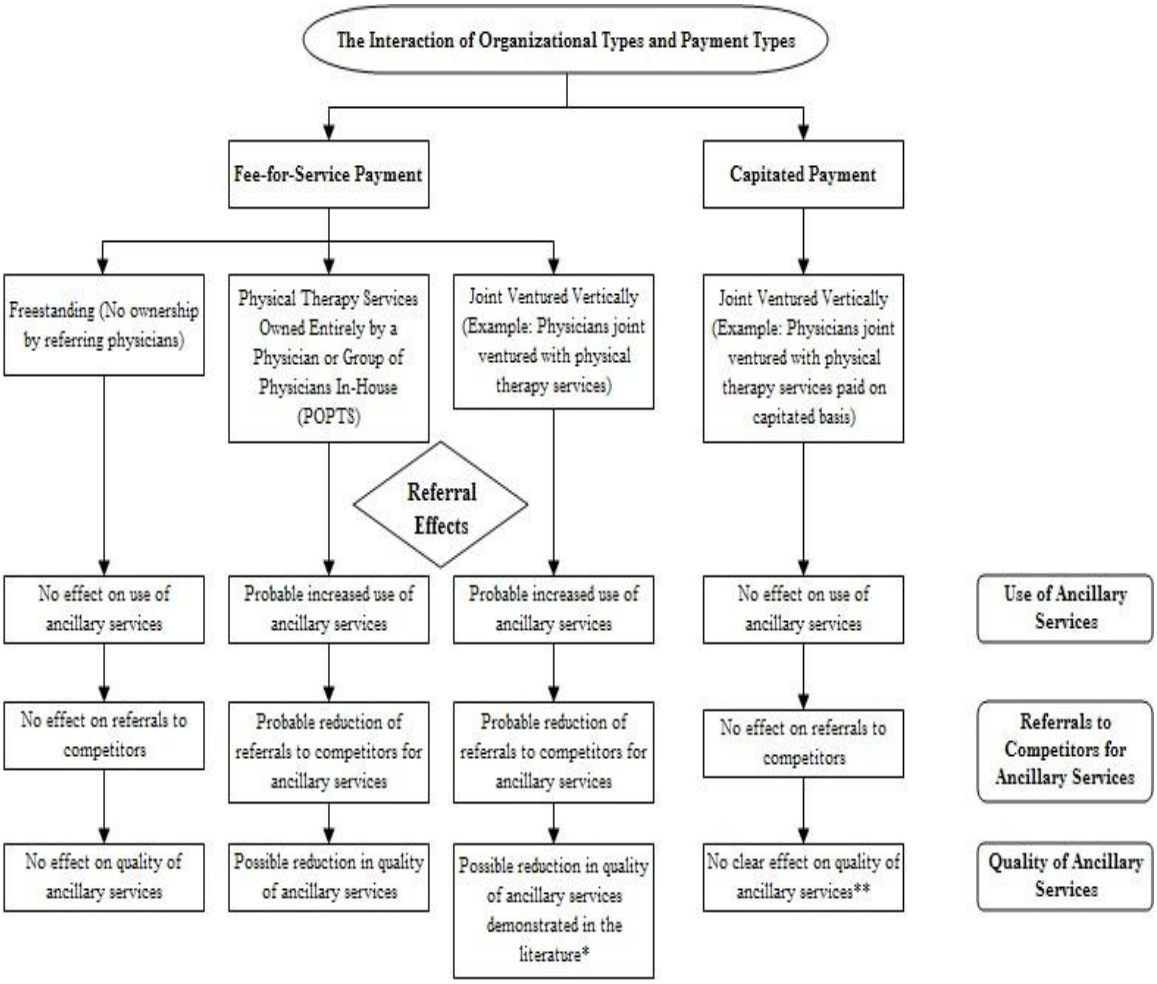
The potential influence of dual agency on the relationship between physicians and their patients has been previously reported (Dranove & White, 1987; Eisenhardt, 1985, 1989; Jensen & Meckling, 1976; Pontes, 1995). An agency relationship exists when one individual or group (the principal) contracts with another individual or group (the agent) to perform some actions or services on the principal's behalf, delegating decision-making authority to this party (Jensen & Meckling, 1976; Ross, 1973). The theory assumes that both the principal and the agent are motivated by their own self-interests, meaning that when their goals are not aligned, they may come into conflict (Eisenhardt, 1989; Jensen & Meckling, 1976; Ross, 1973). Using the physician/patient relationship as an example, a patient may be motivated to pursue the least costly form of care that produces a desired health outcome, while an entrepreneurial physician may be motivated to increase health care service utilization to maximize his or her profitability.

The selection of a course of treatment by the agent that is not aligned with the principal's goals of efficiency is termed a moral hazard. In this example, the problem for the principal (patient) is to ensure that the agent (physician) adheres to a standard of care that is both efficacious and efficient. The principal remains reliant upon the physician's judgment because of the information asymmetry between them. The patient is dependent upon the physician's content expertise to guide referrals and select the most appropriate course of treatment. Since there are significant variations between physicians in treatment paradigms and protocols, with best practice often remaining ambiguous, it is difficult to

judge the quality of the care the clinician is rendering (Phelps, 2000). A lack of clear evidence or adherence to practice and clinical guidelines or protocols may allow extraneous variables to have a greater influence on the selected course of treatment. If treatments yield similar outcomes and are easily substituted, physicians who are motivated by their own financial self-interests may have incentives to utilize more services or to select the more lucrative forms of treatment, such as procedures that are reimbursed at a greater rate and those that are less costly to produce. Dranove and White state "…for a contract between a physician and a patient to be efficient, there must be no alternative to the action that the physician actually takes whereby he could have provided the same quality of care employing fewer resources" (Dranove & White, 1987, p. 406).

Physicians who are motivated by their own self-interests may not be inclined to self-regulate their behaviors. Instead, external governance mechanisms, such as the Stark Laws and state laws regulating self-referral activities, are designed to protect principals (i.e., patients and their insurance companies), from the jeopardy inherent to physicians' dual agency roles. Due to the complexity of these laws and the difficulty of enforcing them, it does not appear that they are substantially influencing physicians' self-referral activities (Mitchell, 2007; Prom, et al., 2002). Issues of agency have consequences not only for the individual relationships between patients and their physicians. There may also be cumulative influence of these behaviors on health care markets, where the exploitation of resources for the promotion of self-interest may be related to the elimination of market competition and decreasing access to essential health services.

Ahern and Scott provide a framework for understanding the relationship between payment schemes, physicians' ownership interest, utilization rates, access to care, and quality of care. These relationships are summarized in Figure 5, which has been revised to focus specifically on physical therapy services.



Adapted from (Ahern & Scott, 1992).

Figure 5. Ahern and Scott's theory on the effects of physician joint ventures on health care costs, access, and quality.

According to Ahern and Scott's theory, fee-for-service arrangements provide incentives for physicians to increase service utilization in order to maximize their profits, and subsequently their job satisfaction (Mitchell, et al., 2000). In keeping with this idea, physicians operating under this payment scheme are likely to work to eliminate their competitors and to maximize their profits by reducing their production costs (e.g., hiring less trained and less expensive labor and spending less time with each patient). This strategy is consistent with agency theory, which suggests that physicians are self-interested and will work to ensure the success and profitability of their practices (Folland, et al., 2004a). Some evidence of these approaches to patient care exists in the literature examining specialty hospitals, diagnostic imaging, and physical therapy practices (Chollet et al., 2006; GAO, 2003; MedPAC, 2005, 2006; Mitchell, 2007; Mitchell & Scott, 1992b). Specific to physical therapy, physicians' ownership interest has been tied to increased utilization, increased numbers of charges, and improved profits for physician practices (Mitchell & Scott, 1992b).

Physicians participating in specialty hospitals tend to refer patients who require more costly care and patients who have poorer reimbursement to community hospitals while retaining better paying patients and patients with better prognoses for their own facilities. These patterns exist in ownership arrangements with specialty hospitals suggesting that ownership status may influence referral patterns (Chollet, et al., 2006; GAO, 2003; MedPAC, 2005, 2006). Ahern and Scott's theory predicts that in a climate of increasing financial pressures and declining reimbursement, entrepreneurial physicians will work to retain patients with fee-for-service reimbursement and reduce or eliminate competition by

annexing ancillary services and creating a captive referral source. This means that physicians are able to control both the quantity and disposition of their referrals. This phenomenon may be studied by examining referral patterns made to hospital-based outpatient physical therapy services by physicians who become owners of these kinds of services.

There are many payment structures for physicians. For example, physicians may receive a salary, or they may receive a set reimbursement (e.g., capitated reimbursement) for seeing a patient regardless of the quantity of procedures performed or the time spent with the patient. They may also receive compensation for each procedure they perform (i.e., fee-for-service). Salaried or capitated systems seem to differ from traditional fee-for-service arrangements in that they encourage physicians to utilize fewer services by rewarding them, for example, with shares of unspent health care premiums (A. Hillman, et al., 1989). According to Ahern and Scott's theory, physicians under these payment schemes are not as motivated to eliminate competition, though they may choose to develop or annex ancillary services to help recover lost revenue. The theory predicts that ownership status may influence physicians' referral behaviors, and it predicts that patients with more lucrative payment types are likely to be retained by self-referring practitioners. Though the model only addresses fee-for-service and capitated payment schemes, the concepts of entrepreneurialism and self-referral for profit can be extrapolated to other payment types and physician ownership arrangements. The critical concept is how the interaction of physicians' ownership of ancillary services and the patients' payer types influence the physicians' referral behaviors.

For the purposes of this research, it was important to establish a hierarchy of reimbursement types. In order to test Ahern and Scott's theory, three distinct payment categories were created. Both the capitated and fee-for-service insured referrals were grouped into a category called **Commercial Insurance**. Reimbursement from both the fee-for-service and capitated reimbursement schemes was expected to exceed reimbursement from other payer types and therefore serve as an incentive for physicians to selectively refer. Medicare referrals are paid according to a fee-schedule, which is less lucrative than most commercial insurance but more lucrative than other programs, such as Medicaid and self-pay. Therefore, **Medicare** was made a second category of payment for this study. The third and final payment category included all other referrals (e.g., Medicaid, agencies and grants, and self-pay), which were classified as **Other Insurance**. The reimbursement for these payers was expected to be less than that of the commercial insurers and Medicare carriers; therefore, Ahern and Scott's theory predicts that physicians will not be motivated to retain these patients for their own practices. Subsequently, the quantities of referrals from this payer category made to the hospital-based OPPT clinics were expected to increase along with population growth. Within the ORHS data set, individuals labeled as self-paying had either chosen to cover their own costs of care out-of-pocket, or they were unable to pay for the services they received. In either case, self-pay represented people who did not utilize insurance to cover the costs of their care.

In summary, since physicians are often the gatekeepers for ancillary services, they may control the quantities and types of referrals made to competing providers of health

care services. Physicians who serve both as gatekeepers and providers of services are able to influence the health care market promoting potentially monopolistic competition. Under these circumstances, market power could become concentrated in the hands of only a few joint ventures or POPTS, thus reducing market efficiency. According to Ahern and Scott's theory, this can be expected to lead to increased health care costs, reduced access to care, reduced quality of services, and poorer health outcomes. For example, if joint ventured or POPTS practices are no longer motivated by market competition to provide quality services, they may elect to utilize fewer skilled health care workers to provide the ancillary services at cheaper salaries, thus maximizing their profitability. Previous reports from the Office of the Inspector General suggest that this has already taken place in physical therapy and that it is an issue that requires the immediate attention of CMS administrators (Office of Inspector General, 1994; Wright, 2006).

Purpose

The purpose of this research was to determine the relationship between the emergence of orthopaedic POPTS and changes in referrals made to hospital-based outpatient rehabilitation centers. The focus of this study was on orthopaedic physicians because of their tendencies to invest in physical therapy services (Graham, 2003). This research was designed to address the following questions and the associated hypotheses:

1. Does the number of referrals per physician made annually to hospital system OPPT clinics change as a result of orthopaedic physicians' transition to POPTS practices?

Hypothesis 1: The orthopaedic physicians were expected to reduce their referrals per physician per year to the hospital system OPPT clinics once they joined POPTS as compared to the number of referrals per physician per year made by non-POPTS orthopaedic physicians over the same time period.

2. Does the number of commercially insured patient referrals made to the hospital system OPPT clinics change as a result of orthopaedic physicians' transition to POPTS practices?

   Hypothesis 2: The hospital system OPPT clinics were expected to receive a significantly decreased number of referrals per year of commercially insured patients from orthopaedic physicians who transitioned to POPTS practices as compared to the number of commercially insured patients from non-POPTS orthopaedic physicians over the same time period.

3. Does the number of Medicare insured patient referrals made to hospital system OPPT clinics change as a result of orthopaedic physicians' transition to POPTS practices?

   Hypothesis 3: The hospital system OPPT clinics were expected to receive a significantly increased number of referrals per year of Medicare insured patients from orthopaedic physicians who transitioned to POPTS practices as compared to the number of Medicare insured patients referred from non-POPTS orthopaedic physicians over the same time period.

4. Does the number of underinsured patient referrals made to hospital system OPPT clinics change as a result of orthopaedic physicians' transition to POPTS practices?

   Hypothesis 4: The hospital system OPPT clinics were expected to receive a significantly increased number of referrals per year of underinsured patients from orthopaedic physicians who transitioned to POPTS practices as compared to the number of underinsured patients referred by non-POPTS orthopaedic physicians over the same time period.

Information from physician practices regarding in-house referrals was not available; however, by studying the patterns of referrals made to market competitors, like ORHS and FHS, it was possible to identify changes in physicians' referral behaviors and ascertain the relationship between those changes and the physicians' participation in POPTS. This study utilized both gross and detailed analyses of physicians' referral practices to ascertain the potential influence of ownership interest on referrals. An analysis at the physician level helped to determine if selective referral to ORHS and FHS may have occurred between 1999 and 2007.

CHAPTER IV: METHODS

This chapter outlines the methods that were used to conduct this study. Included is an outline of the materials, software, and data sources used; the procedure; and the statistical analyses conducted. This project was approved by Virginia Commonwealth University's Institutional Review Board (IRB) according to exempt review criteria.

Research Design

This study was a longitudinal, retrospective analysis comparing referrals made to two groups of hospital-based outpatient PT clinics (OPPT). This research examined the relationship between orthopaedic physicians' physical therapy practice ownership status and physical therapy referrals made to the hospital-based OPPT centers between 1999 and 2005 for Orlando Regional Healthcare System (ORHS) and 1999 to 2007 for Florida Hospital System (FHS). The research included information from the two hospital systems' databases and phone interviews of orthopaedic physician practices and physical therapy practiced, which helped to track changes in the Orlando OPPT market. The hospital systems that were selected for this study are the two not-for-profit systems that serve the Orlando region. These systems are a broadly representative sample of facilities for the region that provide care to persons with various forms of insurance as well as persons with little to no insurance coverage. These systems are potentially vulnerable to

changes in referral patterns because they rely on their abilities to cost-shift in order to offset the costs of care provided to persons with limited ability to pay for their care. Details about the outpatient physical therapy facilities are included in Table 5. The units of analysis for this study were the individual orthopaedic physicians who referred to ORHS and FHS during the study period.

Sample from ORHS

Administrators with ORHS agreed to provide data regarding referrals made for outpatient physical therapy services by orthopaedic physicians between 1999 and August of 2005. Due to a database conversion that damaged ORHS facility records, information on orthopaedic referrals made to ORHS OPPT clinics from the last quarter of 2005 to 2007 were unavailable for analysis. The referrals were made to ten outpatient physical therapy clinics located throughout the Orlando region. Additional information regarding the ORHS outpatient physical therapy clinics is included in Appendix G. A copy of the data usage agreement signed by the ORHS administrators is included in Appendix A.

ORHS administrators provided a list of orthopaedic physicians who made referrals to ORHS outpatient physical therapy clinics between 1999 and 2005 (N=134). Many of these physicians are represented in the current ORHS physician list, which highlights their continued ties to the ORHS facilities. The list of orthopaedic physicians affiliated with ORHS facilities as of July 24, 2007, was available through the ORHS "Find a Physician" service at the following website: http://www.orlandoregional.org/orlandoregional/Find_a_Physician.aspx?Wid=1.

Table 5. Hospital-based OPPT providers and their data.

Hospital System	City	Clinic Name	Dates
ORHS Clinics			
	Orlando, FL	Orlando Regional Medical Center Campus	Opened Prior to 1999
	Orlando, FL	Dr. Phillips Hospital (Formerly Sand Lake)	Opened Prior to 1999
	Longwood, FL	Orlando Regional South Seminole Hospital	Opened Prior to 1999
	Orlando, FL	Orlando Regional: Lucerne Medical Center	Opened Prior to 1999
	Orlando, FL	Dr. Phillips: YMCA	Opened 2006
	St. Cloud, FL	St. Cloud Regional Rehab Services	Opened 2003
	Orlando, FL	Arnold Palmer Hospital for Children	Opened 2003
	Orlando, FL	Orlando Regional Outpatient Rehabilitation: Orange Avenue Location	Closed 2000
	Wekiva, FL	Orlando Regional Outpatient Rehabilitation: Wekiva Location	Closed 2006
	Winter Park, FL	Orlando Regional Outpatient Rehabiltation: Winter Park Location	Closed 2004
	Oviedo, FL	Orlando Regional Outpatient Rehabilitation: Oviedo Location	Closed 2006
FHS Clinics			
	Altamonte Springs, FL	Florida Hospital Rehabilitation and Sports Medicine	Opened Prior to 1999
	Apopka, FL	Florida Hospital Rehabilitation Center: Apopka Location	Opened Prior to 1999
	Celebration, FL	Florida Hospital Rehabilitation and Sports Medicine: Celebration Health	Opened Prior to 1999
	Orlando, FL	Florida Hospital Rehabilitation and Sports Medicine: East Orlando	Opened Prior to 1999
	Lake Mary, FL	Florida Hospital Rehabilitation and Sports Medicine: Lake Mary	Opened Prior to 1999
	Orlando, FL	Florida Hospital Rehabilitation and Sports Medicine: Maitland RDV Sportsplex	Opened Prior to 1999
	Ocoee, FL	Florida Hospital Rehabilitation and Sports Medicine: Ocoee	Opened Prior to 1999
	Orlando, FL	Florida Hospital Rehabilitation and Sports Medicine: Orlando – Lee Road	Opened Prior to 1999
	Orlando, FL	Florida Hospital Rehabilitation and Sports Medicine: Orlando - Downtown	Opened Prior to 1999
	Oviedo, FL	Florida Hospital Rehabilitation and Sports Medicine: Oviedo	Opened Prior to 1999
	Winter Park, FL	Florida Hospital Rehabilitation and Sports Medicine: Orthopaedic Institute at Winter Park Memorial Hospital	Opened Prior to 1999
	Winter Park, FL	Florida Hospital Rehabilitation and Sports Medicine: YMCA Crosby Wellness Center	Opened Prior to 1999

This list allowed identification of the physicians (N=68) who provided referrals to ORHS for OPPT who also had privileges at the institution. For the purposes of this research, orthopaedic physicians were classified as physicians specializing in orthopaedics and who are trained as medical doctors (M.D.) or doctors of osteopathics (D.O.). Details regarding physician-level data are provided in upcoming sections.

The ORHS data were collected at the first visit of each outpatient physical therapy episode of care. The ORHS data provided for analysis included: date of initial visit, patient age, patient sex, name of referring physician, primary diagnosis by ICD-9 code, payer type, and facility where services were received. Information on patient race and co-morbidities were not included in the ORHS OPPT database and therefore were not available for analysis. The data collected at intake were compiled in a hospital database that provided patient identifiers including medical record number and account number, the date of the initial visit, the type of rehabilitation service the patients were receiving, in this case physical therapy (coded by ORHS as **PTX**), and the facility where the services were rendered. For the purposes of this research, patient-specific identifiers were removed from the data by hospital database managers prior to the information being made available for analysis. De-identification of this information protected patient confidentiality. Information regarding the date of visit, name of referring physician, payer type, and facility where services were received was included in the statistical analyses. Rationale for the selection of these variables is explained later in this chapter.

Sample from FHS

Administrators with FHS provided data regarding referrals made for outpatient physical therapy services by orthopaedic physicians (N=91) between 1999 and 2007. Many of these physicians are represented in the current FHS physician list, which highlights their continued ties to the FHS facilities. Additional information regarding the current FHS outpatient physical therapy clinics is included in Appendix G. A copy of the data usage agreement signed by the FHS administrators is included in Appendix A.

The list of orthopaedic physicians who had privileges at FHS facilities as of November 1, 2007, was available through the FHS "Physician Directory" service at the following website: http://www.floridahospitalphysicians.com. This list allowed identification of the physicians (N=39) who provided referrals to FHS for OPPT who also had privileges at the institution. Several of the orthopaedic physicians have served as referral sources for nearly a decade. Many of these physicians are represented in the current physician list, which highlights their continued ties to the FHS facilities. Some of the physicians (N=29) in the FHS and ORHS databases are listed as having affiliations with both facilities.

Similar to the ORHS data, the FHS data were collected at the first visit of each outpatient physical therapy episode of care. The information collected by the intake personnel included patient name, patient sex, patient date of birth, primary diagnosis for which the patient is being referred by International Classification of Diseases (ICD-9) code, name of the referring physician, patient address, patient social security number, and insurance information. These data were then compiled into facility-specific databases that

provided patient identifiers, including medical record number and account number, the date of the initial visit, the type of rehabilitation service (e.g., physical therapy or speech therapy) the patient was receiving, and the facility where the services were being rendered. FHS had not yet centralized their collection of the patients' information. Data extraction was conducted by FHS information systems (IS) personnel on behalf of hospital administrators, but the data extractions were time-consuming and involved independent queries of each facility's database. Therefore, FHS administrators agreed only to provide de-identified information on the total number of referrals made by each individual orthopaedic physician for each year. Subsequently, the FHS data that were shared with the researcher included the year of each referral, the total number of referrals, and the name of each referring physician.

Establishing the Status of Physician Practices

Surveys and interviews were conducted to investigate the Orlando, Florida OPPT market. The surveys and interviews included ORHS and FHS staff and administrators, physicians' offices, and OPPT clinics. Figure 6 outlines the strategy that was used to conduct these investigations.

The years in which the Orlando region's orthopaedic POPTS practices developed were determined through preliminary interviews with ORHS and FHS physical therapy staff and administrators and phone calls to individual orthopaedic practices. First, the lists of orthopaedic physicians who referred to the ORHS and FHS outpatient clinics between 1999 and 2007 were reviewed. Then lists of orthopaedic physicians with privileges at ORHS and/or FHS from each facility's online list of physician providers were compiled

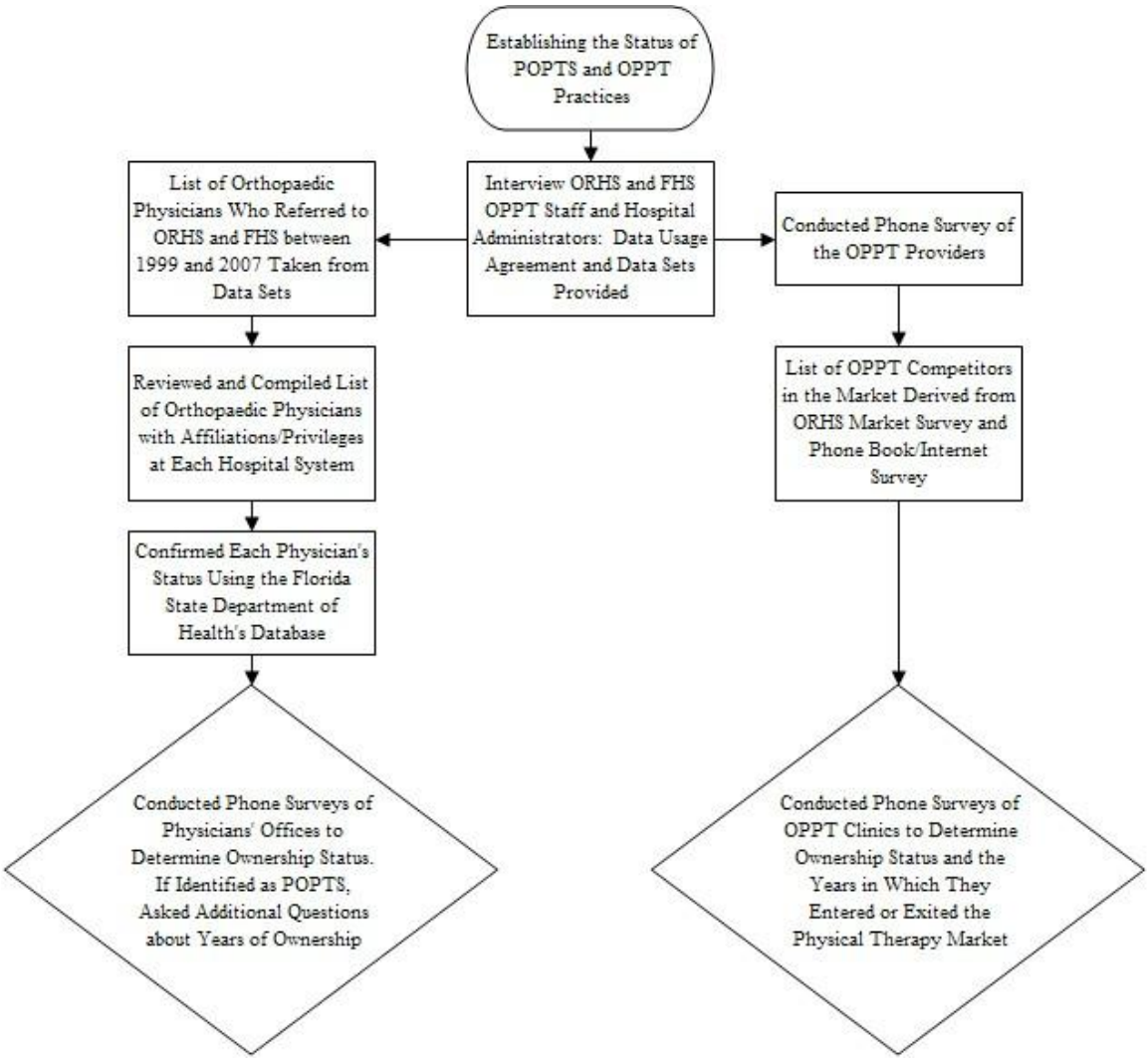


Figure 6. Establishing the status of POPTS and OPPT practices.

to clarify their relationships with the two systems and to help determine which physicians may have left the local market (Florida Hospital, 2007; Orlando Regional Healthcare System, 2007). In January of 2008 the Florida Department of Health's website (http://ww2.doh.state.fl.us/IRM00PRAES/PRASLIST.ASP) also was utilized to confirm the physicians' status as well as the locations of their practices. This site provided data on physicians including, but not limited to, specialty certification, training,

proceedings/actions, affiliations, and locations of practice. Once the physicians' statuses were confirmed, the lists from ORHS and FHS were combined and then each of the physicians' offices was contacted to determine if they provided physical therapy within their offices or owned physical therapy practices. During the phone interview, the practice managers or office administrators were contacted. The scripted phone interviews for the physician offices are included in Appendix H. The physicians' practice managers or office administrators were asked the following questions:

1. Does your practice currently invest in or own physical therapy services to which you make referrals?
2. If yes, in what year did you invest in or take ownership of the physical therapy services?
3. Has your practice previously invested in or owned physical therapy services to which you made referrals?
4. If yes, in which years did you have these ties to physical therapy services?

Establishing the Status of Competitive Providers of Outpatient PT

The next step in this research was to identify the presence of competitor OPPT providers in the region and to determine when they entered the market and became potential recipients of OPPT referrals. These data were not used in the direct hypothesis testing. However, the presence of additional competitors in the market during the study period would be important to consider during the discussion about any identified changes in referral patterns to the hospital-based OPPT clinics.

A list of outpatient physical therapy providers for the Orlando region was compiled through an ORHS marketing survey from 2002 provided by ORHS administrators as well as a phone book and Internet review. This list was current as of January, 2009. The site managers of these facilities were contacted by phone to ask if they provide orthopaedic physical therapy, if they have physicians who have ownership interest, and in which year they developed their practices. Not all of the providers listed in the 2002 ORHS marketing survey are still in practice, so there was not 100% representation of the competing providers who were practicing in the area between 1999 and 2007 (responders N=71 OPPT clinic locations; unavailable N=15 OPPT clinic locations).There did not appear to be any systematic difference in non-responders/unavailables versus responders to the clinic surveys. The non-responders/unavailables had been located throughout the metro area. The researcher was unable to determine in which years facilities had closed. The list of providers from whom information was obtained is located in Appendix F.

Materials and Procedures

Data Sources

This study was conducted using the existing proprietary databases maintained by ORHS and FHS and information from the phone surveys of the physicians' offices and of other outpatient PT providers in the area. Per report, ORHS and FHS databases provided 100% of their records of outpatient physical therapy encounters for the specified time period.

Data were extracted from each facility's database by information systems (IS) personnel at ORHS and FHS. The data obtained from the IS database queries at each of the hospital facilities was compiled in Microsoft Excel® to allow for data coding and manipulation. All data were stored on a password protected laptop or on portable storage drives kept in a locked cabinet accessible only to the researcher. The de-identified data elements from ORHS that were used in statistical analyses included: a) year of the referral, b) referring physician name, c) facility where services were received, and d) payer type. The data elements from FHS that were used for analysis included: 1) year of referral, 2) referring physician name, and 3) total number of referrals per year per physician. Information on payer type was not available from the FHS database. Information on patient race, socioeconomic status, and co-morbidities was not included in either of these databases and was therefore not available for the analysis.

The dates of the referrals and names of referring physicians were used to determine if the referrals were made when the physicians were or were not participating in POPTS practices, based upon information obtained from the phone interviews. Payer type was used in the analysis of physician status as it related to referral patterns to the ORHS OPPT clinics. Payer type and physician status data from ORHS were used to test the selective referral construct of Ahern and Scott's theory. Variables and the rationale for their inclusion are highlighted in Table 6.

A total of ten ORHS outpatient physical therapy facilities were represented in the ORHS database. Four of the facilities included in the data set have closed since 2000. ORHS has also opened, merged, and renamed some of its locations. Seven hospital-based

Table 6. Database variables and the rationale for their inclusion.

Variable Heading	Rationale
Date of Referral by Year	To establish if a referral was made when the physician was participating in a POPTS practice
Referring Physician Name	To track referrals made to each facility and establish which referrals were made by physicians participating in POPTS
Facility to Which the Patient Was Referred	To determine if patterns of referrals made to the ORHS or FHS facilities by matched pairs of physicians were similar.
Payer Type	To determine the payer case mix referred to ORHS. These data were not available for FHS.
Practice	To determine how many physician practices there were that made referrals. This was selected as a possible covariant, because physicians within a practice might refer similarly.

OPPT facilities are open currently. All of the ORHS OPPT facilities, past and present, are listed in Appendix G.

The FHS database provided information on the number of referrals made by each orthopaedic physician each year. A total of 13 facilities contributed data to the data set between 1999 and 2007. Two of these facilities closed during the specified time period. Three new facilities opened since the study period. A list of the current FHS facilities is included in Appendix G.

Orthopaedic physician status- ORHS and FHS. Over the period of 1999 to 2005, ORHS OPPT clinics received referrals from 134 orthopaedic physicians. These physicians were categorized by the researcher based upon their ownership status for physical therapy services (Table 7).

Seventy-nine (58.9%) of the physicians were found to be non-POPTS physicians based on survey results. Forty-seven (35.1%) of the physicians joined POPTS between

Table 7. Physician group coding.

Ownership Status	Physician Group Code
POPTS throughout Study Period	Group 0
Became POPTS during Study Period	Group 1
Left POPTS during Study Period	Group 2
Never POPTS	Group 3

1999 and 2005. Four (3.0%) of the physicians left POPTS between 1999 and 2005, and four (3.0%) were members of POPTS before and during the study period.

Between 1999 and 2007, FHS OPPT clinics received referrals from 91 orthopaedic physicians. Forty-three (47.3%) of the physicians were found to be non-POPTS physicians, based on survey results. Thirty-nine (42.9%) of the physicians joined POPTS between 1999 and 2007. Four of the physicians left POPTS between 1999 and 2007 (4.3%), and five (5.5%) were members of POPTS before and during the study period.

A total of 143 orthopaedic physicians made referrals to ORHS and FHS between 1999 and 2007. Of these physicians 86 (60.1%) were non-POPTS between 1999 and 2007. Forty-eight (33.6%) joined POPTS between 1999 and 2007. Four of the 143 physicians (2.8%) left POPTS between 1999 and 2007, and five (3.5%) were members of POPTS before and during the study period (Table 8). Over the study period a total of 75 different orthopaedic practices referred to ORHS and/or FHS (Table 9).

Several of the physicians included in the data sets had a history of referring only one to two patients per year to either institution, and there was a large amount of variability in the referral patterns of the physicians. Looking for changes in referral relationships between physicians and the hospital OPPT clinics following physicians' transitions to

Table 8. Overall count of physicians who made referrals by group and institution.

Physician Group	ORHS Only	FHS Only	Both	Total
Group 0	0	1	4	5
Group 1	9	1	38	48
Group 2	0	0	4	4
Group 3	43	7	36	86
Total	52	9	82	143

Table 9. Overall count of practices that made referrals by group and institution.

Physician Group	ORHS Only	FHS Only	Both	Total
Group 0	0	0	1	1
Group 1	0	0	5	5
Group 2	0	0	1	1
Group 3	38	4	26	68
Total	38	4	33	75

POPTS presupposed that a relationship between the physicians and the hospitals existed before the POPTS transition was made. Therefore, only Group 1 and Group 3 physicians who had established themselves as reliable referral sources were included in the hypothesis testing for this study. A reliable referral source was defined based on a minimum annual volume of referrals of 10 patients per year. Using this criterion reduced the number of physicians available for comparison in the hypothesis testing (Table 10).

Table 10. Physicians who met the inclusion criterion for the hypothesis testing.

Physician Group	ORHS	FHS
Group 1	17	28
Group 3	8	19
Total	25	37

Data Cleaning and Organization

Once the raw data from ORHS and FHS were compiled in Microsoft Excel ®, the data were reviewed to ensure that only referrals for outpatient physical therapy made during the specified time period were included. For the ORHS data a total of 454 occupational therapy referrals, 884 radiology referrals, two outpatient laboratory referrals, 64 speech pathology referrals, and 24 other types of outpatient referrals were identified and eliminated from the data set. The FHS data did not yield any referrals for other services aside from OPPT. In addition each case was reviewed to verify that the OPPT referrals were made by orthopaedic physicians, either M.D.'s or D.O.'s. For the ORHS data, the type of insurance associated with the referral was also reviewed. The ORHS and FHS data sets were then transferred to separate Microsoft Excel® spreadsheets. To facilitate institutional and aggregate analyses, FHS and ORHS were assigned numeric codes by hospital system (**HOSP**). FHS was assigned the numeric code **0**, and ORHS was assigned the numeric code **1**.

Physician group classification- ORHS and FHS. Based upon the information obtained from the phone interviews, each of the orthopaedic physicians who referred to ORHS and FHS OPPT facilities was assigned a unique, numeric physician identifier (**PHYSID**). Another column was created to show which practice these physicians were involved in, and these practices were also assigned unique, numeric identifiers (**PRACCD**). Next the physicians were assigned to one of four groups based upon their ownership status: **Group 0** physicians remained in POPTS between 1999 and 2005, **Group 1** joined POPTS between 1999 and 2005, **Group 2** physicians were in POPTS in 1999 but transitioned out

of the POPTS practices before 2005, and **Group 3** physicians did not participate in POPTS. Physicians who referred to FHS were classified in the same manner. The physician groups were coded in a separate column (**PHYSCD**) in each of the ORHS and FHS data Microsoft Excel® spreadsheets.

The status of referrals. It was necessary to identify whether the referrals being examined had been made before or after the Group 1 physicians transitioned to POPTS. A dichotomous variable called **STATUS** was created that represented the before or after POPTS transition conditions. The information gleaned from the phone interviews was used to identify the years in which the Group 1 physicians transitioned to POPTS. Referrals made before that transition were assigned the **PRE** value of **0**. Referrals made after the transition were assigned the **POST** value of **1**. Years 1 and 2 versus 4 and 5 were used to similarly classify referrals from the Group 3 physicians who were paired to the Group 1 physicians for comparison. This process of pairing the Group 1 and Group 3 physicians is described in more detail later in this chapter.

Payer classification- ORHS data only. Payer type was recorded with each ORHS referral in the database under the column **PAYCD**. Traditional indemnity or managed care payer plans were coded **COMMERCIAL= 0**. Payers from **MEDICARE** were coded **1**. All other payer groups, including Medicaid, agencies/grants, and self-pay, were coded **OTHER = 2**. Patients in Medicare and Medicaid HMO's were classified according to Medicare and Medicaid rather that managed care (commercial). By using these grouping systems, it was possible to statistically analyze for differences in the referral patterns based upon payer type between physicians who originally did not participate in

POPTS but then later joined POPTS practices (Group 1) and physicians who never joined POPTS (Group 3). The coding scheme is included in Table 11. Group 0 and 2 physicians' data were not included in the direct hypothesis testing, because there were too few of these physicians to make comparisons.

Table 11. Coding for data set.

Data Coding	Type of Data	Definition
PHYSID	Scale	Unique physician identifier
PHYSCD	Scale	1=Group 1; 3=Group 3
PRACCD	Scale	Unique physician practice identifier
REFNO	Scale	Sum of referrals per year and per payer category
YEAR	Scale	Year of referral
HOSP	Nominal	0= FHS; 1=ORHS
STATUS	Nominal	0= PRE; 1=POST Group 1 physician's transition to POPTS
PAYCD	Ordinal	0= Commercial insurance; 1= Medicare; 2= Other

Data Analysis

Descriptive Analyses

Market competition. The analysis began with a description of the competitors who entered the Orlando OPPT market in the years included in this study. The list of competitors was compiled from the phone interviews conducted by the researcher. The entry and exit of competitors were examined to help facilitate discussion about factors influencing the volume of OPPT referrals made by orthopaedic physicians to the hospital system OPPT clinics.

Aggregate and hospital system-level descriptive analyses. Descriptive statistics for each system, ORHS and FHS, were generated independently and in aggregate regarding

total number of orthopaedic referrals and the average referrals per orthopaedic physician for all physician groups. The proportions of referrals to ORHS associated with each payer type were also calculated by dividing the number of referrals in each payer category by the total referrals made to ORHS by each physician group each year. The data from Group 0 and Group 2 were not used in hypothesis testing, but they are reported in the results as descriptive statistics to support discussion of the overall referral behaviors of physicians in these two groups.

Hypothesis Testing

The subjects (units of analysis) of the hypothesis tests were the individual physicians. Group 1 and Group 3 physicians who met the minimum referral criterion in year one were randomly paired with each other using their physician identifiers (**PHYSID**) and the random number generating feature in Microsoft Excel ®. A total of 8 physician pairs were generated for ORHS and 19 pairs for FHS (Figure 7).

Once the groups of physician pairs were established, the data for the Group 1 physicians' transition years and for their paired Group 3 physicians' corresponding years were deleted from the data used in the statistical testing (Figure 8). Only the data for years 1 and 5 or for years 1, 2, 4, and 5 were selected for analysis. These years were expected to capture possible changes in referrals due to the changes in physicians' ownership status. The transition year data were not included in the analyses, since the data for Group 1 were likely to be at least partially influenced by the Group 1 physicians' transitions to POPTS. The Group 3 data for these same years were also not included as an attempt to provide a historical control for comparison.

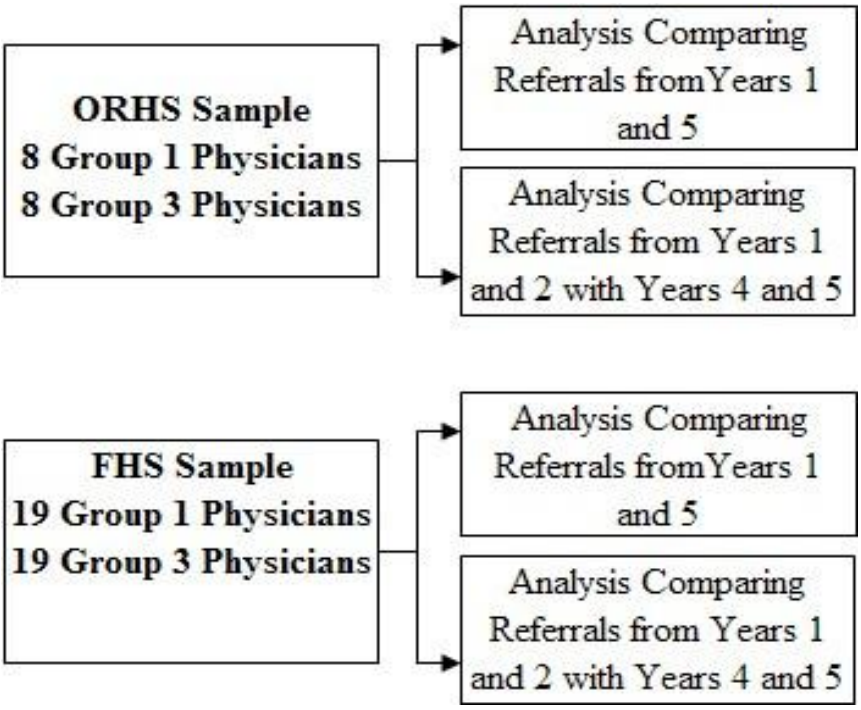


Figure 7. Pairing for analyses.

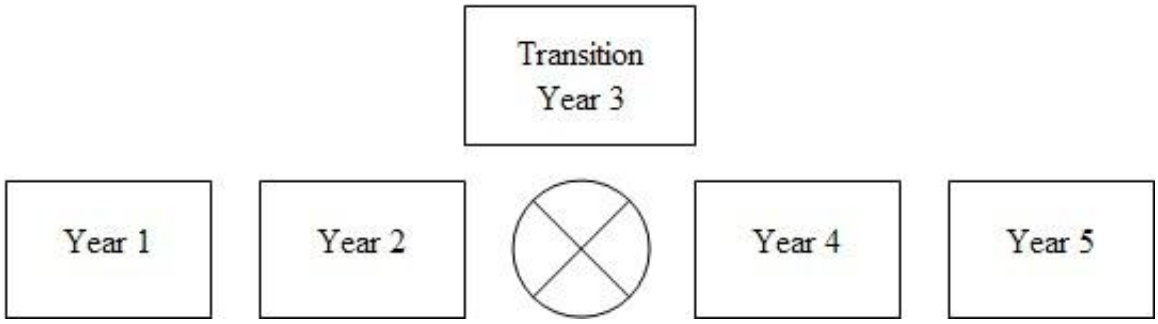


Figure 8. Research model for years of data analyzed.

The exact timing of the Group 1 physicians' transition to POPTS could not be determined within year 3. It was possible the years adjacent to this transition might also have been influenced by the timing of the Group 1 physicians' conversion to POPTS. For example, if the transition to POPTS occurred late in year 3, the transition may have at

least partially masked any change in the following years' referral behaviors. If the transition occurred early in year 3, there may have already been changes in referral behaviors leading up to the transition. The years farthest removed from the transition year (i.e., years 1 and 5) were expected to be less influenced by the transition years.

The data were analyzed in SPSS ® using Mixed Linear Models (MLM). These models are an extension of the General Linear Model (GLM) and are used to predict relationships among events (Laird & Ware, 1982). The MLM allows the data to exhibit correlated and non-constant variability (Laird & Ware, 1982). In other words, the MLM allows the researcher to model means as well as variances and co-variances. Co-variances were a concern in this research design, because repeated measurements were taken on the same experimental units (**PHYSID**). Each physician's referrals were assessed **PRE** and **POST**, and it was expected that these pre and post measurements within a physician would have greater correlation than between pre and post measurements between physicians.

MLM includes both fixed and random effects. For this research the variable **STATUS** was treated as a random effect. **STATUS** had two levels, **PRE** and **POST**. **STATUS** provided the time element for this research which allowed the researcher to track changes in physicians' referrals. **PHYSID** also served as a random effect. The fixed effects were physician group (**PHYSCD**) with its two levels (Group 1 and Group 3) and insurance type (**PAYCD**) with its three levels (COMMERCIAL=0, MEDICARE=1, and OTHER=2). The number of referrals (**REFNO**) served as the dependent variable for all of the hypothesis testing. The α level for these tests was set at $p \leq 0.05$.

Full factorial analyses were conducted using the Type III Sum of Squares to determine the main and interaction effects of all of the independent variables on the dependent variable. These analyses were conducted to investigate the influences of physician ownership, payer type, and the combined influence of physician ownership and payer type on the referrals made to the hospital-based OPPT centers. Parameter estimates and estimated marginal means were selected for reporting. Comparisons of main effects were conducted post hoc using Bonferoni confidence interval adjustment.

For each of the analyses, the co-variance structure that provided the best model of the within-subjects variability was selected. This selection was made based upon the lowest Akaike's Information Criterion (AIC) score for each of the models generated (Akaike, 1974). The AIC relies on the method of maximum likelihood which selects values of the model parameters that produce the distribution most likely to have resulted in the observed data (Akaike, 1974). The AIC allows several models to be ranked according to their goodness of fit. The lower the AIC number, the better the model fits the data (Akaike, 1974). The unstructured co-variance models, which assume that each correlation is non-zero but unique, resulted in the best fit for all of the MLMs generated for this study.

The relatively small sample size of paired physicians created the potential that the statistical tests would be underpowered to detect changes in referral patterns if present. As a result, the mean differences in referrals (**POST-PRE**) between Group 1 and Group 3 physicians and 95% confidence intervals were calculated for each of the hypotheses. These calculations allowed the researcher to determine the direction of any changes in

referrals made by the Group 1 and Group 3 physicians **PRE** to **POST**, to uncover the influence of sample size on the precision of the analyses, and to provide point estimates of changes in referrals for comparison of the physician groups' referral behaviors.

Analyzing Total Referrals: Hypothesis 1

Hypothesis 1 stated that the orthopaedic physicians were expected to reduce their referrals per physician per year to the hospital system OPPT clinics once they joined POPTS as compared to the number of referrals per physician per year made by non-POPTS orthopaedic physicians over the same time period. The total referrals were examined for each institution independently and then for the two facilities in aggregate. The interaction of physician group (**PHYSCD**) and ownership status (**STATUS**) on number of referrals (**REFNO**) was tested. For this hypothesis the fixed effect of insurance type (**PAYCD**) was not included in the model.

Referrals were first examined for years 1 and 5 only. The analyses were then repeated in a second model using data for years 1, 2, 4, and 5. These tests with the additional years' data served as sensitivity analyses of the stability of the effects of physician ownership on the number of referrals made to the hospital-based OPPT clinics. It was anticipated that the data from years 2 and 4 may have been influenced by the Group 1 physicians' transition to POPTS during year 3. These data were therefore expected to display greater variability than the data from years 1 and 5.

Analyzing the Influence of Payer Type: Hypotheses 2, 3, and 4

Further analyses were conducted only on the ORHS data set. These analyses were designed to test the following research hypotheses:

Hypothesis 2: The hospital system OPPT clinics were expected to receive a significantly decreased number of referrals per year of commercially insured patients from orthopaedic physicians who transitioned to POPTS practices as compared to the number of commercially insured patients from non-POPTS orthopaedic physicians over the same time period.

Hypothesis 3: The hospital system OPPT clinics were expected to receive a significantly increased number of referrals per year of Medicare insured patients from orthopaedic physicians who transitioned to POPTS practices as compared to the number of Medicare insured patients referred from non-POPTS orthopaedic physicians over the same time period.

Hypothesis 4: The hospital system OPPT clinics were expected to receive a significantly increased number of referrals per year of underinsured patients from orthopaedic physicians who transitioned to POPTS practices as compared to the number of underinsured patients referred by non-POPTS orthopaedic physicians over the same time period.

MLMs were constructed in SPSS ® in the same manner as what was reported for testing of Hypothesis 1 except that for Hypotheses 2-4 **PAYCD** was included in the model. The numbers of referrals per physician (**REFNO**) were modeled as the dependent variable. For the first analysis, only data from years 1 and 5 were included. The second analysis added in the data for years 2 and 4 as well. Each of the statistical models was designed to determine the combined effects of physicians' ownership status and payer type on the referrals made to the hospital-based OPPT clinics. The second analysis with

the additional years of data was conducted in order to examine the stability of the combined effects of physician ownership and payer type on the number of referrals made to the hospital-based OPPT clinics. Findings from these statistical tests are reported in the Results (Chapter V).

CHAPTER V: RESULTS

This chapter contains the results of the descriptive and inferential analyses for the referral patterns from four orthopedic physician groups to the Orlando Regional Healthcare System (ORHS) and the Florida Hospital System (FHS). The physician groups are organized by their ownership status. The focus of this dissertation was on the referral behavior of physicians who became owners compared to the referral behavior of physicians who never became owners of physical therapy services. The role of ownership status was explored through analysis of referrals to both hospital systems. The additional influence of payer type on referral patterns was assessed using ORHS data only.

Descriptive Analyses

Orlando OPPT Market

A total of 32 Orlando businesses were identified that provided outpatient orthopaedic physical therapy services during the study time period (some with more than one location). For the phone interview, twelve of the OPPT practices were unavailable, insolvent, or unable to provide the researcher the year in which they began seeing patients. For the practices that were able to provide data, Figure 9 provides a depiction of their years of entry into the Orlando market. This figure also provides information on the numbers of POPTS practices in the Orlando region each year. These data show that the

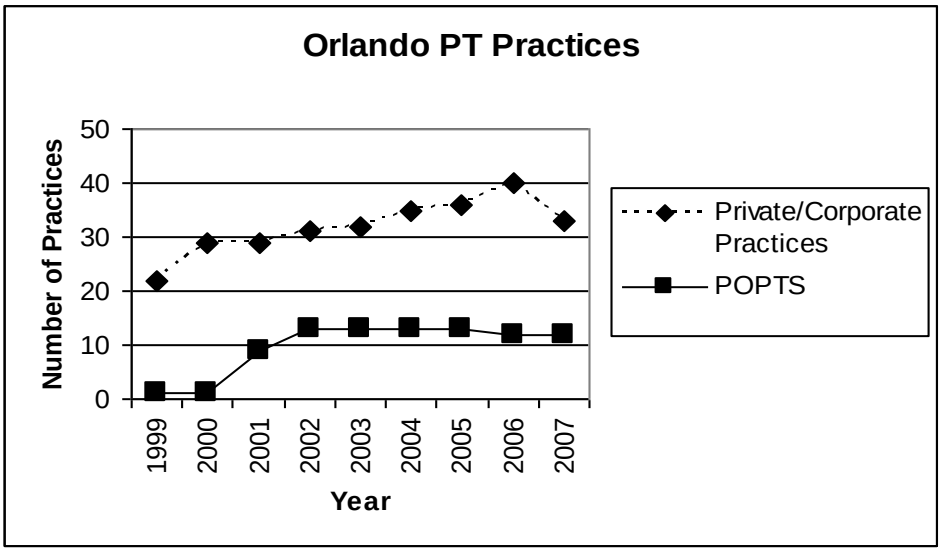


Figure 9. OPPT practices in Orlando by year.

number of OPPT clinics to which the orthopaedic physicians had access increased over the study period, which may have influenced the volume of referrals being sent to the hospital system OPPT clinics.

Referrals to ORHS

Between January of 1999 and October for 2005, ORHS received a total of 25,640 OPPT referrals (Table 12). Group 1 (N=47) accounted for 43.2% of the referrals and Group 3 (N=79) accounted for 46.8% of the referrals to ORHS. Group 0 physicians (N=4) contributed 7.8% of the referrals and Group 2 (N=4) contributed 2.2% of the referrals. Graphical analysis of the period 1999 to 2005 shows that both Group 1 and Group 3 physicians were increasing their total number of referrals to ORHS while referrals from Groups 0 and 2 remained relatively stable over time (Figure 10). The rate of increase in referrals was higher for all four physician groups between 2003 and 2004, with Group 3 physicians demonstrating the greatest increase.

Table 12. Referrals to ORHS per physician group.

PHYSICIAN CODE	1999	2000	2001	2002	2003	2004	2005	(blank)	Grand Total
Group 0	87	201	136	109	148	657	649*		**1987**
Group 1	850	1644	1806	1717	1621	2218	1230*	1†	**11087**
Group 2	12	15	28	27	55	136	274*		**547**
Group 3	283	781	1227	1317	1410	3921	3078*	2†	**12019**
Grand Total	1232	2641	3197	3170	3234	6932	5231*	3†	**25640**

*Data for 2005 for ORHS are incomplete. Only three-quarters of the year are represented.
†Missing information on year of referral.

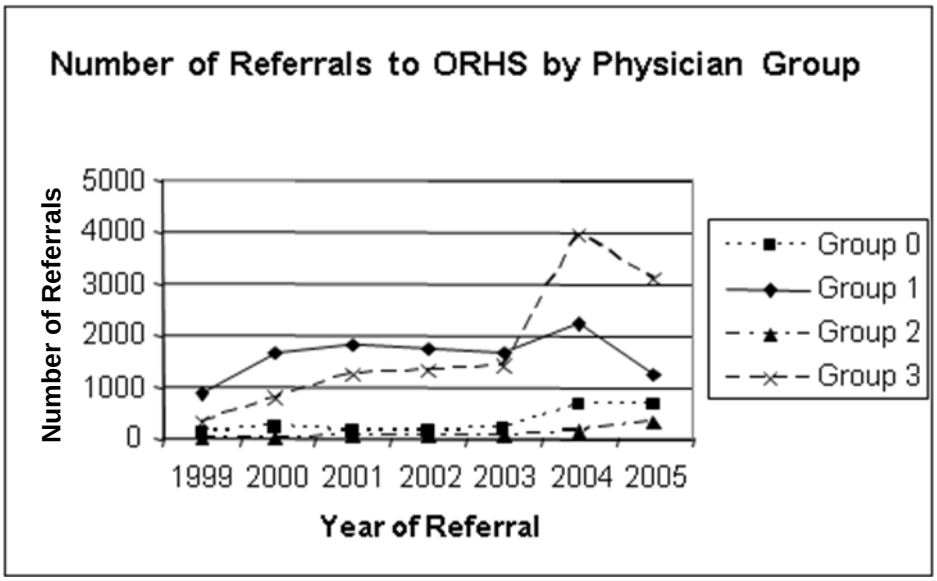


Figure 10. Referrals made to ORHS by each physician group.

The average number of referrals per physician for each year is displayed graphically in Figure 11 (data in Table 1 in Appendix I). The data show that the average number of referrals from all of the physician groups made to ORHS increased over time.

Distribution of patient age and gender for referrals to ORHS. The referrals made to ORHS varied by patient characteristics. All four physician groups referred a greater proportion of female patients than male patients to the ORHS hospital-based centers, which is consistent with national trends for the time of the study (Ciolek & Hwang, 2006). The average age and distribution of referrals by sex is included in Table 13.

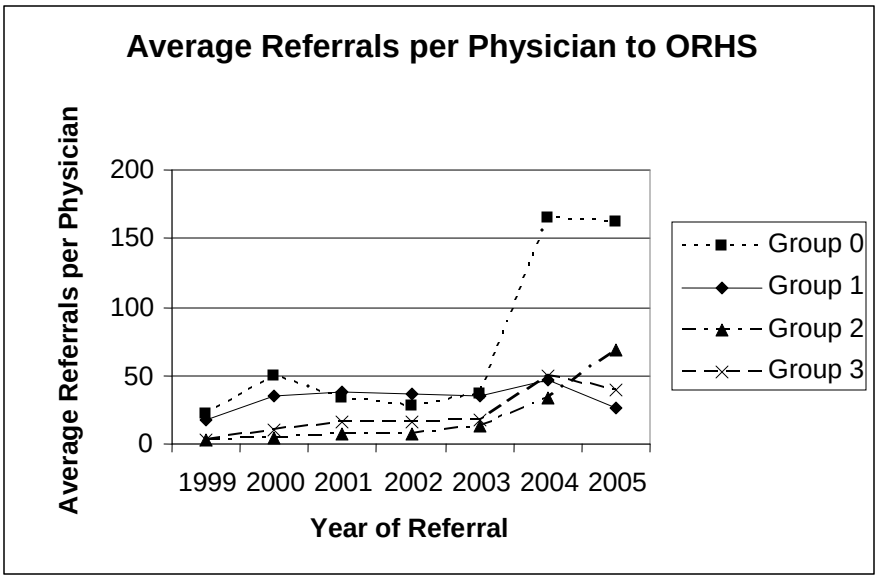


Figure 11. Average number of referrals to ORHS per physician by physician group.

Table 13. Age and sex distribution of ORHS referrals by physician group.

Physician Group	Females		Males	
	Average Age	% of Referrals	Average Age	% of Referrals
Group 0 (N = 4)	54.3 years (S.D.=15.6)	59.5%	44.3 years (S.D.=15.5)	40.5%
Group 1 (N = 47)	49.0 years (S.D.=16.6)	66.3%	42.8 years (S.D.=17.8)	33.7%
Group 2 (N = 4)	55.3 years (S.D.=12.0)	63.0%	42.3 years (S.D.=14.0)	37.0%
Group 3 (N = 79)	45.1 years (SD=21.9)	59.7%	36.0 years (S.D.=24.1)	40.3%

Distribution of payer type for referrals to ORHS. The percentage of referrals by each physician group within each payer type is displayed in Figures 12, 13 and 14. These graphs illustrate variability in referral patterns among the physician groups over the study period. For example, the proportion of patients with commercial insurance referred by Group 1 physicians steadily declined while the proportion of patients with commercial insurance referred by Group 3 physicians dipped and then began increasing over the same

time period (Figure 12). On the other hand, the percentage of Medicare and other insurance referrals made by both Group 1 and Group 3 physicians fluctuated over time (Figures 13 and 14). The variability in referrals made by Group 0 and Group 2 physicians in all payer groups likely was related to the small sample sizes of each group. Table 2 in Appendix I provides a breakdown of the referrals made to ORHS by physician group and payer type. Data from all of the physicians who referred to ORHS during the specified time period are included in this table. The percentages of total referrals by physician group and payer group are included in Table 3 in Appendix I.

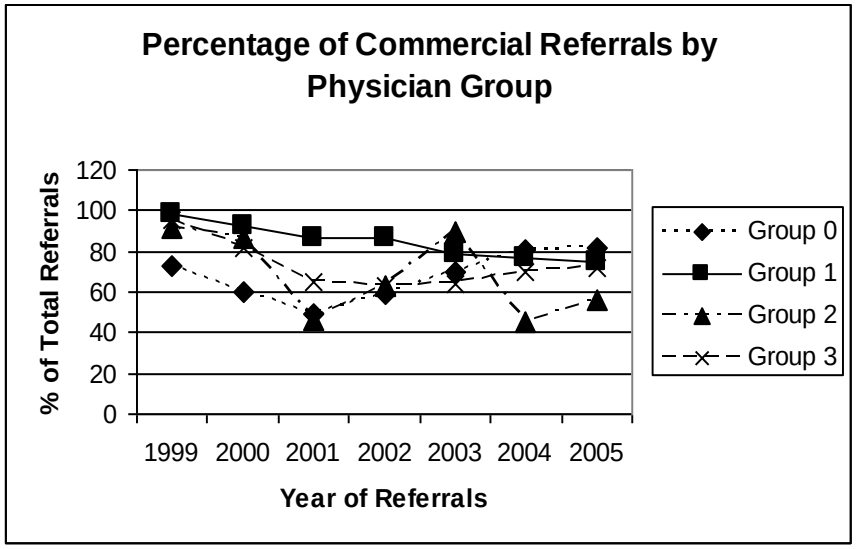


Figure 12. Percentage of commercial referrals by physician group.

Referrals to FHS

Between January of 1999 and October of 2007, FHS received a total of 38,724 OPPT referrals (Table 4 in Appendix I). Groups 1 (N=39) and 3 (N=43) accounted for 67.2% and 27.9% of the total referrals to FHS, respectively. Group 0 physicians (N=5) contributed 1.1% of referrals and Group 2 physicians (N=4) contributed 3.8% of referrals. Graphical analysis shows that the total referrals from Group 1 physicians made

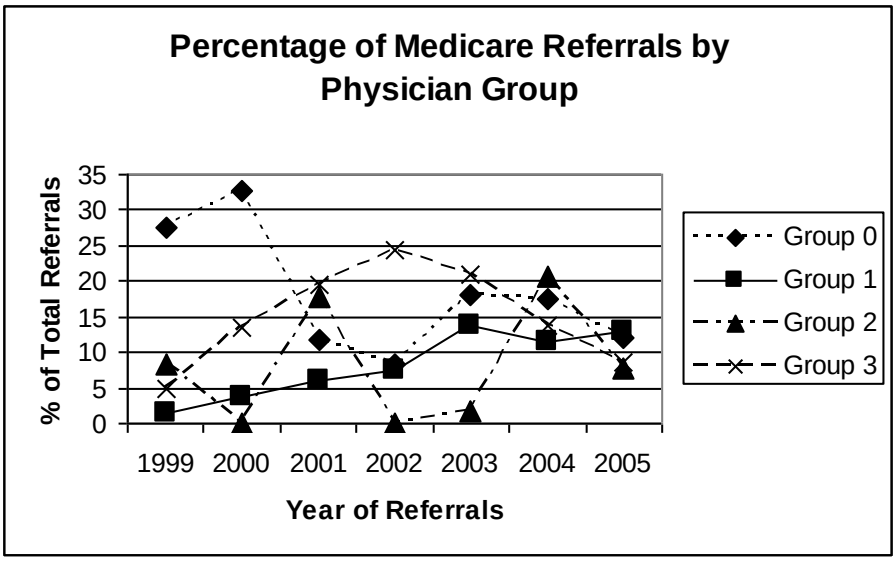


Figure 13. Percentage of Medicare referrals by physician group.

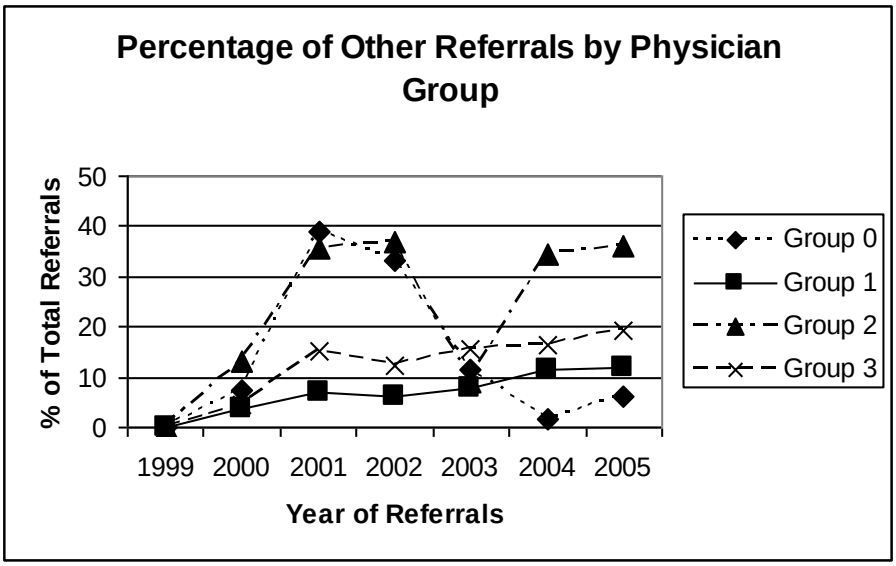


Figure 14. Percentage of other referrals by physician group.

to FHS increased from baseline to peak in 2002 and then essentially returned to baseline by 2007, while the total referrals from Group 3 physicians increased over the same time period (Figure 15).

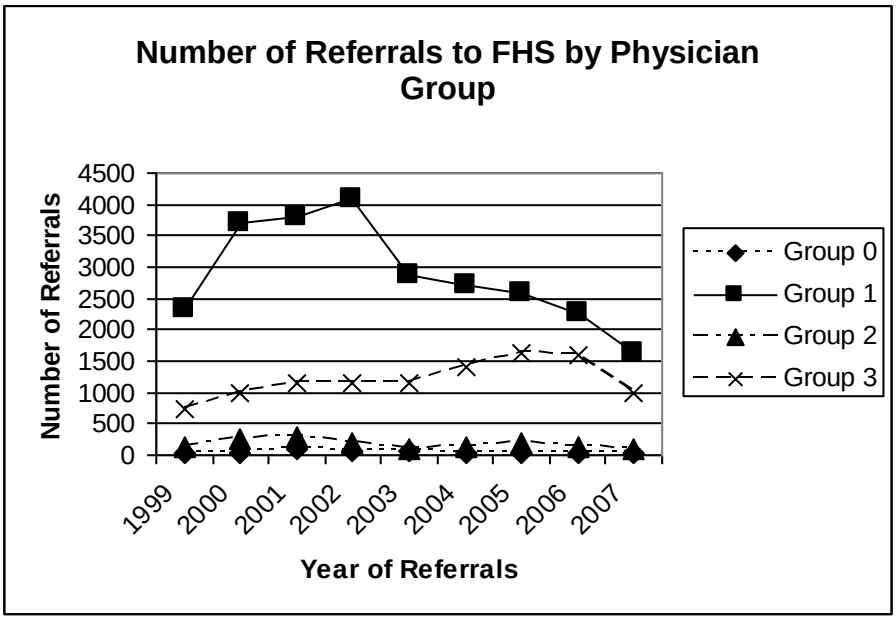


Figure 15. Referrals to FHS by physician group.

When examining the average number of referrals per physician made to FHS each year, the decline in Group 1 physician referrals and the increase in Group 3 physician referrals also were apparent (Figure 16; raw data in Table 5 in Appendix I).

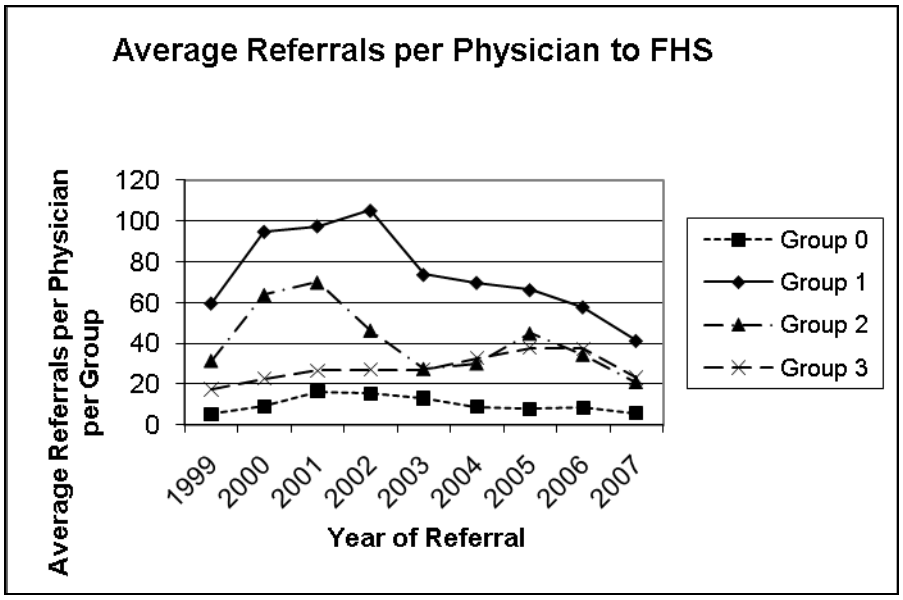


Figure 16. Average number of referrals per physician to FHS.

Aggregate Referrals to Both Hospital Systems

Data from a total of 143 orthopaedic physicians are included in the combined ORHS and FHS data sets. A breakdown of the number of physicians by group and institution is included in Table 14. As stated previously, many of the orthopaedic physicians are affiliated with both ORHS and FHS; however, some of the physicians are affiliated with only one of these two institutions. Specifically, the majority of the Group 1 physicians overlapped in making referrals to both systems whereas many of the Group 3 physicians exclusively referred to ORHS.

Table 14. Number of physicians per group who referred to each institution.

Physician Group		**ORHS Only**	**FHS Only**	**Both Systems**
Group 0	(Always POPTS)	0	1	4
Group 1	(Became POPTS)	9	1	38
Group 2	(Left POPTS)	0	0	4
Group 3	(Never POPTS)	43	7	36

A total of 64,361 OPPT referrals were recorded in the ORHS and FHS data sets combined for the years included in this study. Group 1 physicians were the most prolific and accounted for 57.6% of the OPPT referrals made to the two institutions. Group 3 accounted for 35.4% of the referrals followed by Group 0 (3.8%) and Group 2 (3.2%). Figure 17 illustrates the aggregate referrals from each group of physicians made to both institutions. Raw data are located in Table 6 in Appendix I.

A t-test demonstrated that overall, there was no significant difference in the average number of referrals made by Group 3 physicians to the two hospital systems ($p=0.250$, $\alpha \leq 0.05$) despite the larger number of Group 3 physicians affiliated with ORHS. In contrast, a similar number of Group 1 physicians referred to both systems, but they

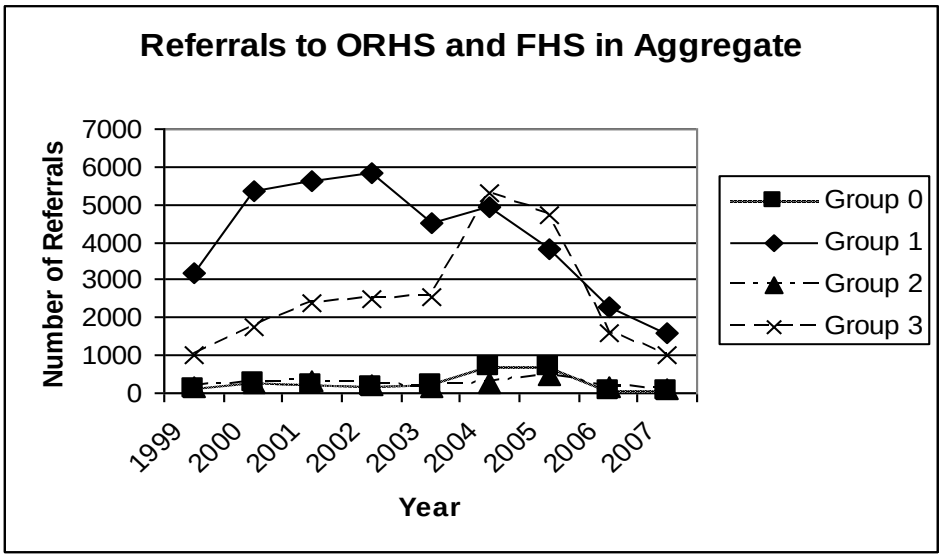


Figure 17. Referrals made to both hospital systems by each physician group over the study time period. *****ORHS data for 2005 limited to three-quarters of the year. FHS data for 2007 limited to three-quarters of the year.

referred significantly more frequently to FHS ($p \leq 0.001$, $\alpha \leq 0.05$). Therefore, a Group 1 physician was more likely to refer to FHS than to ORHS whereas a Group 3 physician was equally likely to refer to either hospital system.

Results for Hypothesis Testing

The threshold criterion for physicians' inclusion in this study was a minimum of ten referrals for year 1. The Group 1 and Group 3 physicians who met the inclusion criterion were randomly paired until the group with the fewest members was exhausted (Table 15).

Table 15. Physicians who met the inclusion criterion for the hypothesis testing.

Physician Group	**ORHS**	**FHS**
Group 1	17	28
Group 3	8	19
Total	25	37

A total of 8 physician pairs for ORHS and 19 pairs for FHS were generated. These same physicians were included in the analyses for the combined hospital systems. The groups of physicians included in the aggregate systems' analyses were uneven, because some of the physicians referred to both systems and were represented twice in the pairings. As a result there were a total of 22 Group 1 physicians and 25 Group 3 physicians included in the aggregate data set. Tables 16-18 provide the total numbers of referrals from the paired physicians for years 1, 2, 4 and 5 of the study period. The data from the Group 1 physicians' transition years and the paired Group 3 physicians' same years are not included. The data represented in these tables were used for the hypothesis testing.

Table 16. Total Referrals: Aggregate data for ORHS and FHS.

Aggregate Data Both Hospitals		**Number of Referrals**	
Physician Group	**STATUS**	**Year 1 vs. 5**	**Year 1 and 2 vs. 4 and 5**
Group 1 (N=22)	PRE	2015	4956
	POST	2054	4895
Group 1 Total		4069	9851
Group 3 (N=25)	PRE	928	2519
	POST	1269	2839
Group 3 Total		2197	5358
Grand Total		6266	15209

Table 17. Total Referrals: ORHS data.

ORHS Data		**Number of Referrals**	
Physician Group	**STATUS**	**Year 1 vs. 5**	**Year 1 and 2 vs. 4 and 5**
Group 1 (N=8)	PRE	341	875
	POST	316	691
Group 1 Total		657	1566
Group 3 (N=8)	PRE	200	859
	POST	373	843
Group 3 Total		573	1702
Grand Total		1230	3268

Table 18. Total Referrals: FHS data.

FHS Data		**Number of Referrals**	
Physician Group	**STATUS**	**Year 1 vs. 5**	**Year 1 and 2 vs. 4 and 5**
Group 1 (N=19)	PRE	1674	4081
	POST	1738	4204
Group 1 Total		3412	8285
Group 3 (N=19)	PRE	728	1660
	POST	896	1996
Group 3 Total		1624	3656
Grand Total		5036	11941

Table 19 provides the within group mean differences in referrals from the **PRE** to **POST** time periods for the Group 1 and Group 3 physicians.

Table 19. Changes in mean referrals (**POST–PRE**).

Changes in Mean Referrals (POST - PRE)	**Changes in Mean Referrals**
Aggregate Data Both Hospitals	
Group 1 Year 1 vs. 5	5.46
Group 3 Year 1 vs. 5	13.64
Group 1 Year 1 and 2 vs. 4 and 5	-4.05
Group 3 Year 1 and 2 vs. 4 and 5	12.80
ORHS Data	
Group 1 Year 1 vs. 5	-3.13
Group 3 Year 1 vs. 5	21.63
Group 1 Year 1 and 2 vs. 4 and 5	-26.50
Group 3 Year 1 and 2 vs. 4 and 5	-2.00
FHS Data	
Group 1 Year 1 vs. 5	3.37
Group 3 Year 1 vs. 5	6.05
Group 1 Year 1 and 2 vs. 4 and 5	6.47
Group 3 Year 1 and 2 vs. 4 and 5	17.68

Referral Patterns over Time

Hypothesis 1 stated that the orthopaedic physicians were expected to reduce their referrals per physician to the hospital system OPPT clinics once they joined POPTS as compared to the number of referrals per physician made by non-POPTS orthopaedic physicians over the same time period.

Hypothesis 1- Analyses for Year 1 versus 5

These tests demonstrated that the interaction between physician group and status was not statistically significant (Tables 20 and 21). In other words, Group 1 physicians' conversion to ownership of physical therapy services did not produce a difference in referral patterns between the physician groups when compared to the referral patterns prior to the transition year. These results occurred when the analyses were performed using aggregate referrals to both hospital systems and with referrals to the individual hospital systems. Outputs for these tests are included as Tests 1, 2, and 3 in Appendix J.

Table 20. Type III tests of fixed effects for year 1 versus 5.

Years of Data	Source	Numerator df	Denominator df	F	Significance
Aggregate 1 vs. 5	Intercept	1	45.000	51.873	.000
	PHYSCD	1	45.000	6.567	**.014**
	STATUS	1	45.000	1.065	.307
	PHYSCD*STATUS	1	45.000	.632	.431
ORHS 1 vs. 5	Intercept	1	14.000	43.055	.000
	PHYSCD	1	14.000	.201	.661
	STATUS	1	14.000	1.297	.274
	PHYSCD*STATUS	1	14.000	2.321	.150
FHS 1 vs. 5	Intercept	1	36.000	40.304	.000
	PHYSCD	1	36.000	5.081	**.030**
	STATUS	1	36.000	.497	.485
	PHYSCD*STATUS	1	36.000	.100	.754

Dependent Variable: REFNO.
PHYSCD= Physician group
STATUS= Pre or post year 3 (transition year)

Table 21. Estimated marginal means for physician groups for year 1 versus 5.

					Confidence Interval	
	PHYSCD	**Mean**	**Std. Error**	**df**	**Lower Bound**	**Upper Bound**
Aggregate 1 vs. 5	Group 1	92.477	13.814	45.000	64.654	120.300
	Group 3	43.940	12.959	45.000	17.840	70.040
ORHS 1 vs. 5	Group 1	41.063	8.284	14.000	23.294	58.831
	Group 3	35.813	8.284	14.000	18.044	53.581
FHS 1 vs. 5	Group 1	89.789	14.761	36.000	59.853	119.726
	Group 3	42.737	14.761	36.000	12.800	72.673

Dependent Variable: REFNO.
PHYSCD= Physician group

Hypothesis 1- Sensitivity Analyses

The addition of referral data from years 2 and 4 to the analysis produced similar results during statistical testing (Tables 22 and 23). There was a main effect for physician group; however, the interaction between physician group and status was not statistically significant. Outputs for these tests are included as Tests 4, 5, and 6 in Appendix J.

Table 22. Type III tests of fixed effects for years 1 and 2 versus 4 and 5.

Years of Data	**Source**	**Numerator df**	**Denominator df**	**F**	**Significance**
Aggregate 1 and 2 vs. 4 and 5	Intercept	1	45.000	54.030	.000
	PHYSCD	1	45.000	6.812	**.012**
	STATUS	1	45.000	.120	.730
	PHYSCD*STATUS	1	45.000	.446	.508
ORHS 1 and 2 vs. 4 and 5	Intercept	1	14.000	34.840	.000
	PHYSCD	1	14.000	.020	.889
	STATUS	1	14.000	.695	.418
	PHYSCD*STATUS	1	14.000	.514	.485
FHS 1 and 2 vs. 4 and 5	Intercept	1	36.000	42.163	.000
	PHYSCD	1	36.000	6.336	**.016**
	STATUS	1	36.000	.759	.390
	PHYSCD*STATUS	1	36.000	.163	.688

Dependent Variable: REFNO.
PHYSCD= Physician group
STATUS= Pre or post year 3 (transition year)

Table 23. Estimated marginal means for physician groups for years 1 and 2 versus 4 and 5.

					Confidence Interval	
	PHYSCD	**Mean**	**Std. Error**	**df**	**Lower Bound**	**Upper Bound**
Aggregate 1 and 2 vs. 4 and 5	Group 1	225.159	32.973	45.000	158.748	291.570
	Group 3	107.160	30.931	45.000	44.861	169.459
ORHS 1 and 2 vs. 4 and 5	Group 1	101.375	24.888	14.000	47.999	154.754
	Group 3	106.375	24.888	14.000	52.996	159.754
FHS 1 and 2 vs. 4 and 5	Group 1	218.026	34.220	36.000	148.625	287.427
	Group 3	96.211	34.220	36.000	26.809	165.612

Dependent Variable: REFNO.
PHYSCD= Physician group

Point Estimation and Between Groups Comparisons for Total Referrals

Table 24 provides the between group mean differences and 95% confidence intervals for changes in referrals between the Group 1 and Group 3 physicians. Each group's changes in mean referrals were calculated **POST** – **PRE**. These changes were then compared between Group 1 and Group 3 (Group 1 – Group 3 = mean differences).

The negative values of the mean differences in change scores (Table 24) indicate that the increase in the referrals for Group 1 was less than the increase in referrals for Group 3 **PRE** to **POST**. This finding is consistent with research Hypothesis 1 which predicted a reduction in referrals to the hospital-based OPPT clinics once the Group 1 physicians transitioned to POPTS. The confidence intervals, however, show the relative imprecision of the statistical models which suggests that sample size may have influenced the models' abilities to detect differences between the physician groups for referrals to OPPT.

Table 24. Group1 – Group 3 differences for changes in mean referrals (**POST–PRE**) and the 95% confidence intervals.

Group1 – Group 3 Differences for Changes in Means	**Paired Differences**			
	Mean Differences	Std. Error Difference	95% Confidence Intervals of the Differences	
			Lower	Upper
Aggregate Data Both Hospitals				
Group 1 vs. 3 for Year 1 vs. 5	-8.19	15.17	-38.73	22.36
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	-16.85	25.22	-67.65	33.96
ORHS Data				
Group 1 vs. 3 for Year 1 vs. 5	-24.75	16.25	-59.59	10.09
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	-24.50	34.18	-97.81	48.81
FHS Data				
Group 1 vs. 3 for Year 1 vs. 5	-2.68	17.43	-38.04	32.67
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	-11.21	27.74	-67.46	45.04

Based upon the findings of the primary statistical and sensitivity analyses, Hypothesis 1 was rejected; however, the point estimations and confidence intervals suggest that with a larger sample size, the hypothesized relationship between physicians' ownership of OPPT services and their referrals for those services may be revealed.

Hypotheses 2-4

Hypotheses 2-4 were tested by examining the influence of physician group, ownership status, and payer type on referrals. Hypothesis 2 stated that the hospital system OPPT clinics were expected to receive a significantly decreased number of referrals per physician of commercially insured patients from orthopaedic physicians who transitioned to POPTS practices as compared to the number of commercially insured patients from non-POPTS orthopaedic physicians over the same time period. Table 25 provides the

total numbers of commercial referrals from the paired physicians for years 1 and 5 of the study period.

Table 25. Commercial referrals to ORHS year 1 versus 5.

Commercial Insurance		**Number of Referrals**
Physician Group	**STATUS**	**Year 1 vs. 5**
Group 1 (N=8)	PRE	329
	POST	232
Group 1 Total		561
Group 3 (N=8)	PRE	182
	POST	263
Group 3 Total		445
Grand Total		1006

Hypothesis 3 stated that the hospital system OPPT clinics were expected to receive a significantly increased number of referrals per physician of Medicare insured patients from orthopaedic physicians who transitioned to POPTS practices as compared to the number of Medicare insured patients referred from non-POPTS orthopaedic physicians over the same time period. Table 26 provides the total numbers of Medicare referrals from the paired physicians for years 1 and 5 of the study period.

Table 26. Medicare referrals to ORHS year 1 versus 5.

Medicare		**Number of Referrals**
Physician Group	**STATUS**	**Year 1 vs. 5**
Group 1 (N=8)	PRE	5
	POST	71
Group 1 Total		76
Group 3 (N=8)	PRE	18
	POST	105
Group 3 Total		123
Grand Total		199

Finally, Hypothesis 4 stated that the hospital system OPPT clinics were expected to receive a significantly increased number of referrals per physician of underinsured patients from orthopaedic physicians who transitioned to POPTS practices as compared to the number of underinsured patients referred by non-POPTS orthopaedic physicians over the same time period. Table 27 provides the total numbers of other insurance referrals from the paired physicians for years 1 and 5 of the study period.

Table 27. Other referrals to ORHS year 1 versus 5.

Other Insurance		**Number of Referrals**
Physician Group	**STATUS**	**Year 1 vs. 5**
Group 1 (N=8)	PRE	7
	POST	13
Group 1 Total		20
Group 3 (N=8)	PRE	0
	POST	5
Group 3 Total		5
Grand Total		25

The data represented in Tables 25-27 were used to test Hypotheses 2-4. Table 28 provides the mean differences in referrals by payer type between the **PRE** and **POST** time periods for the Group 1 and Group 3 physicians.

Hypotheses 2-4- Analyses for Year 1 versus 5

The interaction between physician group, ownership status, and payer type was not statistically significant (P=0.268; Table 29). The estimated marginal means for the **PAYCD** by **STATUS** interaction (Table 30) suggested a difference in referral patterns for Medicare patients following the transition period that was confirmed statistically

Table 28. Changes in mean referrals to ORHS by payer type (**POST–PRE**).

Changes in Means = POST-PRE	**Changes in Mean Referrals**
ORHS Data Commercial	
Group 1 Year 1 vs. 5	-12.13
Group 3 Year 1 vs. 5	10.13
Group 1 Year 1 and 2 vs. 4 and 5	-38.88
Group 3 Year 1 and 2 vs. 4 and 5	-9.25
ORHS Data Medicare	
Group 1 Year 1 vs. 5	8.25
Group 3 Year 1 vs. 5	10.88
Group 1 Year 1 and 2 vs. 4 and 5	9.63
Group 3 Year 1 and 2 vs. 4 and 5	11.88
ORHS Data Other	
Group 1 Year 1 vs. 5	0.75
Group 3 Year 1 vs. 5	0.13
Group 1 Year 1 and 2 vs. 4 and 5	3.25
Group 3 Year 1 and 2 vs. 4 and 5	-4.63

Table 29. Type III tests of fixed effects for ORHS year 1 versus 5.

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	14.000	43.055	.000
PHYSCD	1	14.000	.201	.661
STATUS	1	14.000	1.297	.274
PAYCD	2	14.000	19.855	**.000**
PHYSCD * STATUS	1	14.000	2.321	.150
PHYSCD * PAYCD	2	14.000	.655	.535
STATUS * PAYCD	2	14.000	5.086	**.022**
PHYSCD * STATUS * PAYCD	2	14.000	1.449	.268

Dependent Variable: REFNO.

PHYSCD= Physician group
STATUS= Pre or post year 3 (transition year)
PAYCD= Payer type associated with the referral

Table 30. Estimated marginal means of payer type and status for ORHS year 1 versus 5.

PAYCD*STATUS

PAYCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
COMMERCIAL	PRE	31.938	5.537	14.000	20.063	43.812
	POST	30.938	6.710	14.000	16.545	45.330
MEDICARE	PRE	1.438	.811	14.000	-.302	3.177
	POST	11.000	3.642	14.000	3.188	18.812
OTHER	PRE	.438	.371	14.000	-.359	1.234
	POST	1.125	.399	14.000	.268	1.982

Dependent Variable: REFNO.

STATUS= Pre or post year 3 (transition year)
PAYCD= Payer type associated with the referral

(p=0.024; Test 7 in Appendix J). However, this change was not significantly different between Group 1 and Group 3 physicians. Tables 31-33 provide the total numbers of referrals from each of the payer types made by the paired physicians for years 1, 2, 4, and 5 of the study period. The data from the Group 1 physicians' transition years and the paired Group 3 physicians' same years are not included. The data represented in these tables were used for the sensitivity analyses of Hypotheses 2-4.

Table 31. Commercial referrals to ORHS years 1 and 2 versus 4 and 5.

Commercial Insurance		**Number of Referrals**
Physician Group	**STATUS**	**Years 1 and 2 vs. 4 and 5**
Group 1 (N=8)	PRE	839
	POST	552
Group 1 Total		1391
Group 3 (N=8)	PRE	643
	POST	569
Group 3 Total		1212
Grand Total		2603

Table 32. Medicare referrals to ORHS years 1 and 2 versus 4 and 5.

Medicare		**Number of Referrals**
Physician Group	**STATUS**	**Years 1 and 2 vs. 4 and 5**
Group 1 (N=8)	PRE	23
	POST	100
Group 1 Total		123
Group 3 (N=8)	PRE	119
	POST	214
Group 3 Total		333
Grand Total		456

Table 33. Other referrals to ORHS years 1 and 2 versus 4 and 5.

Other Insurance		**Number of Referrals**
Physician Group	**STATUS**	**Years 1 and 2 vs. 4 and 5**
Group 1 (N=8)	PRE	13
	POST	39
Group 1 Total		52
Group 3 (N=8)	PRE	97
	POST	60
Group 3 Total		157
Grand Total		209

Hypotheses 2-4- Sensitivity Analyses

The addition of referral data from years 2 and 4 did not produce a statistically significant interaction between physician group, ownership status, and payer type ($p=0.519$; Table 34). In addition, the interaction between status and payer type was lost ($p=0.067$; Table 34). The sensitivity analyses showed no statistically significant change in commercial referrals, Medicare referrals, or referrals with other types of insurance over the study period. Output for this test is included as Test 8 in Appendix J.

Table 34. Type III tests of fixed effects for ORHS years 1 and 2 versus 4 and 5.

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	14.000	32.556	.000
PHYSCD	1	14.000	.056	.816
STATUS	1	14.000	.514	.485
PAYCD	2	14.000	14.034	**.000**
PHYSCD * STATUS	1	14.000	.363	.556
PHYSCD * PAYCD	2	14.000	1.132	.350
STATUS * PAYCD	2	14.000	3.310	.067
PHYSCD * STATUS * PAYCD	2	14.000	.687	.519

Dependent Variable: REFNO.

PHYSCD= Physician group
STATUS= Pre or post year 3 (transition year)
PAYCD= Payer type associated with the referral

Point Estimation and Between Groups Comparisons for Referrals by Payer Type

Table 35 provides the mean differences between the Group 1 and Group 3 physicians and the 95% confidence interval of those differences in referrals by payer type. The negative values of the mean differences in change scores (Table 35) for commercial insurance indicate a decrease in the rate of commercial referrals made to the hospital-based OPPT clinics **PRE** to **POST** by Group 1 relative to Group 3. The negative values of the mean differences in change scores for Medicare referrals indicate a decrease in the rate of Medicare referrals made to the hospital-based OPPT clinics **PRE** to **POST** by Group 1 relative to Group 3. Finally, the positive values of the mean differences in change scores for referrals with other types of insurance indicate an increase in the rate of other types of referrals made to the hospital-based OPPT clinics **PRE** to **POST** by Group 1 relative to Group 3.

Table 35. Groups 1 – Group 3 differences for changes in mean referrals (**POST–PRE**) by payer type and the 95% confidence intervals.

Group 1 – Group 3 Differences for Changes in Means	**Paired Differences**			
	Mean Differences	Std. Error Difference	95% Confidence Intervals of the Differences	
			Lower	Upper
ORHS Data Commercial				
Group 1 vs. 3 for Year 1 vs. 5	-22.25	13.46	-51.13	6.63
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	-26.63	31.66	-94.53	41.28
ORHS Data Medicare				
Group 1 vs. 3 for Year 1 vs. 5	-2.63	5.98	-15.44	10.19
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	-2.25	6.28	-15.71	11.21
ORHS Data Other				
Group 1 vs. 3 for Year 1 vs. 5	0.63	0.85	-1.20	2.45
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	7.88	9.68	-12.88	28.63

The confidence intervals for each of these point estimations show the relative imprecision of the statistical models and point to the influence that sample size may have had on the statistical the models' abilities to detect differences between the physician groups (Table 35). Based upon the findings of the primary statistical and sensitivity analyses (Tests 7 and 8 in Appendix J), Hypotheses 2-4 were rejected.

Summary

The hypothesis testing did not demonstrate a significant change in referrals per physician following orthopedic physicians' transition to POPTS. The two physician groups referred differently during the study period, but ownership status did not appear to influence the referrals. Hypothesis 1 was not supported in any of the statistical models. Hypotheses 2-4 regarding the influence of payer type on referral patterns from POPTS physicians also were not supported. Descriptive differences in referrals of patients with commercial insurance versus those with Medicare and other types of insurance were not dependent upon physician group or ownership status. Point estimation and 95%

confidence intervals for mean differences between Group1 and Group 3 suggested that the hypothesized relationships between physician ownership of PT services and total referrals, commercial referrals, and underinsured referrals may exist, but the small samples sizes limited the power of the statistical tests and their abilities to detect differences between the groups.

CHAPTER VI: DISCUSSION AND CONCLUSION

This chapter discusses the findings for the research questions and integrates those findings with existing literature pertaining to the influence of physician ownership on referral behaviors. The roles of other factors that may influence physicians' referrals are also explored. Finally, the study's limitations and implications are provided, and directions for future research are addressed.

The Influence of Physician Ownership on Total Referrals

Findings for Hypothesis 1

There was no statistically significant difference between the Group 1 and Group 3 physicians in total referrals made to ORHS and FHS over the study period. In other words, physicians' ownership of physical therapy services was not a statistically significant factor in determining the number of referrals made to the hospital-based OPPT clinics over the five year period. One potential explanation for this finding is that overall population growth in the region created an increased volume of patients for both physician groups (Table 2 on pg. 69 of this dissertation). If the Group 1 physician practices did not have the capacity to absorb an excess demand for physical therapy services, then their referral rates to the hospital-based OPPT clinics may not have differed meaningfully from the Group 3 physician referral rates. However, analysis of the

descriptive referral data only for the Group 1 and Group 3 physicians included in the hypothesis testing revealed a more complicated picture.

Prior to 2001, referrals in aggregate from both the Group 1 and Group 3 physicians grew (Figures 18-20). After 2002, referrals from both groups started to decline, although the referral patterns to each individual facility differed. For ORHS, there was a dip in referrals in 2003, followed by an increase in 2004 and another decline in 2005 from both Group 1 and Group 3 physicians (Figure 19). Despite these fluctuations, the referrals to ORHS from both physicians' groups were always above the baseline number of referrals made in 1999. Meanwhile, FHS saw a spike in its referrals from Group 1 physicians in 2003 and then a decline below baseline between 2004 and 2006 (Figure 20). Group 3 physicians' referrals hovered around the baseline value throughout the study period. Interestingly, the referral patterns from the Group 1 and Group 3 physicians tended to mirror each other throughout the study period. One possible explanation for this observation is that, in spite of ownership status, there is regional consistency in orthopaedists' decision-making related to referral to PT services. Unfortunately, the extent to which physicians in this market interact and share similar management strategies cannot be captured through hospital-system data. However, the common patterns in referrals from both groups are consistent with the outcome of the statistical testing for this hypothesis.

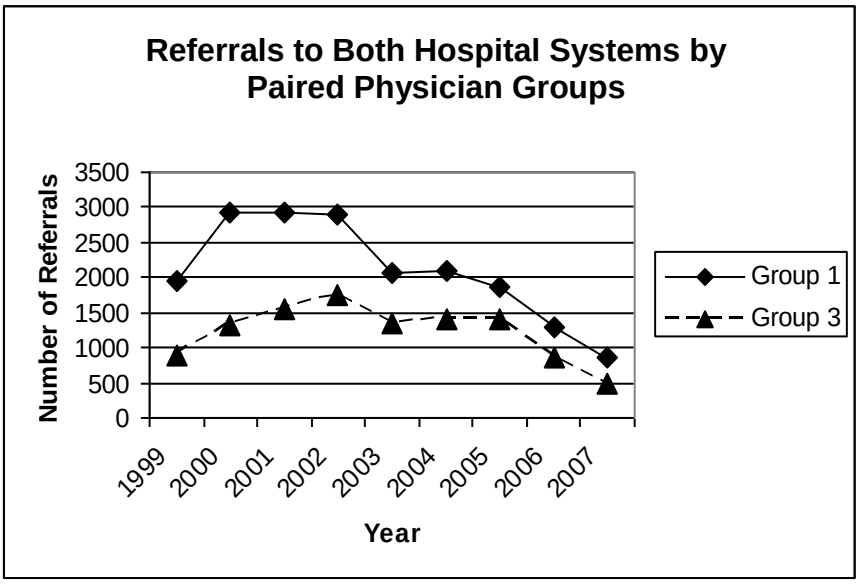


Figure 18. Referrals to both hospital systems by paired physician groups. *ORHS contributed data for only the first three-quarters of 2005 and no data for 2006 or 2007. FHS contributed data only for the first three-quarters of 2007.

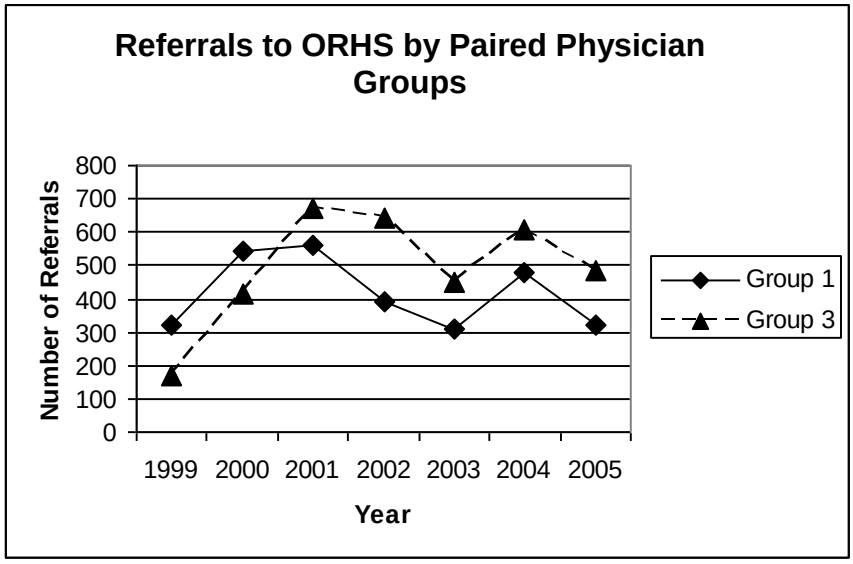


Figure 19. Referrals to ORHS by paired physician groups. *ORHS contributed data for only the first three-quarters of 2005.

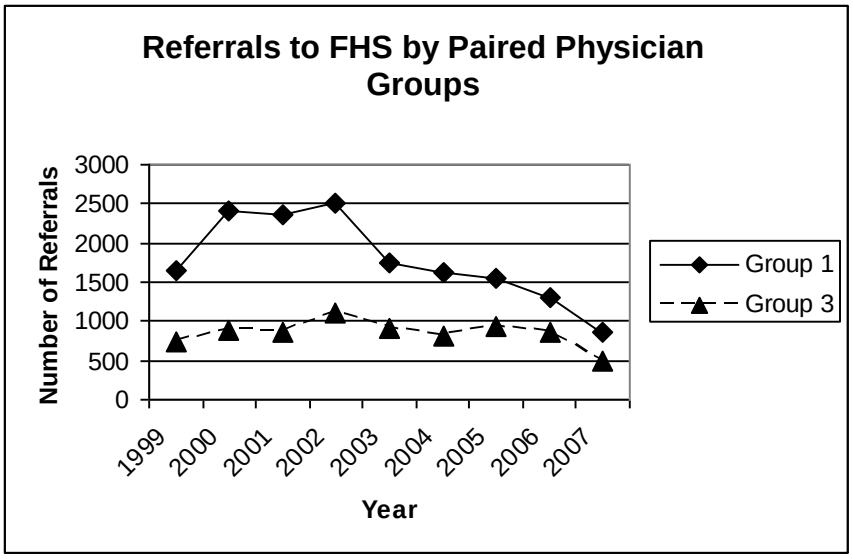


Figure 20. Referrals to FHS by paired physician groups.*FHS contributed data only for the first three-quarters of 2007.

Population growth may explain why the referral rates for Group 3 physicians surpassed and remained above the Group 1 physicians in the ORHS data. The increase in the population may also explain why the overall referrals from both groups made to ORHS exceeded the baseline number of referrals made in 1999 over time. However, the overall decline in referrals from both groups depicted in Figure 19 suggests that any increased demand for physical therapy services was met through other means.

Location may influence patients' choices of providers because of time and transportation costs. The Orlando Metropolitan Statistical Area (MSA) is 110.2 square miles and includes three counties (City of Orlando, 2011). While the hospital-based OPPT providers are located in numerous parts of the Orlando MSA, the distances that patients must travel to be able to access these clinics may still be a factor in their decisions to pursue OPPT at these clinics (Appendix G). Table 36 shows the county locations of the POPTS OPPT clinics, the non-POPTS physician practices, the hospital-

Table 36. Clinic locations around Orlando metropolitan area.

Locations	Orange County	Osceola County	Seminole County	Other*
POPTS Practices	**13**	**0**	**1**	**0**
Non-POPTS Practices	40	13	16	2
ORHS OPPT Clinics	**5** (2 closed)	**1**	**1** (2 closed)	**0**
FHS OPPT Clinics	**8**	**2**	**3**	**0**
Other OPPT Clinics	**27**	**4**	**19**	**3**
Total = POPTS + OPPT Clinics	**53**	**7**	**24**	**3**

*Location outside of but in close proximity to Orlando MSA.

based OPPT clinics, and the other OPPT clinics. The concentration of physician and OPPT practices in Orange County is understandable given that the population is also densest in this region (previous Table 2). Of note is the high number of other OPPT practices in Orange as well as Seminole counties. Growth of new OPPT practices increased markedly between 1999 and 2003 (previous Figure 9). If these competitors were more accessible to patients in need of OPPT services, they may have absorbed some of the referrals by both Group 1 and Group 3 physicians that would have otherwise been made to the hospital-based OPPT clinics.

It is possible that there is no difference between how Group 1 and Group 3 physicians changed their referral patterns over the study period. In addition, regional physician practice variation, population growth, and clinic locations, may have also contributed to the lack of statistical significance in the tests of Hypothesis 1. It is also possible that small sample sizes may have led to an underpowered study. For example, the direction and magnitude of change in referrals **PRE** to **POST** indicates that the Group 1 physicians were increasing their referrals at a slower rate than the Group 3 physicians in aggregate and to each individual hospital system (previous Table 19 and Table 24). However, the relatively large confidence intervals calculated for the Group 1 and Group 3 comparisons

(previous Table 24) are a result of the small sample size and highlight the imprecision of the statistical models. The potential influence of sample size on the hypothesis testing is explored in more depth in the *Limitations* section of this chapter.

The Interaction of Ownership and Payer Type

Findings for Hypotheses 2, 3, and 4

This study investigated a theorized relationship between physicians' ownership of physical therapy services, patients' payer types, and referrals made to hospital-based OPPT clinics. The combined influence of ownership status and each of three levels of insurance type were explored to see if there was a difference between the referrals of more lucrative and less lucrative insurance types made by physicians who joined POPTS versus non-POPTS physicians. These hypotheses were explored only with the ORHS data, because FHS was unable to provide payer data for this study.

Commercial Insurance

Theory suggests that physicians who become owners of physical therapy services will work to retain patients with lucrative sources of reimbursement (i.e., commercial insurance) for their own practices and refer other types of patients (i.e., Medicare and other) to outside providers (Ahern & Scott, 1992). The researcher hypothesized that OPPT clinics would receive significantly fewer commercial referrals per year from orthopaedic physicians who transitioned to POPTS as compared to the number of commercially insured patients referred from non-POPTS orthopaedic physicians over the same time period (Hypothesis 2). Statistical testing showed that ownership was not a significant factor in the referrals of commercially insured patients to ORHS for OPPT.

These findings suggest that physicians' referrals to the hospital-based OPPT clinics were not influenced by the patients' payer type but rather by other factors.

The results of previous studies and of the present research suggest that physicians' referral behaviors are complex and cannot be predicted by a single factor such as ownership interest in services to which they make referrals. Factors that have been shown to influence physicians' referrals for physical therapy include patient characteristics (Ehrmann-Feldman, Rossignol, Abenhaim, & Gobeille, 1996; Freburger, Carey, & Holmes, 2005; Freburger, Holmes, & Carey, 2003; Jorgensen & Olesen, 2001) , physicians' experiences with and attitudes toward physical therapy (Clemence & Seamark, 2003; Freburger, et al., 2005; Kerssens & Groenewegen, 1990; Stanton, Fox, Frangos, & et al., 1985; Uili, Shepard, & Savinar, 1984) , and physicians' expectations for physical and motor outcomes resulting from physical therapy interventions (Archer, MacKenzie, Bosse, Pollak, & Riley III, 2009).

Ehrmann-Feldman and colleagues examined patient factors associated with physicians' referrals of Canadian workers experiencing low back pain. These authors found that older individuals, females, and persons with specific diagnoses were more likely to be referred to a PT (Ehrmann-Feldman, et al., 1996). Jorgensen and Olesen (2001) used survey data along with information from a county health insurance register to describe referral rates from general practitioners (GP's) to physical therapy. According to this study, women were more likely than men to be referred for PT. In addition, the numbers of referrals also varied between physician practices. However, these factors predicted only a small portion of the variability observed in the data.

In a 2003 cross-sectional analysis of the National Ambulatory Medical Care Survey (NAMCS), Freburger and colleagues identified insurance status and physician characteristics as predictors of PT referral. PCP's were more likely to refer for PT if their patients had private insurance or non-managed care plans. Orthopedic surgeons were more likely than PCP's to refer patients for PT, especially if those patients were covered by workers' compensation or managed care. D.O.'s were more likely than allopathic physicians to refer for PT (Freburger, et al., 2003). Freburger and colleagues (2005) also examined data collected at 20 U.S. spine centers participating in the National Spine Network. These authors showed that patients with certain spinal disorder diagnoses, with more education, females, and patients less than 50 years of age were more likely to be referred for PT. In addition, there was variability in PT referral rates dependent upon which spinal center the patient visited. Due to their limited data set, the authors were not able to comment on whether insurance or illness severity may have influenced the referrals.

Clemence and Seamark (2003) conducted a series of interviews of GP's, physical therapists, and patients participating in the National Health System of the United Kingdom. GPs' past experience with physical therapy was described as affecting all of the surveyed GPs' uses of physical therapy services. The GP's suggested that experience gained in clinical practice appeared to be more important than formal training. This finding supports the previous work of Stanton and colleagues (1985) who conducted a survey of resident physicians in order to determine if these physicians felt they had adequate information and training to effectively refer patients to physical therapy. Their

findings suggested the presence of a knowledge deficit among many resident physicians regarding physical therapy evaluations and treatments. The authors proposed that additional education of physicians regarding physical therapy is necessary beyond medical school and resident training (Stanton, et al., 1985). In a similar study, Uili and colleagues (1984) conducted a U.S. survey of physicians in multiple subspecialties to determine their knowledge and utilization of physical therapy services. Physical medicine and rehabilitation specialists and physicians who had been in practice ten years or more had the most knowledge of physical therapy procedures and were most likely to refer for PT services (Uili, et al., 1984).

A 2009 study by Archer and colleagues explored the influence of physician and practice characteristics, physicians' outcome expectations, and physicians' attitudes toward physical therapy on referrals of patients with traumatic lower-extremity injury to PT. A cross-sectional survey was conducted using case vignettes. The authors found that on average, the surgeons felt that 57.6% of their patients with traumatic lower-extremity injury referred for physical therapy would have a positive health outcome. The surgeons expected the best outcomes for use of assistive devices, strength, and range of motion. The poorest outcome was expected for prevention of chronic pain. Nearly one-third of the patients in the case vignettes (32.6%) were expected to have no health benefit beyond what would occur with a surgeon-directed home exercise program, 27.2% were expected to have no improvement beyond what would naturally occur, and an additional 24.2% were anticipated to have negative outcomes from physical therapy. Positive physician outcome expectations for patients' improvements in physical and motor outcomes were

predictive of referrals for PT (odds ratio= 2.7, $p<0.001$) (Archer, et al., 2009). These findings highlight the importance of expectations for outcomes in the decision-making of physicians who are considering referral for physical therapy. The authors suggested that low referral rates may in part be attributed to physicians' preferences for surgeon-directed, home-based exercises rather than physical therapy (Archer, et al., 2009). This study used only case vignettes, however, and did not attempt to examine physicians' actual referral behaviors which may be influence by other factors as well.

With regard to physicians' referrals in general, Shea and colleagues (1999) determined referrals occur between primary care physicians (PCP), between specialists, and between PCP's and specialists. In their study, patient incomes and levels of education, health conditions, and insurance type appeared to be significant factors in referrals between physicians (Shea, Stuart, Vasey, & Nag, 1999). Through a national survey of primary care physicians, Kinchen and colleagues showed that the medical skill of the specialist to whom the primary care physician was referring, the timeliness of the appointments their patients received, the previous experience of the PCP with the specialists, the quality of communication from the specialists, and the specialist's history of returning the referred patients back to the PCP's also influence referrals for specialty services (Kinchen, Cooper, Levine, Wang, & Powe, 2004). Finally, Franks and colleagues showed that female physicians, physicians with more experience, physician specialists, physicians who saw patients with a narrower range of diagnoses, and physicians who were risk averse were more likely to make referrals (Franks, Williams, Zwanziger, Mooney, & Sorbero, 2000).

The findings of these studies and of the present research reveal some of the complexity of physicians' referral behaviors. In comparison to the referral behaviors of the Group 1 physicians, Group 0 physicians' data showed that physicians who were owners of POPTS throughout 1999-2005 appeared to increase their referrals of commercially insured patients to ORHS over time (Table 2 in Appendix I). These descriptive data support the idea that factors other than ownership may have provided a greater influence on the Group 0 physicians' referral decisions. On the other hand, it is possible that these physicians had reached their capacity to provide physical therapy services to their patients, so they needed to make referrals to other providers to handle the overflow of new patients. Access to proprietary physician data is necessary to determine whether these resource constraints actually influenced referral patterns from these physicians.

Although physicians' referral behaviors are complex and do not appear to be fully explained by ownership status, evidence of a potential influence of POPTS status on the Group 1 physicians' referrals of patients with commercial insurance was seen in the calculations of mean differences in these referrals between the Group 1 and Group 3 physicians over time (previous Table 35). Compared to the Group 3 physicians, Group 1 physicians decreased their mean referrals of commercially insured patients between 22.3 and 26.6 patients. However, the wide 95% confidence interval suggests that the sample size was insufficient to detect a significant difference between the groups.

Medicare

Ahern and Scott's (1992) theory suggests that patients with Medicare would likely be selectively referred by POPTS to outside providers. The researcher hypothesized that hospital-based OPPT clinics would receive a significantly increased number of Medicare referrals per year from orthopaedic physicians who transitioned to POPTS practices as compared to Medicare referrals per year from non-POPTS orthopaedic physicians (Hypothesis 3). However, statistical testing showed that ownership was not a significant factor in the referrals of Medicare insured patients to the ORHS OPPT clinics. The hypothesis testing revealed no significant difference between the physician groups for changes in Medicare referrals, and no influence of POPTS status on the Group 1 physicians' referrals of patients with Medicare was seen in the calculations of mean differences between the Group 1 and Group 3 physicians over time (previous Table 35). Compared to the Group 3 physicians, Group 1 physicians decreased their mean referrals of Medicare-insured patients between 2.25 and 2.63 patients.

These findings again suggest that physician owners of OPPT clinics did not alter their referrals based upon patients' insurance types. However, volume increases due to increases in the local population may have overcome differences in referral patterns between the groups. An overall increase in Medicare referrals was predictable, considering the census data for the region showed growth in the elderly population. Another possible explanation is that the difference in reimbursement rates from commercially insured patients and Medicare patients may not have been large enough to provide a financial incentive for physicians to selectively refer Medicare patients. A list

of physical therapy procedures that are commonly performed in outpatient physical therapy clinics and their reimbursements from Florida's Medicare administrative contractors (MAC) and fiscal intermediaries (FI) over the study period are listed in Table 37 (Centers for Medicare and Medicaid Services, 2011). The majority of the physical therapy procedures had increasing reimbursement over the study period. The rates of change in the reimbursement for the procedures are also included in this table (Table 37).

Table 37. Medicare reimbursement for physical therapy services over the study period (Florida only).

Common Procedural Terminology Code	Procedure	Reimbursement per Procedure in U.S. Dollars (% Change in Reimbursement)					
		2000	2001	2002	2003	2004	2005
97001	Physical Therapy Evaluation	60.54	68.56 (↑13.2%)	66.11 (↑9.2%)	66.11	73.43 (↑21.3%)	74.61 (↑23.2)
97032	Electrical Stimulation (Attended)	16.35	18.88 (↑15.5)	16.47 (↑0.7%)	16.47	15.46 (↓5.4%)	15.66 (↓4.2%)
97035	Ultrasound	12.15	14.13 (↑16.3)	10.61 (↓12.7%)	10.61	12.20 (↑0.4%)	12.00 (↓1.2)
97110	Therapeutic Exercise	22.94	24.79 (↑8.1%)	25.82 (↑12.6%)	25.82	28.59 (↑24.6%)	27.64 (↑20.5%)
97112	Neuromuscular Reeducation	23.98	27.20 (↑13.4%)	26.73 (↑11.5%)	26.73	28.35 (↑11.5%)	29.06 (↑21.2%)
97116	Gait Training	21.36	25.33 (↑18.6%)	22.22 (↑4.0%)	23.98 (↑12.3%)	24.36 (↑14.0%)	24.19 (↑13.2%)
97124	Massage	19.58	22.25 (↑13.6%)	20.00 (↑2.1%)	21.37 (↑9.1%)	21.67 (↑10.7%)	21.94 (↑12.1%)
97140	Manual Therapy	26.04	28.26 (↑8.5%)	23.97 (↓7.9%)	25.75 (↓1.1%)	26.19 (↑0.6%)	26.17 (↑0.5%)

% Change relative to base year (2000).

If the Medicare rates of reimbursement were similar to commercial rates of reimbursement for the same procedures, there would not have been a significant financial incentive for entrepreneurial physicians to externally refer patients who had Medicare.

The investigator was unable to compare Medicare's reimbursement rates with those of the commercial payers, however, because the commercial insurance fee schedules are not publicly available. Additional research is needed to determine if these other factors play a role in the Medicare referrals made by othopaedic physicians for outpatient physical therapy.

Other Types of Insurance

Ahern and Scott's (1992) theory suggests that underinsured patients would likely be selectively referred by POPTS physicians to outside providers. The researcher hypothesized that OPPT clinics would receive a significantly increased number of underinsured referrals per year from orthopaedic physicians who transitioned to POPTS practices as compared to underinsured referrals per year from non-POPTS orthopaedic physicians (Hypothesis 4). In the statistical tests, physician ownership of OPPT clinics did not appear to influence the numbers of underinsured referrals made to the hospital-based OPPT clinics. It may be that the orthopaedic physicians in this study were not influenced by their patients' insurance status when making referrals for OPPT. It is also possible that patients' financial constraints and increases in the overall numbers of uninsured/underinsured patients might have masked potential changes in referral patterns.

The census data for Orlando showed that the numbers of children and persons living in poverty was increasing over the study period and that Medicaid enrollment for the region was also rising (previous Tables 2-4). Both the Group 1 and Group 3 physicians increased their overall referrals of underinsured patients over the same time frame. However, the underinsured referrals from the Group 1 physicians failed to keep pace with

the growing rates of Medicaid enrollees in the Orlando area, while the underinsured referrals from Group 3 were proportional to the percentages of Medicaid enrollees in Orlando (previous Table 4). One possibility for the difference in the rates of Medicaid referrals between the two physician groups is that the Group 3 physicians were treating more underinsured patients and subsequently had more of these patients available for referral to OPPT. However, the greatest increase in Medicaid enrollment occurred between 2004 and 2006, a period outside of the timeline of the present research. Data for this time period were not available due to the incomplete ORHS data set. Therefore, the time frame available for this analysis may not have been sufficient to detect an impact from increased Medicaid enrollment on the referral patterns of the Group 1 physicians.

As was the case with referral patterns for patients with commercial insurance, a potential influence of POPTS status on the Group 1 physicians' was seen over time in the calculations of mean differences in referrals of underinsured patients between the Group 1 and Group 3 physicians (previous Table 35). Compared to the Group 3 physicians, Group 1 physicians increased their mean referrals of underinsured patients by up to 7.87 patients per year, but the wide 95% confidence interval suggests that the sample size was insufficient to detect a difference between the groups.

Ultimately, people with fewer financial resources who seek health care are restricted to providers who are willing or able to accept Medicaid reimbursement or self-paying patients, or to those who perform pro bono care. Research investigating the patient volumes, payer mixes, and referral patterns for physician practices would help to

determine if underinsured patients are able to access physicians and if they are subsequently referred for and able to access physical therapy services.

Limitations

The following section outlines the limitations associated with this research. It begins with a discussion about the influence of sample size on the outcomes of the statistical tests and then explores issues associated with the data resources, the influence of other factors, and the generalizability of the findings.

Sample Size

In an attempt to identify an unbiased estimate of any changes in referral patterns, it was necessary to identify and include only physicians who were consistent referral sources for OPPT at ORHS and FHS. Physicians with a history of OPPT referrals to ORHS and FHS were thought to be familiar with these institutions as providers of OPPT. Inclusion of physicians with a minimum number of referrals in year 1 provided a baseline for comparison of any changes in the referral patterns that were being investigated. Unfortunately, application of this criterion reduced the sample of physicians available for analysis by 80.2% for ORHS and 42.7% for FHS, a situation that may have resulted in an underpowered study. As previously noted, the large confidence intervals calculated for each of the hypotheses involving Group 1 and Group 3 comparisons suggest that the small sample sizes led to imprecision of the statistical models (previous Table 24 and Table 35). Table 38 shows the total numbers of physicians who referred to ORHS and FHS as well as the subset of physicians who were deemed consistent referral sources.

Table 38. The numbers of physicians who referred to ORHS and FHS for OPPT.

Physician Group	ORHS Total Physicians (Met Criterion)	FHS Total Physicians (Met Criterion)
Group 1	47 (17)	39 (28)
Group 3	79 (8)	43 (19)

Group 1 physicians who met the inclusion criterion accounted for 51.0% of the aggregate Group 1 referrals; Group 3 physicians who met the criterion accounted for 48.4% of the aggregate Group 3 referrals.

The hypothesized number of annual referrals needed to establish physicians as consistent referral sources was determined a priori. Anecdotal reports subsequently were obtained from a small, non-random sample of physical therapists involved in private outpatient PT practices (non-POPTS) in several states. These physical therapists were queried online through a physical therapy practice management listserv (PTManager.com) and in direct conversation (Kovacek, 2011). The consensus of this informal group was that physicians who made a minimum of 10-12 referrals per year could be considered consistent referral sources for some OPPT practices. This approach has limited face validity, however. In the absence of empirical data to define a regular source of referrals, it is possible that the physicians in this study were misidentified in this regard**.** In order to assess the impact of the established inclusion criterion on the results of this study, a post hoc analysis was conducted using an alternative method for identifying physicians who met the minimum threshold for inclusion. The minimum threshold was maintained at ten referrals per year. However, the actual number of

referrals per physician prior to the transition year was calculated as an average over years 1 and 2 of the study period rather than counted just in year 1. By using this approach, an additional 11 pairs of physicians became eligible for inclusion for analysis for ORHS (19 pairs in total). An additional pair of physicians was also eligible for the FHS post hoc analyses (20 pairs in total). A total of 28 Group 1 and 33 Group 3 physicians were eligible for inclusion in the samples for the two systems in aggregate, up from 22 and 25 respectively.

The Mixed Linear Models were repeated as previously described using this new paired sample group. The findings for total referrals were similar to the results of the initial analyses. Physician ownership did not appear to negatively influence the numbers of referrals made to the hospital-based OPPT clinics. The findings differed, however, for the combined influence of physician ownership and payer type on referrals. Table 39 shows the data used in this post hoc analysis. The table includes the numbers of referrals in the post hoc data for years 1 and 5 and the percent change in referrals between the primary analysis data and the post hoc data.

The post hoc analysis using the larger sample size revealed a significant three-way interaction between payer type, status, and physician group ($p=0.034$) (Tables 40 and 41). The estimated marginal means for the PAYCD by STATUS by PHYSCD interaction (Table 41) suggested a difference in referral patterns for commercially insured patients following the transition period that was confirmed statistically ($p=0.010$; Test 15 in Appendix J). Group 3 increased its commercial referrals, while Group 1 decreased its

Table 39. Post Hoc: Referrals to ORHS year 1 versus 5 and percent change in referrals from primary analyses.

Year 1 versus 5		Number of Referrals (% Change in Number of Referrals from Primary Analyses)		
Physician Group	**STATUS**	**Commercial**	**Medicare**	**Other**
Group 1 (N=19)	PRE	655 (↑99.1%)	13 (↑160.0%)	10 (↑42.9%)
	POST	429 (↑84.9%)	113 (↑59.2%)	74 (↑469.2%)
Group 1 Total		1084 (↑93.2%)	126 (↑65.8%)	84 (↑320.0%)
Group 3 (N=19)	PRE	238 (↑30.8%)	43 (↑138.9%)	5 (↑%)†
	POST	436 (↑65.8%)	176 (↑67.6%)	85 (↑1600.0%)
Group 3 Total		674 (↑51.5%)	219 (↑78.0%)	90 (↑1700.0%)
Grand Total		1758 (↑74.8%)	345 (↑73.4%)	174 (↑596.0%)

† Increase to 5 referrals in POST condition from 0 referrals in PRE condition.

Table 40. Post Hoc: Type III tests of fixed effects for ORHS year 1 versus 5.

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	36.000	59.318	.000
PHYSCD	1	36.000	1.107	.300
STATUS	1	36.000	3.781	.060
PAYCD	2	36.000	17.115	**.000**
PHYSCD*STATUS	1	36.000	6.944	**.012**
PHYSCD*PAYCD	2	36.000	2.597	.088
STATUS*PAYCD	2	36.000	1.557	.225
PHYSCD*STATUS*PAYCD	2	36.000	3.735	**.034**

Dependent Variable: REFNO.

PHYSCD= Physician group
STATUS= Pre or post year 3 (transition year)
PAYCD= Payer type associated with the referral

Table 41. Post Hoc: Estimated marginal means for physician group, status, and payer type for ORHS year 1 versus 5.

PAYCD*PHYSCD*STATUS

PAYCD	PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
						Lower Bound	Upper Bound
COMMERCIAL	Group 1	PRE	34.474	6.190	36.000	21.920	47.027
		POST	22.579	4.853	36.000	12.737	32.421
	Group 3	PRE	12.526	6.190	36.000	-.027	25.080
		POST	22.947	4.853	36.000	13.105	32.790
MEDICARE	Group 1	PRE	.684	.805	36.000	-.949	2.318
		POST	5.947	2.477	36.000	.924	10.971
	Group 3	PRE	2.263	.805	36.000	.630	3.897
		POST	9.263	2.477	36.000	4.240	14.287
OTHER	Group 1	PRE	.526	.307	36.000	-.096	1.149
		POST	3.895	2.262	36.000	-.693	8.483
	Group 3	PRE	.263	.307	36.000	-.359	.886
		POST	4.474	2.262	36.000	-.114	9.062

Dependent Variable: REFNO.

PHYSCD= Physician group
STATUS= Pre or post year 3 (transition year)
PAYCD= Payer type associated with the referral

commercial referrals over the study period. Referrals of patients with Medicare and other types of insurance were not influenced by physicians' ownership of OPPT services.

Including a larger sample size in the post hoc analyses led to outcomes that were different than those seen in the initial statistical tests. This is preliminary evidence that a larger sample may have revealed the hypothesized relationships between physician ownership status, payer type, and referrals to hospital-based OPPT clinics. It is critical to note, however, that no clinically important difference in referral rates was established a priori for this research. The calculations of the mean differences reinforce these finding

by highlighting the direction of change in referrals for the POPTS versus the non-POPTS physicians (Tables 42 and 43). The findings support the need for future researchers to use larger sample sizes in the data analysis to maximize the power of the statistical tests.

Table 42. Post Hoc: Group1 – Group 3 differences for changes in mean referrals (**POST–PRE**) and the 95% confidence intervals.

Group1 – Group 3 Differences for Changes in Means	**Paired Differences**			
	Mean Differences	Std. Error Difference	95% Confidence Intervals of the Differences	
			Lower	Upper
Aggregate Data Both Hospitals				
Group 1 vs. 3 for Year 1 vs. 5	-17.54	12.16	-41.86	6.78
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	-24.50	19.94	-64.40	15.41
ORHS Data				
Group 1 vs. 3 for Year 1 vs. 5	-24.90	9.45	-44.05	-5.74
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	-32.84	18.14	-69.63	3.95
FHS Data				
Group 1 vs. 3 for Year 1 vs. 5	-5.30	16.44	-38.57	27.97
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	-7.15	26.02	-59.82	45.52

Table 43. Post Hoc: Groups 1 – Group 3 differences for changes in mean referrals (**POST – PRE**) by payer type and the 95% confidence intervals.

Group 1 – Group 3 Differences for Changes in Means	**Paired Differences**			
	Mean Differences	Std. Error Difference	95% Confidence Intervals of the Differences	
			Lower	Upper
ORHS Data Commercial				
Group 1 vs. 3 for Year 1 vs. 5	-22.32	7.81	-38.16	-6.47
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	-32.05	15.49	-63.48	-0.63
ORHS Data Medicare				
Group 1 vs. 3 for Year 1 vs. 5	-1.74	2.88	-7.54	4.10
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	-1.63	3.29	-8.30	5.03
ORHS Data Other				
Group 1 vs. 3 for Year 1 vs. 5	-.084	3.19	-7.31	5.62
Group 1 vs. 3 for Year 1 and 2 vs. 4 and 5	0.84	6.48	-12.30	13.99

Data Resources and Quality

The researcher was unable to obtain proprietary referral data directly from physicians' practices. These data would have allowed the researcher to examine the total referrals and payer types associated with the referrals for OPPT made by the physicians in this study. The number of patients who were referred to in-house care or to corporate or privately held OPPT clinics might have also been determined from these proprietary data. Without this information, it was unclear how many patients were actually being seen by these physicians, how many were being referred for OPPT, and the final dispositions of those referrals. The payer types associated with those referrals and the numbers and types of insurance networks the providers participated in also were unknown. Without access to this information, the researcher was only able to draw inferences from the orthopaedic OPPT referrals made to the two hospital systems. This indirect approach to understanding physicians' behaviors only partially addresses the apparently complex issue of physicians' referrals.

This research required the use of phone interviews to verify orthopaedic physicians' ownership or non-ownership of OPPT clinics. The timing of the Group 1 physicians' becoming owners was studied relative to patterns of the OPPT referrals they made to ORHS and FHS. Group 3 physicians' referrals were also studied over the same time period. It is possible that the data obtained from the phone interviews were inaccurate. The researcher contacted and spoke with the practice manager at each physician practice to ascertain if the practice owned or invested in OPPT. If the practice did have ownership interest in OPPT, the managers were asked in what year they became owners or investors

in these services. This investigation relied upon the accuracy of these data to determine the timing of the physicians' referrals relative to their changes in ownership of OPPT services. The researcher did not ask about the number of physical therapy staff working at the clinics, nor were the clinics asked how the employment of the physical therapy staff changed over time. These data should be collected in future research in order to more fully understand the capacities of the POPTS and OPPT clinics to treat patients. Estimating the treatment capacities of these clinics would allow researchers to better predict how patient volumes might influence physicians' referrals for PT made to outside providers. The expectation would be that when physician-owned clinics reached their capacities to treat patients, additional patients would be referred to outside providers or not at all.

The absence of data from the non-responsive and closed OPPT competitor clinics identified in this research may have influenced the findings. The researcher was unable to determine the timing of entry into and exit from the OPPT market for these clinics. Also, the investigator was unable to determine if physicians had had an ownership interest in these clinics. In the absence of data, the investigator had to assume that the non-responding clinics were similar to the responding OPPT competitor clinics.

This research required the use of secondary data sets. Since this was a retrospective analysis, the researcher was not involved in the initial data collection, coding, or screening of the ORHS and FHS databases. There also was no retrospective way to detect inaccuracies in the coding made by the hospitals' data entry personnel. The numbers and types of referrals made to the two hospital systems were included in the hospital data sets

which provided a reportedly 100% representation of the outpatient orthopaedic physical therapy referrals received by the two systems. These data facilitated comparison of the patterns of OPPT referrals made to the two hospital systems between 1999 and 2007. However, these two hospital systems represented only a portion of the outpatient physical therapy providers in the Orlando area (Appendix F).

An additional limitation in the use of the ORHS and FHS databases was that they did not make it possible to identify patients treated for physical therapy at the hospital systems prior to the study period. The researcher also could not determine if each episode of care was the result of a new patient referral or perhaps a repeat referral. Patients who had received physical therapy previously at the hospital-based OPPT clinics might have requested to be sent to these facilities due to familiarity or prior experience with these clinics. The physicians also might have selected these facilities for referral based upon their prior experiences with the hospital-based clinicians and the outcomes of their physical therapy services. Alternatively, the patients may have also subscribed to insurance or managed care organizations that limited the numbers of providers available to them. In any case, referral patterns of patients already familiar with an outside PT provider may be less sensitive to change due to a change in physician ownership status than referral patterns of patients who have never received physical therapy. In the future, researchers should examine repeat versus new referrals when reflecting upon how physicians' referral decisions are influenced by factors such as ownership.

The ORHS and FHS databases also did not capture information pertaining to patient's secondary diagnoses and co-morbidities. Patient characteristics have been shown to

influence physicians' referral decisions, and patients with multiple health concerns are likely to be more costly to care for in the context of fixed reimbursement. Physicians motivated by income may be inclined to refer these types of patients to other facilities for their care. Another drawback to the use of the hospitals' proprietary databases was that FHS was unable to provide information regarding the payer types associated with the orthopaedic referrals made to its facilities. This limited the analysis of the distribution of referrals by payer type to the ORHS facilities only.

Level of Analysis

The administrators at ORHS and FHS perceived a change in their orthopaedic OPPT referrals at a time when there was a rise in POPTS practices (Jagger, 2007). The administrators suggested that the increase in POPTS practices was creating referral problems for their clinics; however, they may not have considered the influence of other market changes that were occurring, such as the increase in OPPT competitors in the region.

During the period of 1999 to 2007, competition for outpatient physical therapy referrals increased. This rise is consistent with the expectation that the demand for physical therapy services would increase as the population in the region increased. Several firms entered the market in the time of this study, and the number eventually plateaued around the year 2007. The emergence of market competitors may have influenced the volume of referrals being sent to certain hospital-system OPPT clinics, especially if they were in close proximity to competitor clinics.

The researcher used a group of non-POPTS physicians for comparison to try to control for some of the history effects within the Orlando market, such as the emergence of market competitors. The impact of ownership was only investigated at the hospital system level, however. The limited sample size precluded analyses of the individual hospital clinics and prevented the researcher from determining the influence of POPTS and market forces on the referrals these individual clinics received. A larger sample of physicians would have allowed for the pairing of physicians who refer to individual clinics in order to control for the history effects of market changes on each hospital-based practice.

Other Influences on Referrals

There are several factors that may contribute to changes in the number of orthopaedic referrals made to hospital-based outpatient rehabilitation centers. For example, increases in population, change in insurance contracts, facility/interpersonal politics, patient preferences for providers, the introduction of new technologies and therapies, practice mergers/consolidation, proximity and convenience, patient and physician familiarity, and health policy may all influence the flow of patients between providers. The influence of these types of factors on the physicians' referrals might explain some of the variability in the data set not accounted for by the statistical models. Having both a control group of orthopaedic physicians who did not participate in POPTS and a group of physicians who did transition to POPTS allowed the researcher to examine between groups differences in patterns of referrals while accounting for some factors in history, such as population or

policy changes and the influence of medical practice consultants, which may have influenced the referral behaviors of the orthopaedic physicians in the region.

In addition to all of these extrinsic influences, physicians participating together in a practice are likely to be similarly influenced by the expectations of that practice and its manager(s). It is reasonable to think that physicians within a practice might experience pressure from the practice managers to refer patients in a manner that makes their businesses more profitable. Therefore, physicians grouped in a particular practice may be influenced to refer similarly, creating a co-variation of referrals. The investigator had hoped to account for this phenomenon by including practice (**PRACCD**) as a co-variate in the statistical models; however, there were too few practices to be able to perform adequate analyses with this additional variable. Interestingly, Group 1 physicians (N=48) tended to be members of large group practices (N=6 practices) while Group 3 physicians (N=86) tended to have independent practices or to practice with small groups of physicians (N=73 practices).

Generalizability

The generalizability of this study's findings is limited to health care markets that are similar to Orlando's. Having the participation of both ORHS and FHS helped to strengthen the argument regarding patterns of orthopaedic physicians' referrals in this market; however, future research should work to include data from a larger sample of referral sources and OPPT providers.

Study Implications

Theory

Ahern and Scott's (1992) theory predicts that entrepreneurial physicians will work to eliminate competition by reducing overall referrals to their competitors. The body of evidence regarding physician ownership of ancillary services includes investigations of specialty hospitals (Government Accountability Office, 2003; Medicare Payment Advisory Committee, 2005, 2006), radiological services (Childs & Hunter, 1972; Government Accountability Office, 1994; B. Hillman, et al., 1990; B. Hillman, Olson, Griffith, Sunshine, Joseph, Kennedy, Helson, et al., 1992; Mitchell, 2007; Mitchell & Scott, 1991, 1992c; Mitchell & Sunshine, 1992), laboratory services (Ahern & Scott, 1992; Danzon, 1982), and physical therapy services (Mitchell & Scott, 1992b; Swedlow, et al., 1992). These studies have uncovered an influence of physician ownership on rates of utilization, numbers of referrals, and costs of care that is consistent with Ahern and Scott's theory.

Specific to physical therapy, physicians' ownership interests have been shown to increase service utilization rates and costs for workers' compensation programs from outpatient physical therapy (Mitchell, 2007; Mitchell & Scott, 1992b; Mitchell & Sunshine, 1992; OIG, 1994; Olshin, et al., 2002; Swedlow, et al., 1992). This research did not support the theory that physician owners of OPPT will work to reduce competition by limiting the numbers and controlling the types of referrals made to outside OPPT providers. Instead, in aggregate total referrals increased suggesting that

physicians may have been influenced by other considerations with respect to referral for PT services.

It is possible that the physicians who referred for OPPT were not motivated by income. It is also possible that physical therapy services are not lucrative enough to influence physicians' referrals for OPPT. For example, there may be greater opportunities to increase income from diagnostics or laboratory testing instead of PT. In addition, other factors such as location, insurance contract restrictions, pre-existing relationships between providers, patients' preferences for providers, provider reputations, and clinical considerations may outweigh ownership considerations with respect to physical therapy.

Although it is possible the theory does not apply to self-referral of PT services, there are other plausible explanations for this study's results. Global changes in the population could have masked the effects of physician self-referral by overwhelming these physicians' capacities to provide the physical therapy services in-house during the study period. Physician practices that transitioned to POPTS may have required a longer period of time to stabilize their PT workforce in response to growing patient demand. In addition to global changes, if the costs to provide physical therapy services exceeded the reimbursement for those services, motivation for physicians to self-refer for profit may have been reduced. Access to data from physician practices or through payer data that identifies physical therapists' employers is needed in order to resolve this issue.

In accordance with Ahern and Scott's theory, it was hypothesized that orthopaedic physicians would selectively retain patients with commercial insurance once they joined POPTS and that they would refer patients with Medicare and other types of insurance to

hospital-based OPPT more frequently after becoming owners. The results of this study did not support these hypotheses. Once again there is a possibility that the theory does not apply to self-referral of physical therapy services. Alternatively, the differential in reimbursement rates between commercial insurers and Medicare may not have been enough in this market during this study period to stimulate differences in referral patterns for these payer classes. Another explanation, however, is that this study was underpowered to detect ownership influences on referral patterns.

Implications for Policy

Several studies have demonstrated the influence of payment type on referrals and utilization rates. The present research showed no relationship between physician ownership, referrals to OPPT services, and patients' payment types. However, there is some indication that the Group 1 physicians were responding in an entrepreneurial fashion to market forces. The data for this study were collected during a time when overall reimbursement for physician services was declining. Estimated Sustainable Growth Rates (SGR) published by the Office of the Actuary for the Centers for Medicare and Medicaid Services (CMS) show that the physician fee scale was being downwardly adjusted between 1999 and 2007 (Table 44) (Office of the Actuary, 2010). The SGR is a method used by CMS to control costs by ensuring that the annual increase in the expense per Medicare beneficiary does not exceed growth in the Gross Domestic Product (GDP) (Office of the Actuary, 2010).

While physicians' reimbursement for services they rendered was declining, reimbursement for other medical interventions (i.e., physical therapy services) was

Table 44. Actual past Medicare Economic Index Increases and Physician Updates for 1992-2009, and Estimated Values for 2010 (Office of the Actuary, 2010).

Year	Physician Medicare Economic Index Increase	Physician Update
1992	3.2%	1.9%
1993	2.7%	1.4%
1994	2.3%	7.0%
1995	2.1%	7.5%
1996	2.0%	0.8%
1997	2.0%	0.6%
1998	2.2%	2.3%
1999	2.3%	2.3%
2000	2.4%	5.5%
2001	2.1%	5.0%
2002	2.6%	-4.8%
2003	3.0%	1.7%
2004	2.9%	1.5%
2005	3.1%	1.5%
2006	2.8%	0.2%
2007	2.1%	0.0%
2008	1.8%	0.5%
2009	1.6%	1.1%
Projected:		
2010	1.2%	-21.3%

increasing (previous Table 37). This may have made annexation of these services more attractive to physicians looking to improve or maintain their incomes. The greatest adjustment to the physician fee schedule occurred in 2001, the same time as when the vast majority of Group 1 physicians transitioned to POPTS. Having a partially-privatized health system makes it difficult for government policymakers to produce legislation that protects against abuses in physicians' referral behaviors across the spectrum of patients and insurers. The issue of selective referral is particularly important for those providers who serve as the safety-net for citizens who have little or no health insurance. Policymakers could require providers who participate in federally funded insurance programs to be transparent in the numbers and types of referrals that are made for

designated health services such as OPPT. In addition to the information that is currently gathered by the Centers for Medicare and Medicaid Services, it would be necessary for physicians to divulge the quantities of the patients they see, the types of patients they see (based upon demographics, levels of acuity/chronicity, and payer), the dispositions of the referrals they make, and the quantities and costs of the care they provide. OPPT clinics also would need to provide information on the number of referrals they receive from these physicians and the payer mixes associated with those referrals, as well as quantities and costs of the services provided. Policymakers must have more information to be able to determine if current regulations are having their intended effects on self-referral for profit activities or if changes to the policies are needed.

Future Research

Acknowledging the limitations of this research, the results must be interpreted carefully. The relationship between physician ownership of physical therapy services and referral patterns can only be fully ascertained when data from all parties are included. It would be meaningful for the purposes of this kind of research to have insurers track what kinds of facilities their clients are referred to for OPPT services or to link individual providers of physical therapy services to particular clinical locations. Specifically, facilities providing OPPT would need to be easily identifiable and coded according to their ownership status. Some examples of categories might be not-for-profit, hospital-based; corporate, hospital-based; not-for-profit, privately owned by physical therapist(s); corporately owned clinics; joint-ventured clinics; and physician-owned clinics. The

owners or investors in these clinics also would need to be tracked to allow researchers, payers, and policymakers to monitor physicians' referral activity.

Linking providers to particular locations would allow researchers to examine the influence of relationships between providers on OPPT referrals. Knowing the locations of specific clinics would help to determine the influence of proximity on referrals. In addition, patients could be sampled to determine what factors influenced their decisions to pursue PT at specific locations or with specific providers. Since patient characteristics have also been shown to influence referrals, patients' demographic data, health statuses, diagnoses, and insurance data would be necessary for more in-depth analysis. Demographic, specialty training, and education data should also be collected on the referring physicians and the providers of the OPPT services to provide a more complete picture of potential influences on referral patterns.

In combination, these data would allow investigators to trace physicians' referrals for OPPT from their origins and to map out the volume and types of patients being referred to various facilities. Knowing the final dispositions of these referrals would allow investigators to draw more robust conclusions about the relationships between physicians' ownership interest and the numbers and types of referrals for OPPT they make to their own clinics and to market competitors. Having these data could then inform policymakers who are trying to influence health care costs and the distribution of OPPT services. In addition, researchers also need to assess the impact of changes in referrals on the economic viability of the clinics that depend upon those referrals.

With regard to the research methodology, the combined approach of aggregate and narrowed analyses was needed in order to detect patterns in physicians' referrals for OPPT. Examining the data in aggregate allowed the researcher to clarify trends in the overall referrals made to the hospital-based OPPT clinics. Then, by utilizing the individual physicians as the units of analysis and pairing the physicians for comparison, the investigator was able to identify the variability of the physicians' referral patterns. Analysis of the paired physician samples allowed for comparison of referral patterns over time while controlling for history effects. These comparisons highlighted the fluctuations in referrals of both the POPTS and non-POPTS orthopaedists. The use of data from years 1 and 5 and then from years 1, 2, 4, and 5 showed that there was a time element in this research, but the stability of the sensitivity analyses highlighted the consistency of the data across the five year study period.

The post hoc analyses resulted in findings that differed from the primary analyses and revealed a possible influence of physician ownership and payer type on referrals. The fact that the post hoc mixed linear model (interaction of **PHYSCD**, **STATUS**, and **PAYCD**) with the larger sample sizes differed from the primary analyses highlights the importance of increasing sample sizes to maximize the power of the statistical tests and reduce errors in interpretation.

Conclusion

This research outlines a novel approach to analyzing the potential influence of physician ownership and payer type on referral behaviors. The findings suggest that physicians' ownership of physical therapy services was not a statistically significant

predictor of their referrals to hospital-based OPPT services. Specifically, there was no significant effect of physician ownership of OPPT services on the total volume of referrals made to two hospital-systems' OPPT clinics. There also was no significant relationship between physician ownership, payer type, and referrals made to the hospital-based clinics. The theory predicting that POPTS physicians would work to eliminate market competition by reducing referral volumes and retaining patients with more lucrative reimbursement for their own practices was not supported. However, post hoc analysis provided some evidence that a larger sample may have revealed the hypothesized relationships between physician ownership, payer type, and referrals for OPPT. Future research utilizing larger samples and data tracking physicians' OPPT referrals from their origins to their final dispositions are needed to clarify the relationships between physicians' ownership of OPPT services and the referrals they make for those services.

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APPENDIX A

DATA USAGE AGREEMENTS

Appendix A: Data Usage Agreements

NORTH GEORGIA
COLLEGE & STATE UNIVERSITY

Monday, January 21, 2008

With this agreement, we provide each participant company (Orlando Regional Healthcare System and Florida Hospital) with the assurance that company specific data will remain confidential and that only aggregate data will be reported in a publication prepared for a peer reviewed national journal. The only mention of the participating companies in the submitted manuscript will be in the form of an acknowledgement of participation. Each system will have first right of refusal prior to publication if the company believes that the confidentiality of the data is not maintained.

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NORTH GEORGIA
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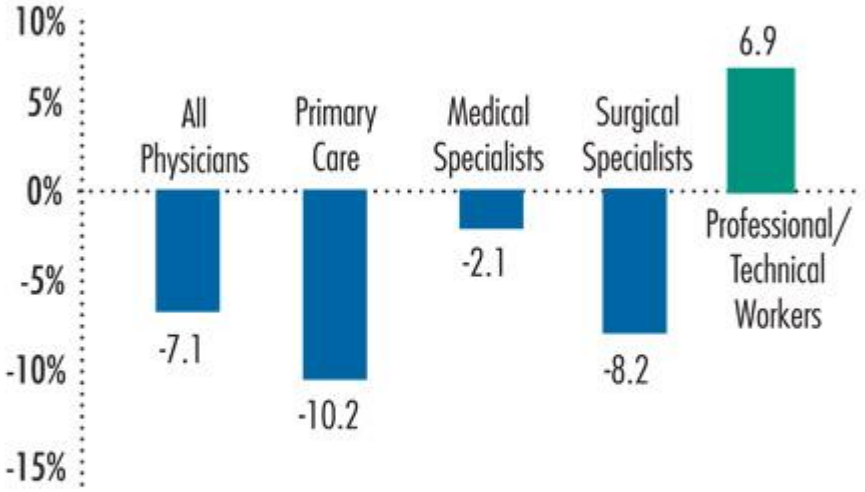
APPENDIX B

PHYSICIAN SALARIES

Appendix B
Part 1: Physician Salaries 1995-2003

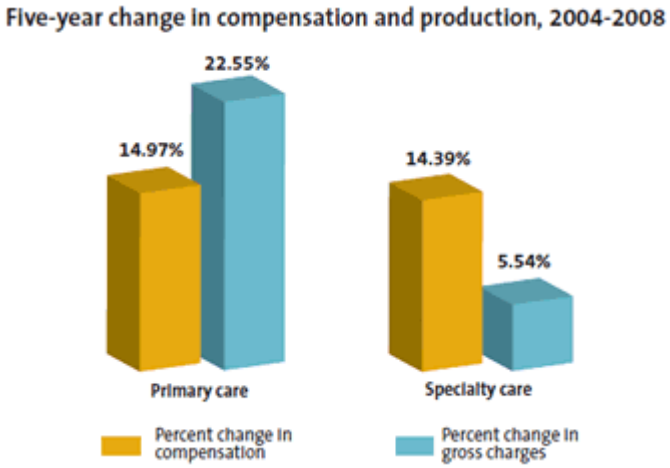
Figure 1: **Percent Change in Average Physician Income, Adjusted for Inflation, 1995-2003**



Note: Physician income data are based on reported net income from the practice of medicine (after expenses and before taxes). The Bureau of Labor Statistics (BLS) Employment Cost Index of wages and salaries for private sector "professional, technical and specialty" workers was used to calculate estimates for these workers. All inflation-adjusted estimates were calculated using the BLS online inflation calculator (*http://146.142.4.24/cgi-bin/cpicalc.pl*).

Source: Community Tracking Study Physician Survey

Appendix B
Part 2: Physician Salaries 2004-2008



Source: MGMA Physician Compensation and Production Survey: 2009 Report Based on 2008 Data. http://www.mgma.com/solutions/landing.aspx?cid=16710&id1=16686&id2=17080&id3=17030&id4l=17034&id4r=17038&id5l=17042&id5r=17028&id6=17040, February 13, 2010.

APPENDIX C

FEDERAL LEGISLATION

Appendix C

Federal Legislation: Section 1
The Social Security Act
Part of the Omnibus Budget Reconciliation Act of 1993

Sec. 1128B. [42 USC § 1320a–7a]. Civil monetary penalties

(a) Improperly filed claims

Any person (including an organization, agency, or other entity, but excluding a beneficiary, as defined in subsection (i)(5) of this section) that—

(1) knowingly presents or causes to be presented to an officer, employee, or agent of the United States, or of any department or agency thereof, or of any State agency (as defined in subsection (i)(1) of this section), a claim (as defined in subsection (i) (2) of this section) that the Secretary determines—

(A) is for a medical or other item or service that the person knows or should know was not provided as claimed, including any person who engages in a pattern or practice of presenting or causing to be presented a claim for an item or service that is based on a code that the person knows or should know will result in a greater payment to the person than the code the person knows or should know is applicable to the item or service actually provided,

(B) is for a medical or other item or service and the person knows or should know the claim is false or fraudulent,

(C) is presented for a physician's service (or an item or service incident to a physician's service) by a person who knows or should know that the individual who furnished (or supervised the furnishing of) the service—

(i) was not licensed as a physician,

(ii) was licensed as a physician, but such license had been obtained through a misrepresentation of material fact (including cheating on an examination required for licensing), or

(iii) represented to the patient at the time the service was furnished that the physician was certified in a medical specialty by a medical specialty board when the individual was not so certified,

(D) is for a medical or other item or service furnished during a period in which the person was excluded from the program under which the claim was made pursuant to a determination by the Secretary under this section or under section 1320a–7, 1320c–5, 1320c–9 (b) (as in effect on September 2, 1982), 1395y(d) (as in effect on August 18, 1987), or 1395cc(b) of this title or as a result of the application of the provisions of section 1395u (j)(2) of this title, or

(E) is for a pattern of medical or other items or services that a person knows or should know are not medically necessary;

(2) knowingly presents or causes to be presented to any person a request for payment which is in violation of the terms of

(A) an assignment under section 1395u (b)(3)(B)(ii) of this title, or

(B) an agreement with a State agency (or other requirement of a State plan under subchapter XIX of this chapter) not to charge a person for an item or service in excess of the amount permitted to be charged, or

(C) an agreement to be a participating physician or supplier under section 1395u (h)(1) of this title, or

(D) an agreement pursuant to section 1395cc (a)(1)(G) of this title;

(3) knowingly gives or causes to be given to any person, with respect to coverage under subchapter XVIII of this chapter of inpatient hospital services subject to the provisions of section 1395ww of this title, information that he knows or should know is false or misleading, and that could reasonably be expected to influence the decision when to discharge such person or another individual from the hospital;

(4) in the case of a person who is not an organization, agency, or other entity, is excluded from participating in a program under subchapter XVIII of this chapter or a State health care program in accordance with this subsection or under section 1320a–7 of this title and who, at the time of a violation of this subsection—

(A) retains a direct or indirect ownership or control interest in an entity that is participating in a program under subchapter XVIII of this chapter or a State health care program, and who knows or should know of the action constituting the basis for the exclusion; or

(B) is an officer or managing employee (as defined in section 1320a–5 (b) of this title) of such an entity;

(5) offers to or transfers remuneration to any individual eligible for benefits under subchapter XVIII of this chapter, or under a State health care program (as defined in section 1320a–7 (h) of this title) that such person knows or should know is likely to influence such individual to order or receive from a particular provider, practitioner, or supplier any item or service for which payment may be made, in whole or in part, under subchapter XVIII of this chapter, or a State health care program (as so defined);

(6) arranges or contracts (by employment or otherwise) with an individual or entity that the person knows or should know is excluded from participation in a Federal health care program (as defined in section 1320a–7b (f) of this title), for the provision of items or services for which payment may be made under such a program; or

(7) commits an act described in paragraph (1) or (2) of section 1320a–7b (b) of this title; shall be subject, in addition to any other penalties that may be prescribed by law, to a civil money penalty of not more than $10,000 for each item or service (or, in cases under paragraph (3), $15,000 for each individual with respect to whom false or misleading information was given; in cases under paragraph (4), $10,000 for each day the prohibited relationship occurs; or in cases under paragraph (7), $50,000 for each such act). In addition, such a person shall be

subject to an assessment of not more than 3 times the amount claimed for each such item or service in lieu of damages sustained by the United States or a State agency because of such claim (or, in cases under paragraph (7), damages of not more than 3 times the total amount of remuneration offered, paid, solicited, or received, without regard to whether a portion of such remuneration was offered, paid, solicited, or received for a lawful purpose). In addition the Secretary may make a determination in the same proceeding to exclude the person from participation in the Federal health care programs (as defined in section 1320a–7b (f)(1) of this title) and to direct the appropriate State agency to exclude the person from participation in any State health care program.

(b) Payments to induce reduction or limitation of services

(1) If a hospital or a critical access hospital knowingly makes a payment, directly or indirectly, to a physician as an inducement to reduce or limit services provided with respect to individuals who—

(A) are entitled to benefits under part A or part B of subchapter XVIII of this chapter or to medical assistance under a State plan approved under subchapter XIX of this chapter, and

(B) are under the direct care of the physician,

the hospital or a critical access hospital shall be subject, in addition to any other penalties that may be prescribed by law, to a civil money penalty of not more than $2,000 for each such individual with respect to whom the payment is made.

(2) Any physician who knowingly accepts receipt of a payment described in paragraph (1) shall be subject, in addition to any other penalties that may be prescribed by law, to a civil money penalty of not more than $2,000 for each individual described in such paragraph with respect to whom the payment is made.

(3)

(A) Any physician who executes a document described in subparagraph (B) with respect to an individual knowing that all of the requirements referred to in such subparagraph are not met with respect to the individual shall be subject to a civil monetary penalty of not more than the greater of—

(i) $5,000, or

(ii) three times the amount of the payments under subchapter XVIII of this chapter for home health services which are made pursuant to such certification.

(B) A document described in this subparagraph is any document that certifies, for purposes of subchapter XVIII of this chapter, that an individual meets the requirements of section 1395f (a)(2)(C) or 1395n (a)(2)(A) of this title in the case of home health services furnished to the individual.

(c) Initiation of proceeding; authorization by Attorney General, notice, etc., estoppel, failure to comply with order or procedure

(1) The Secretary may initiate a proceeding to determine whether to impose a civil money penalty, assessment, or exclusion under subsection (a) or (b) of this section only as authorized by the Attorney General pursuant to procedures agreed upon by them. The Secretary may not initiate an action under this section with respect to any claim, request for payment, or other occurrence described in this section later than six years after the date the claim was presented, the request for payment was made, or the occurrence took place. The Secretary may initiate an action under this section by serving notice of the action in any manner authorized by Rule 4 of the Federal Rules of Civil Procedure.

(2) The Secretary shall not make a determination adverse to any person under subsection (a) or (b) of this section until the person has been given written notice and an opportunity for the determination to be made on the record after a hearing at which the person is entitled to be represented by counsel, to present witnesses, and to cross-examine witnesses against the person.

(3) In a proceeding under subsection (a) or (b) of this section which—

(A) is against a person who has been convicted (whether upon a verdict after trial or upon a plea of guilty or nolo contendere) of a Federal crime charging fraud or false statements, and

(B) involves the same transaction as in the criminal action,

the person is estopped from denying the essential elements of the criminal offense.

(4) The official conducting a hearing under this section may sanction a person, including any party or attorney, for failing to comply with an order or procedure, failing to defend an action, or other misconduct as would interfere with the speedy, orderly, or fair conduct of the hearing. Such sanction shall reasonably relate to the severity and nature of the failure or misconduct. Such sanction may include—

(A) in the case of refusal to provide or permit discovery, drawing negative factual inferences or treating such refusal as an admission by deeming the matter, or certain facts, to be established,

(B) prohibiting a party from introducing certain evidence or otherwise supporting a particular claim or defense,

(C) striking pleadings, in whole or in part,

(D) staying the proceedings,

(E) dismissal of the action,

(F) entering a default judgment,

(G) ordering the party or attorney to pay attorneys' fees and other costs caused by the failure or misconduct, and

(H) refusing to consider any motion or other action which is not filed in a timely manner.

(d) Amount or scope of penalty, assessment, or exclusion

In determining the amount or scope of any penalty, assessment, or exclusion imposed pursuant to subsection (a) or (b) of this section, the Secretary shall take into account—

(1) the nature of claims and the circumstances under which they were presented,
(2) the degree of culpability, history of prior offenses, and financial condition of the person presenting the claims, and
(3) such other matters as justice may require.

(e) Review by courts of appeals

Any person adversely affected by a determination of the Secretary under this section may obtain a review of such determination in the United States Court of Appeals for the circuit in which the person resides, or in which the claim was presented, by filing in such court (within sixty days following the date the person is notified of the Secretary's determination) a written petition requesting that the determination be modified or set aside. A copy of the petition shall be forthwith transmitted by the clerk of the court to the Secretary, and thereupon the Secretary shall file in the Court [1] the record in the proceeding as provided in section 2112 of title 28. Upon such filing, the court shall have jurisdiction of the proceeding and of the question determined therein, and shall have the power to make and enter upon the pleadings, testimony, and proceedings set forth in such record a decree affirming, modifying, remanding for further consideration, or setting aside, in whole or in part, the determination of the Secretary and enforcing the same to the extent that such order is affirmed or modified. No objection that has not been urged before the Secretary shall be considered by the court, unless the failure or neglect to urge such objection shall be excused because of extraordinary circumstances. The findings of the Secretary with respect to questions of fact, if supported by substantial evidence on the record considered as a whole, shall be conclusive. If any party shall apply to the court for leave to adduce additional evidence and shall show to the satisfaction of the court that such additional evidence is material and that there were reasonable grounds for the failure to adduce such evidence in the hearing before the Secretary, the court may order such additional evidence to be taken before the Secretary and to be made a part of the record. The Secretary may modify his findings as to the facts, or make new findings, by reason of additional evidence so taken and filed, and he shall file with the court such modified or new findings, which findings with respect to questions of fact, if supported by substantial evidence on the record considered as a whole, shall be conclusive, and his recommendations, if any, for the modification or setting aside of his original order. Upon the filing of the record with it, the jurisdiction of the court shall be exclusive and its judgment and decree shall be final, except that the same shall be subject to review by the Supreme Court of the United States, as provided in section 1254 of title 28.

(f) Compromise of penalties and assessments; recovery; use of funds recovered

Civil money penalties and assessments imposed under this section may be compromised by the Secretary and may be recovered in a civil action in the name of the United States brought in United States district court for the district where the claim was presented, or where the claimant resides, as determined by the Secretary. Amounts recovered under this section shall be paid to the Secretary and disposed of as follows:

(1)

(A) In the case of amounts recovered arising out of a claim under subchapter XIX of this chapter, there shall be paid to the State agency an amount bearing the same proportion to the total amount recovered as the State's share of the amount paid by the State agency for such claim bears to the total amount paid for such claim.

(B) In the case of amounts recovered arising out of a claim under an allotment to a State under subchapter V of this chapter, there shall be paid to the State agency an amount equal to three-sevenths of the amount recovered.

(2) Such portion of the amounts recovered as is determined to have been paid out of the trust funds under sections 1395i and 1395t of this title shall be repaid to such trust funds.

(3) With respect to amounts recovered arising out of a claim under a Federal health care program (as defined in section 1320a–7b (f) of this title), the portion of such amounts as is determined to have been paid by the program shall be repaid to the program, and the portion of such amounts attributable to the amounts recovered under this section by reason of the amendments made by the Health Insurance Portability and Accountability Act of 1996 (as estimated by the Secretary) shall be deposited into the Federal Hospital Insurance Trust Fund pursuant to section 1395i (k)(2)(C) of this title.

(4) The remainder of the amounts recovered shall be deposited as miscellaneous receipts of the Treasury of the United States.

The amount of such penalty or assessment, when finally determined, or the amount agreed upon in compromise, may be deducted from any sum then or later owing by the United States or a State agency to the person against whom the penalty or assessment has been assessed.

(g) Finality of determination respecting penalty, assessment, or exclusion

A determination by the Secretary to impose a penalty, assessment, or exclusion under subsection (a) or (b) of this section shall be final upon the expiration of the sixty-day period referred to in subsection (e) of this section. Matters that were raised or that could have been raised in a hearing before the Secretary or in an appeal pursuant to subsection (e) of this section may not be raised as a defense to a civil action by the United States to collect a penalty, assessment, or exclusion assessed under this section.

(h) Notification of appropriate entities of finality of determination

Whenever the Secretary's determination to impose a penalty, assessment, or exclusion under subsection (a) or (b) of this section becomes final, he shall notify the appropriate State or local medical or professional organization, the appropriate State agency or agencies administering or supervising the administration of State health care programs (as defined in section 1320a–7 (h) of this title), and the appropriate utilization and quality control peer review organization, and the appropriate State or local licensing agency or organization (including the agency specified in section 1395aa (a) and 1396a (a)(33) of this title) that such a penalty, assessment, or exclusion has become final and the reasons therefore.

(i) Definitions

For the purposes of this section:

(1) The term "State agency" means the agency established or designated to administer or supervise the administration of the State plan under subchapter XIX of this chapter or designated to administer the State's program under subchapter V of this chapter or subchapter XX of this chapter.

(2) The term "claim" means an application for payments for items and services under a Federal health care program (as defined in section 1320a–7b (f) of this title).

(3) The term "item or service" includes

(A) any particular item, device, medical supply, or service claimed to have been provided to a patient and listed in an itemized claim for payment, and

(B) in the case of a claim based on costs, any entry in the cost report, books of account or other documents supporting such claim.

(4) The term "agency of the United States" includes any contractor acting as a fiscal intermediary, carrier, or fiscal agent or any other claims processing agent for a Federal health care program (as so defined).

(5) The term "beneficiary" means an individual who is eligible to receive items or services for which payment may be made under a Federal health care program (as so defined) but does not include a provider, supplier, or practitioner.

(6) The term "remuneration" includes the waiver of coinsurance and deductible amounts (or any part thereof), and transfers of items or services for free or for other than fair market value. The term "remuneration" does not include—

(A) the waiver of coinsurance and deductible amounts by a person, if—

(i) the waiver is not offered as part of any advertisement or solicitation;

(ii) the person does not routinely waive coinsurance or deductible amounts; and

(iii) the person—

(I) waives the coinsurance and deductible amounts after determining in good faith that the individual is in financial need; or

(II) fails to collect coinsurance or deductible amounts after making reasonable collection efforts;

(B) subject to subsection (n) of this section, any permissible practice described in any subparagraph of section 1320a–7b (b)(3) of this title or in regulations issued by the Secretary;

(C) differentials in coinsurance and deductible amounts as part of a benefit plan design as long as the differentials have been disclosed in writing to all beneficiaries, third party payers, and providers, to whom claims are presented and as long as the differentials meet the standards as defined in regulations promulgated by the Secretary not later than 180 days after August 21, 1996; or

(D) [2] incentives given to individuals to promote the delivery of preventive care as determined by the Secretary in regulations so promulgated.

(D) [2] a reduction in the copayment amount for covered OPD services under section 1395l (t)(5)(B) [3] of this title.

(7) The term "should know" means that a person, with respect to information—

(A) acts in deliberate ignorance of the truth or falsity of the information; or

(B) acts in reckless disregard of the truth or falsity of the information, and no proof of specific intent to defraud is required.

(j) Subpoenas

(1) The provisions of subsections (d) and (e) of section 405 of this title shall apply with respect to this section to the same extent as they are applicable with respect to subchapter II of this chapter. The Secretary may delegate the authority granted by section 405 (d) of this title (as made applicable to this section) to the Inspector General of the Department of Health and Human Services for purposes of any investigation under this section.

(2) The Secretary may delegate authority granted under this section and under section 1320a–7 of this title to the Inspector General of the Department of Health and Human Services.

(k) Injunctions

Whenever the Secretary has reason to believe that any person has engaged, is engaging, or is about to engage in any activity which makes the person subject to a civil monetary penalty under this section, the Secretary may bring an action in an appropriate district court of the United States (or, if applicable, a United States court of any territory) to enjoin such activity, or to enjoin the person from concealing, removing, encumbering, or disposing of assets which may be required in order to pay a civil monetary penalty if any such penalty were to be imposed or to seek other appropriate relief.

(l) Liability of principal for acts of agent

A principal is liable for penalties, assessments, and an exclusion under this section for the actions of the principal's agent acting within the scope of the agency.

(m) Claims within jurisdiction of other departments or agencies

(1) For purposes of this section, with respect to a Federal health care program not contained in this chapter, references to the Secretary in this section shall be deemed to be references to the Secretary or Administrator of the department or agency with jurisdiction over such program and references to the Inspector General of the Department of Health and Human Services in this section shall be deemed to be references to the Inspector General of the applicable department or agency.

(2)

(A) The Secretary and Administrator of the departments and agencies referred to in paragraph (1) may include in any action pursuant to this section, claims within the jurisdiction of other Federal departments or agencies as long as the following conditions are satisfied:

(i) The case involves primarily claims submitted to the Federal health care programs of the department or agency initiating the action.

(ii) The Secretary or Administrator of the department or agency initiating the action gives notice and an opportunity to participate in the investigation to the Inspector General of the department or agency with primary jurisdiction over the Federal health care programs to which the claims were submitted.

(B) If the conditions specified in subparagraph (A) are fulfilled, the Inspector General of the department or agency initiating the action is authorized to exercise all powers granted under the Inspector General Act of 1978 (5 U.S.C. App.) with respect to the claims submitted to the other departments or agencies to the same manner and extent as provided in that Act with respect to claims submitted to such departments or agencies.

(n) Safe harbor for payment of Medigap premiums

(1) Subparagraph (B) of subsection (i)(6) of this section shall not apply to a practice described in paragraph (2) unless—

(A) the Secretary, through the Inspector General of the Department of Health and Human Services, promulgates a rule authorizing such a practice as an exception to remuneration; and

(B) the remuneration is offered or transferred by a person under such rule during the 2-year period beginning on the date the rule is first promulgated.

(2) A practice described in this paragraph is a practice under which a health care provider or facility pays, in whole or in part, premiums for Medicare supplemental policies for individuals entitled to benefits under part A of subchapter XVIII of this chapter pursuant to section 426–1 of this title.

Appendix C

Federal Legislation: Section 2
The Social Security Act
Part of the Omnibus Budget Reconciliation Act of 1993

Anti-Kickback: The Intent-Based Criminal Statute

Sec. 1128B. [42 USC § 1320a–7b]. Criminal penalties for acts involving Federal health care programs

(a) Making or causing to be made false statements or representations

Whoever—

(1) knowingly and willfully makes or causes to be made any false statement or representation of a material fact in any application for any benefit or payment under a Federal health care program (as defined in subsection (f) of this section),
(2) at any time knowingly and willfully makes or causes to be made any false statement or representation of a material fact for use in determining rights to such benefit or payment,
(3) having knowledge of the occurrence of any event affecting

(A) his initial or continued right to any such benefit or payment, or
(B) the initial or continued right to any such benefit or payment of any other individual in whose behalf he has applied for or is receiving such benefit or payment, conceals or fails to disclose such event with an intent fraudulently to secure such benefit or payment either in a greater amount or quantity than is due or when no such benefit or payment is authorized,

(4) having made application to receive any such benefit or payment for the use and benefit of another and having received it, knowingly and willfully converts such benefit or payment or any part thereof to a use other than for the use and benefit of such other person,
(5) presents or causes to be presented a claim for a physician's service for which payment may be made under a Federal health care program and knows that the individual who furnished the service was not licensed as a physician, or
(6) for a fee knowingly and willfully counsels or assists an individual to dispose of assets (including by any transfer in trust) in order for the individual to become eligible for medical assistance under a State plan under subchapter XIX of this chapter, if disposing of the assets results in the imposition of a period of ineligibility for such assistance under section 1396p (c) of this title,
shall

(i) in the case of such a statement, representation, concealment, failure, or conversion by any person in connection with the furnishing (by that person) of items or services for which payment is or may be made under

the program, be guilty of a felony and upon conviction thereof fined not more than $25,000 or imprisoned for not more than five years or both, or (ii) in the case of such a statement, representation, concealment, failure, conversion, or provision of counsel or assistance by any other person, be guilty of a misdemeanor and upon conviction thereof fined not more than $10,000 or imprisoned for not more than one year, or both. In addition, in any case where an individual who is otherwise eligible for assistance under a Federal health care program is convicted of an offense under the preceding provisions of this subsection, the administrator of such program may at its option (notwithstanding any other provision of such program) limit, restrict, or suspend the eligibility of that individual for such period (not exceeding one year) as it deems appropriate; but the imposition of a limitation, restriction, or suspension with respect to the eligibility of any individual under this sentence shall not affect the eligibility of any other person for assistance under the plan, regardless of the relationship between that individual and such other person.

(b) Illegal remunerations

(1) Whoever knowingly and willfully solicits or receives any remuneration (including any kickback, bribe, or rebate) directly or indirectly, overtly or covertly, in cash or in kind—

(A) in return for referring an individual to a person for the furnishing or arranging for the furnishing of any item or service for which payment may be made in whole or in part under a Federal health care program, or

(B) in return for purchasing, leasing, ordering, or arranging for or recommending purchasing, leasing, or ordering any good, facility, service, or item for which payment may be made in whole or in part under a Federal health care program,

shall be guilty of a felony and upon conviction thereof, shall be fined not more than $25,000 or imprisoned for not more than five years, or both.

(2) Whoever knowingly and willfully offers or pays any remuneration (including any kickback, bribe, or rebate) directly or indirectly, overtly or covertly, in cash or in kind to any person to induce such person—

(A) to refer an individual to a person for the furnishing or arranging for the furnishing of any item or service for which payment may be made in whole or in part under a Federal health care program, or

(B) to purchase, lease, order, or arrange for or recommend purchasing, leasing, or ordering any good, facility, service, or item for which payment may be made in whole or in part under a Federal health care program,

shall be guilty of a felony and upon conviction thereof, shall be fined not more than $25,000 or imprisoned for not more than five years, or both.

(3) Paragraphs (1) and (2) shall not apply to—

(A) a discount or other reduction in price obtained by a provider of services or other entity under a Federal health care program if the reduction in price is properly disclosed and appropriately reflected in the

costs claimed or charges made by the provider or entity under a Federal health care program;

(B) any amount paid by an employer to an employee (who has a bona fide employment relationship with such employer) for employment in the provision of covered items or services;

(C) any amount paid by a vendor of goods or services to a person authorized to act as a purchasing agent for a group of individuals or entities who are furnishing services reimbursed under a Federal health care program if—

(i) the person has a written contract, with each such individual or entity, which specifies the amount to be paid the person, which amount may be a fixed amount or a fixed %age of the value of the purchases made by each such individual or entity under the contract, and

(ii) in the case of an entity that is a provider of services (as defined in section 1395x (u) of this title), the person discloses (in such form and manner as the Secretary requires) to the entity and, upon request, to the Secretary the amount received from each such vendor with respect to purchases made by or on behalf of the entity;

(D) a waiver of any coinsurance under part B of subchapter XVIII of this chapter by a Federally qualified health care center with respect to an individual who qualifies for subsidized services under a provision of the Public Health Service Act [42 U.S.C. 201 et seq.];

(E) any payment practice specified by the Secretary in regulations promulgated pursuant to section 14(a) of the Medicare and Medicaid Patient and Program Protection Act of 1987 or in regulations under section 1395w–104 (e)(6) [1] of this title;

(F) any remuneration between an organization and an individual or entity providing items or services, or a combination thereof, pursuant to a written agreement between the organization and the individual or entity if the organization is an eligible organization under section 1395mm of this title or if the written agreement, through a risk-sharing arrangement, places the individual or entity at substantial financial risk for the cost or utilization of the items or services, or a combination thereof, which the individual or entity is obligated to provide;

(G) the waiver or reduction by pharmacies (including pharmacies of the Indian Health Service, Indian tribes, tribal organizations, and urban Indian organizations) of any cost-sharing imposed under part D of subchapter XVIII of this chapter, if the conditions described in clauses (i) through (iii) of section 1320a–7a (i)(6)(A) of this title are met with respect to the waiver or reduction (except that, in the case of such a waiver or reduction on behalf of a subsidy eligible individual (as defined in section 1395w–

114 (a)(3) of this title), section 1320a–7a (i)(6)(A) of this title shall be applied without regard to clauses (ii) and (iii) of that section); and
(H) any remuneration between a health center entity described under clause (i) or (ii) of section 1396d (l)(2)(B) of this title and any individual or entity providing goods, items, services, donations, loans, or a combination thereof, to such health center entity pursuant to a contract, lease, grant, loan, or other agreement, if such agreement contributes to the ability of the health center entity to maintain or increase the availability, or enhance the quality, of services provided to a medically underserved population served by the health center entity.

(c) False statements or representations with respect to condition or operation of institutions

Whoever knowingly and willfully makes or causes to be made, or induces or seeks to induce the making of, any false statement or representation of a material fact with respect to the conditions or operation of any institution, facility, or entity in order that such institution, facility, or entity may qualify (either upon initial certification or upon recertification) as a hospital, critical access hospital, skilled nursing facility, nursing facility, intermediate care facility for the mentally retarded, home health agency, or other entity (including an eligible organization under section 1395mm (b) of this title) for which certification is required under subchapter XVIII of this chapter or a State health care program (as defined in section 1320a–7 (h) of this title), or with respect to information required to be provided under section 1320a–3a of this title, shall be guilty of a felony and upon conviction thereof shall be fined not more than $25,000 or imprisoned for not more than five years, or both.

(d) Illegal patient admittance and retention practices

Whoever knowingly and willfully—
(1) charges, for any service provided to a patient under a State plan approved under subchapter XIX of this chapter, money or other consideration at a rate in excess of the rates established by the State (or, in the case of services provided to an individual enrolled with a medicaid managed care organization under subchapter XIX of this chapter under a contract under section 1396b (m) of this title or under a contractual, referral, or other arrangement under such contract, at a rate in excess of the rate permitted under such contract), or
(2) charges, solicits, accepts, or receives, in addition to any amount otherwise required to be paid under a State plan approved under subchapter XIX of this chapter, any gift, money, donation, or other consideration (other than a charitable, religious, or philanthropic contribution from an organization or from a person unrelated to the patient)—
(A) as a precondition of admitting a patient to a hospital, nursing facility, or intermediate care facility for the mentally retarded, or

(B) as a requirement for the patient's continued stay in such a facility, when the cost of the services provided therein to the patient is paid for (in whole or in part) under the State plan,
shall be guilty of a felony and upon conviction thereof shall be fined not more than $25,000 or imprisoned for not more than five years, or both.

(e) Violation of assignment terms

Whoever accepts assignments described in section 1395u (b)(3)(B)(ii) of this title or agrees to be a participating physician or supplier under section 1395u (h)(1) of this title and knowingly, willfully, and repeatedly violates the term of such assignments or agreement, shall be guilty of a misdemeanor and upon conviction thereof shall be fined not more than $2,000 or imprisoned for not more than six months, or both.

(f) "Federal health care program" defined

For purposes of this section, the term "Federal health care program" means—

(1) any plan or program that provides health benefits, whether directly, through insurance, or otherwise, which is funded directly, in whole or in part, by the United States Government (other than the health insurance program under chapter 89 of title 5); or

(2) any State health care program, as defined in section 1320a–7 (h) of this title.

Appendix C

Federal Legislation: Section 3
The Ethics in Patient Referral Act (Stark II Legislation): Civil Statute
Part of the Omnibus Budget Reconciliation Act of 1993

Sec. 1877. [42 USC § 1395nn]. Limitation on certain physician referrals

(a) Prohibition of certain referrals

(1) In general
Except as provided in subsection (b) of this section, if a physician (or an immediate family member of such physician) has a financial relationship with an entity specified in paragraph (2), then—

(A) the physician may not make a referral to the entity for the furnishing of designated health services for which payment otherwise may be made under this subchapter, and

(B) the entity may not present or cause to be presented a claim under this subchapter or bill to any individual, third party payer, or other entity for designated health services furnished pursuant to a referral prohibited under subparagraph (A).

(2) Financial relationship specified
For purposes of this section, a financial relationship of a physician (or an immediate family member of such physician) with an entity specified in this paragraph is—

(A) except as provided in subsections (c) and (d) of this section, an ownership or investment interest in the entity, or

(B) except as provided in subsection (e) of this section, a compensation arrangement (as defined in subsection (h)(1) of this section) between the physician (or an immediate family member of such physician) and the entity.

An ownership or investment interest described in subparagraph (A) may be through equity, debt, or other means and includes an interest in an entity that holds an ownership or investment interest in any entity providing the designated health service.

(b) General exceptions to both ownership and compensation arrangement prohibitions

Subsection (a)(1) of this section shall not apply in the following cases:

(1) Physicians' services
In the case of physicians' services (as defined in section 1395x (q) of this title) provided personally by (or under the personal supervision of) another physician in the same group practice (as defined in subsection (h)(4) of this section) as the referring physician.

(2) In-office ancillary services

In the case of services (other than durable medical equipment (excluding infusion pumps) and parenteral and enteral nutrients, equipment, and supplies)—

(A) that are furnished—

(i) personally by the referring physician, personally by a physician who is a member of the same group practice as the referring physician, or personally by individuals who are directly supervised by the physician or by another physician in the group practice, and

(ii)

(I) in a building in which the referring physician (or another physician who is a member of the same group practice) furnishes physicians' services unrelated to the furnishing of designated health services, or

(II) in the case of a referring physician who is a member of a group practice, in another building which is used by the group practice—

(aa) for the provision of some or all of the group's clinical laboratory services, or

(bb) for the centralized provision of the group's designated health services (other than clinical laboratory services), unless the Secretary determines other terms and conditions under which the provision of such services does not present a risk of program or patient abuse, and

(B) that are billed by the physician performing or supervising the services, by a group practice of which such physician is a member under a billing number assigned to the group practice, or by an entity that is wholly owned by such physician or such group practice,

if the ownership or investment interest in such services meets such other requirements as the Secretary may impose by regulation as needed to protect against program or patient abuse.

(3) Prepaid plans

In the case of services furnished by an organization—

(A) with a contract under section 1395mm of this title to an individual enrolled with the organization,

(B) described in section 1395l (a)(1)(A) of this title to an individual enrolled with the organization,

(C) receiving payments on a prepaid basis, under a demonstration project under section 1395b–1 (a) of this title or under section 222(a) of the Social Security Amendments of 1972, to an individual enrolled with the organization,

(D) that is a qualified health maintenance organization (within the meaning of section 300e–9 (d) [1] of this title) to an individual enrolled with the organization, or

(E) that is a Medicare+Choice organization under part C of this subchapter that is offering a coordinated care plan described in section 1395w–21 (a)(2)(A) of this title to an individual enrolled with the organization.

(4) Other permissible exceptions

In the case of any other financial relationship which the Secretary determines, and specifies in regulations, does not pose a risk of program or patient abuse.

(5) Electronic prescribing

(c) exception established by regulation under section 1395w–104 (e)(6) of this title.[1](c) General exception related only to ownership or investment prohibition for ownership in publicly traded securities and mutual funds Ownership of the following shall not be considered to be an ownership or investment interest described in subsection (a)(2)(A) of this section:

(1) Ownership of investment securities (including shares or bonds, debentures, notes, or other debt instruments) which may be purchased on terms generally available to the public and which are—

(A)

(i) securities listed on the New York Stock Exchange, the American Stock Exchange, or any regional exchange in which quotations are published on a daily basis, or foreign securities listed on a recognized foreign, national, or regional exchange in which quotations are published on a daily basis, or

(ii) traded under an automated interdealer quotation system operated by the National Association of Securities Dealers, and

(B) in a corporation that had, at the end of the corporation's most recent fiscal year, or on average during the previous 3 fiscal years, stockholder equity exceeding $75,000,000.

(2) Ownership of shares in a regulated investment company as defined in section 851(a) of the Internal Revenue Code of 1986, if such company had, at the end of the company's most recent fiscal year, or on average during the previous 3 fiscal years, total assets exceeding $75,000,000.

(d) Additional exceptions related only to ownership or investment prohibition

The following, if not otherwise excepted under subsection (b) of this section, shall not be considered to be an ownership or investment interest described in subsection (a)(2)(A) of this section:

(1) Hospitals in Puerto Rico

In the case of designated health services provided by a hospital located in Puerto Rico.

(2) Rural providers

In the case of designated health services furnished in a rural area (as defined in section 1395ww (d)(2)(D) of this title) by an entity, if—

(A) substantially all of the designated health services furnished by the entity are furnished to individuals residing in such a rural area; and

(B) effective for the 18-month period beginning on December 8, 2003, the entity is not a specialty hospital (as defined in subsection (h)(7) of this section).

(3) Hospital ownership

In the case of designated health services provided by a hospital (other than a hospital described in paragraph (1)) if—

(A) the referring physician is authorized to perform services at the hospital;

(B) effective for the 18-month period beginning on December 8, 2003, the hospital is not a specialty hospital (as defined in subsection (h)(7) of this section); and

(C) the ownership or investment interest is in the hospital itself (and not merely in a subdivision of the hospital).

(e) Exceptions relating to other compensation arrangements

The following shall not be considered to be a compensation arrangement described in subsection (a)(2)(B) of this section:

(1) Rental of office space; rental of equipment

(A) Office space

Payments made by a lessee to a lessor for the use of premises if—

(i) the lease is set out in writing, signed by the parties, and specifies the premises covered by the lease,

(ii) the space rented or leased does not exceed that which is reasonable and necessary for the legitimate business purposes of the lease or rental and is used exclusively by the lessee when being used by the lessee, except that the lessee may make payments for the use of space consisting of common areas if such payments do not exceed the lessee's pro rata share of expenses for such space based upon the ratio of the space used exclusively by the lessee to the total amount of space (other than common areas) occupied by all persons using such common areas,

(iii) the lease provides for a term of rental or lease for at least 1 year,

(iv) the rental charges over the term of the lease are set in advance, are consistent with fair market value, and are not determined in a

manner that takes into account the volume or value of any referrals or other business generated between the parties,

(v) the lease would be commercially reasonable even if no referrals were made between the parties, and

(vi) the lease meets such other requirements as the Secretary may impose by regulation as needed to protect against program or patient abuse.

(B) Equipment

Payments made by a lessee of equipment to the lessor of the equipment for the use of the equipment if—

(i) the lease is set out in writing, signed by the parties, and specifies the equipment covered by the lease,

(ii) the equipment rented or leased does not exceed that which is reasonable and necessary for the legitimate business purposes of the lease or rental and is used exclusively by the lessee when being used by the lessee,

(iii) the lease provides for a term of rental or lease of at least 1 year,

(iv) the rental charges over the term of the lease are set in advance, are consistent with fair market value, and are not determined in a manner that takes into account the volume or value of any referrals or other business generated between the parties,

(v) the lease would be commercially reasonable even if no referrals were made between the parties, and

(vi) the lease meets such other requirements as the Secretary may impose by regulation as needed to protect against program or patient abuse.

(2) Bona fide employment relationships

Any amount paid by an employer to a physician (or an immediate family member of such physician) who has a bona fide employment relationship with the employer for the provision of services if—

(A) the employment is for identifiable services,

(B) the amount of the remuneration under the employment—

(i) is consistent with the fair market value of the services, and

(ii) is not determined in a manner that takes into account (directly or indirectly) the volume or value of any referrals by the referring physician,

(C) the remuneration is provided pursuant to an agreement which would be commercially reasonable even if no referrals were made to the employer, and

(D) the employment meets such other requirements as the Secretary may impose by regulation as needed to protect against program or patient abuse.

Subparagraph (B)(ii) shall not prohibit the payment of remuneration in the form of a productivity bonus based on services performed personally by the physician (or an immediate family member of such physician).

(3) Personal service arrangements

(A) In general

Remuneration from an entity under an arrangement (including remuneration for specific physicians' services furnished to a non-profit blood center) if—

(i) the arrangement is set out in writing, signed by the parties, and specifies the services covered by the arrangement,

(ii) the arrangement covers all of the services to be provided by the physician (or an immediate family member of such physician) to the entity,

(iii) the aggregate services contracted for do not exceed those that are reasonable and necessary for the legitimate business purposes of the arrangement,

(iv) the term of the arrangement is for at least 1 year,

(v) the compensation to be paid over the term of the arrangement is set in advance, does not exceed fair market value, and except in the case of a physician incentive plan described in subparagraph (B), is not determined in a manner that takes into account the volume or value of any referrals or other business generated between the parties,

(vi) the services to be performed under the arrangement do not involve the counseling or promotion or a business arrangement or other activity that violates any State or Federal law, and

(vii) the arrangement meets such other requirements as the Secretary may impose by regulation as needed to protect against program or patient abuse.

(B) Physician incentive plan exception

(i) In general In the case of a physician incentive plan (as defined in clause (ii)) between a physician and an entity, the compensation may be determined in a manner (through a withhold, capitation, bonus, or otherwise) that takes into account directly or indirectly the volume or value of any referrals or other business generated between the parties, if the plan meets the following requirements:

(I) No specific payment is made directly or indirectly under the plan to a physician or a physician group as an inducement to reduce or limit medically necessary services provided with respect to a specific individual enrolled with the entity.

(II) In the case of a plan that places a physician or a physician group at substantial financial risk as determined by the Secretary pursuant to section 1395mm (i)(8)(A)(ii)

of this title, the plan complies with any requirements the Secretary may impose pursuant to such section.

(III) Upon request by the Secretary, the entity provides the Secretary with access to descriptive information regarding the plan, in order to permit the Secretary to determine whether the plan is in compliance with the requirements of this clause.

(ii) "Physician incentive plan" defined For purposes of this subparagraph, the term "physician incentive plan" means any compensation arrangement between an entity and a physician or physician group that may directly or indirectly have the effect of reducing or limiting services provided with respect to individuals enrolled with the entity.

(4) Remuneration unrelated to the provision of designated health services

In the case of remuneration which is provided by a hospital to a physician if such remuneration does not relate to the provision of designated health services.

(5) Physician recruitment

In the case of remuneration which is provided by a hospital to a physician to induce the physician to relocate to the geographic area served by the hospital in order to be a member of the medical staff of the hospital, if—

(A) the physician is not required to refer patients to the hospital,

(B) the amount of the remuneration under the arrangement is not determined in a manner that takes into account (directly or indirectly) the volume or value of any referrals by the referring physician, and

(C) the arrangement meets such other requirements as the Secretary may impose by regulation as needed to protect against program or patient abuse.

(6) Isolated transactions

In the case of an isolated financial transaction, such as a one-time sale of property or practice, if—

(A) the requirements described in subparagraphs (B) and (C) of paragraph (2) are met with respect to the entity in the same manner as they apply to an employer, and

(B) the transaction meets such other requirements as the Secretary may impose by regulation as needed to protect against program or patient abuse.

(7) Certain group practice arrangements with a hospital

(A) In general

An arrangement between a hospital and a group under which designated health services are provided by the group but are billed by the hospital if—

(i) with respect to services provided to an inpatient of the hospital, the arrangement is pursuant to the provision of inpatient hospital services under section 1395x (b)(3) of this title.

(ii) the arrangement began before December 19, 1989, and has continued in effect without interruption since such date,
(iii) with respect to the designated health services covered under the arrangement, substantially all of such services furnished to patients of the hospital are furnished by the group under the arrangement,
(iv) the arrangement is pursuant to an agreement that is set out in writing and that specifies the services to be provided by the parties and the compensation for services provided under the agreement,
(v) the compensation paid over the term of the agreement is consistent with fair market value and the compensation per unit of services is fixed in advance and is not determined in a manner that takes into account the volume or value of any referrals or other business generated between the parties,
(vi) the compensation is provided pursuant to an agreement which would be commercially reasonable even if no referrals were made to the entity, and
(vii) the arrangement between the parties meets such other requirements as the Secretary may impose by regulation as needed to protect against program or patient abuse.

(8) Payments by a physician for items and services

Payments made by a physician—

(A) to a laboratory in exchange for the provision of clinical laboratory services, or

(B) to an entity as compensation for other items or services if the items or services are furnished at a price that is consistent with fair market value.

(f) Reporting requirements

Each entity providing covered items or services for which payment may be made under this subchapter shall provide the Secretary with the information concerning the entity's ownership, investment, and compensation arrangements, including—

(1) the covered items and services provided by the entity, and

(2) the names and unique physician identification numbers of all physicians with an ownership or investment interest (as described in subsection (a)(2)(A) of this section), or with a compensation arrangement (as described in subsection (a)(2)(B) of this section), in the entity, or whose immediate relatives have such an ownership or investment interest or who have such a compensation relationship with the entity.

Such information shall be provided in such form, manner, and at such times as the Secretary shall specify. The requirement of this subsection shall not apply to designated health services provided outside the United States or to entities which the Secretary determines provides [3] services for which payment may be made under this subchapter very infrequently.

(g) Sanctions

(1) Denial of payment

No payment may be made under this subchapter for a designated health service which is provided in violation of subsection (a)(1) of this section.

(2) Requiring refunds for certain claims

If a person collects any amounts that were billed in violation of subsection (a)(1) of this section, the person shall be liable to the individual for, and shall refund on a timely basis to the individual, any amounts so collected.

(3) Civil money penalty and exclusion for improper claims

Any person that presents or causes to be presented a bill or a claim for a service that such person knows or should know is for a service for which payment may not be made under paragraph (1) or for which a refund has not been made under paragraph (2) shall be subject to a civil money penalty of not more than $15,000 for each such service. The provisions of section 1320a–7a of this title (other than the first sentence of subsection (a) and other than subsection (b)) shall apply to a civil money penalty under the previous sentence in the same manner as such provisions apply to a penalty or proceeding under section 1320a–7a (a) of this title.

(4) Civil money penalty and exclusion for circumvention schemes

Any physician or other entity that enters into an arrangement or scheme (such as a cross-referral arrangement) which the physician or entity knows or should know has a principal purpose of assuring referrals by the physician to a particular entity which, if the physician directly made referrals to such entity, would be in violation of this section, shall be subject to a civil money penalty of not more than $100,000 for each such arrangement or scheme. The provisions of section 1320a–7a of this title (other than the first sentence of subsection (a) and other than subsection (b)) shall apply to a civil money penalty under the previous sentence in the same manner as such provisions apply to a penalty or proceeding under section 1320a–7a (a) of this title.

(5) Failure to report information

Any person who is required, but fails, to meet a reporting requirement of subsection (f) of this section is subject to a civil money penalty of not more than $10,000 for each day for which reporting is required to have been made. The provisions of section 1320a–7a of this title (other than the first sentence of subsection (a) and other than subsection (b)) shall apply to a civil money penalty under the previous sentence in the same manner as such provisions apply to a penalty or proceeding under section 1320a–7a (a) of this title.

(6) Advisory opinions

(A) In general

The Secretary shall issue written advisory opinions concerning whether a referral relating to designated health services (other than clinical laboratory services) is prohibited under this section. Each advisory opinion

issued by the Secretary shall be binding as to the Secretary and the party or parties requesting the opinion.

(B) Application of certain rules

The Secretary shall, to the extent practicable, apply the rules under subsections (b)(3) and (b)(4) of this section and take into account the regulations promulgated under subsection (b)(5) of section 1320a–7d of this title in the issuance of advisory opinions under this paragraph.

(C) Regulations

In order to implement this paragraph in a timely manner, the Secretary may promulgate regulations that take effect on an interim basis, after notice and pending opportunity for public comment.

(D) Applicability

This paragraph shall apply to requests for advisory opinions made after the date which is 90 days after August 5, 1997, and before the close of the period described in section 1320a–7d (b)(6) of this title.

(h) Definitions and special rules

For purposes of this section:

(1) Compensation arrangement; remuneration

(A) The term "compensation arrangement" means any arrangement involving any remuneration between a physician (or an immediate family member of such physician) and an entity other than an arrangement involving only remuneration described in subparagraph (C).

(B) The term "remuneration" includes any remuneration, directly or indirectly, overtly or covertly, in cash or in kind.

(C) Remuneration described in this subparagraph is any remuneration consisting of any of the following:

(i) The forgiveness of amounts owed for inaccurate tests or procedures, mistakenly performed tests or procedures, or the correction of minor billing errors.

(ii) The provision of items, devices, or supplies that are used solely to—

(I) collect, transport, process, or store specimens for the entity providing the item, device, or supply, or

(II) order or communicate the results of tests or procedures for such entity.

(iii) A payment made by an insurer or a self-insured plan to a physician to satisfy a claim, submitted on a fee for service basis, for the furnishing of health services by that physician to an individual who is covered by a policy with the insurer or by the self-insured plan, if—

(I) the health services are not furnished, and the payment is not made, pursuant to a contract or other arrangement between the insurer or the plan and the physician,
(II) the payment is made to the physician on behalf of the covered individual and would otherwise be made directly to such individual,
(III) the amount of the payment is set in advance, does not exceed fair market value, and is not determined in a manner that takes into account directly or indirectly the volume or value of any referrals, and
(IV) the payment meets such other requirements as the Secretary may impose by regulation as needed to protect against program or patient abuse.

(2) Employee

An individual is considered to be "employed by" or an "employee" of an entity if the individual would be considered to be an employee of the entity under the usual common law rules applicable in determining the employer-employee relationship (as applied for purposes of section 3121(d)(2) of the Internal Revenue Code of 1986).

(3) Fair market value

The term "fair market value" means the value in arms length transactions, consistent with the general market value, and, with respect to rentals or leases, the value of rental property for general commercial purposes (not taking into account its intended use) and, in the case of a lease of space, not adjusted to reflect the additional value the prospective lessee or lessor would attribute to the proximity or convenience to the lessor where the lessor is a potential source of patient referrals to the lessee.

(4) Group practice

(A) Definition of group practice

The term "group practice" means a group of 2 or more physicians legally organized as a partnership, professional corporation, foundation, not-for-profit corporation, faculty practice plan, or similar association—

(i) in which each physician who is a member of the group provides substantially the full range of services which the physician routinely provides, including medical care, consultation, diagnosis, or treatment, through the joint use of shared office space, facilities, equipment and personnel,
(ii) for which substantially all of the services of the physicians who are members of the group are provided through the group and are billed under a billing number assigned to the group and amounts so received are treated as receipts of the group,
(iii) in which the overhead expenses of and the income from the practice are distributed in accordance with methods previously determined,

(iv) except as provided in subparagraph (B)(i), in which no physician who is a member of the group directly or indirectly receives compensation based on the volume or value of referrals by the physician,

(v) in which members of the group personally conduct no less than 75 % of the physician-patient encounters of the group practice, and

(vi) which meets such other standards as the Secretary may impose by regulation.

(B) Special rules

(i) Profits and productivity bonuses A physician in a group practice may be paid a share of overall profits of the group, or a productivity bonus based on services personally performed or services incident to such personally performed services, so long as the share or bonus is not determined in any manner which is directly related to the volume or value of referrals by such physician.

(ii) Faculty practice plans In the case of a faculty practice plan associated with a hospital, institution of higher education, or medical school with an approved medical residency training program in which physician members may provide a variety of different specialty services and provide professional services both within and outside the group, as well as perform other tasks such as research, subparagraph (A) shall be applied only with respect to the services provided within the faculty practice plan.

(5) Referral; referring physician

(A) Physicians' services

Except as provided in subparagraph (C), in the case of an item or service for which payment may be made under part B of this subchapter, the request by a physician for the item or service, including the request by a physician for a consultation with another physician (and any test or procedure ordered by, or to be performed by (or under the supervision of) that other physician), constitutes a "referral" by a "referring physician".

(B) Other items

Except as provided in subparagraph (C), the request or establishment of a plan of care by a physician which includes the provision of the designated health service constitutes a "referral" by a "referring physician".

(C) Clarification respecting certain services integral to a consultation by certain specialists

A request by a pathologist for clinical diagnostic laboratory tests and pathological examination services, a request by a radiologist for diagnostic radiology services, and a request by a radiation oncologist for radiation therapy, if such services are furnished by (or under the supervision of) such pathologist, radiologist, or radiation oncologist pursuant to a

consultation requested by another physician does not constitute a "referral" by a "referring physician".

(6) Designated health services

The term "designated health services" means any of the following items or services:

(A) Clinical laboratory services.
(B) Physical therapy services.
(C) Occupational therapy services.
(D) Radiology services, including magnetic resonance imaging, computerized axial tomography scans, and ultrasound services.
(E) Radiation therapy services and supplies.
(F) Durable medical equipment and supplies.
(G) Parenteral and enteral nutrients, equipment, and supplies.
(H) Prosthetics, orthotics, and prosthetic devices and supplies.
(I) Home health services.
(J) Outpatient prescription drugs.
(K) Inpatient and outpatient hospital services.

(7) Specialty hospital

(A) In general

For purposes of this section, except as provided in subparagraph (B), the term "specialty hospital" means a subsection (d) hospital (as defined in section 1395ww (d)(1)(B) of this title) that is primarily or exclusively engaged in the care and treatment of one of the following categories:

(i) Patients with a cardiac condition.
(ii) Patients with an orthopedic condition.
(iii) Patients receiving a surgical procedure.
(iv) Any other specialized category of services that the Secretary designates as inconsistent with the purpose of permitting physician ownership and investment interests in a hospital under this section.

(B) Exception

For purposes of this section, the term "specialty hospital" does not include any hospital—

(i) determined by the Secretary—
(I) to be in operation before November 18, 2003; or
(II) under development as of such date;
(ii) for which the number of physician investors at any time on or after such date is no greater than the number of such investors as of such date;
(iii) for which the type of categories described in subparagraph (A) at any time on or after such date is no different than the type of such categories as of such date;
(iv) for which any increase in the number of beds occurs only in the facilities on the main campus of the hospital and does not

exceed 50 % of the number of beds in the hospital as of November 18, 2003, or 5 beds, whichever is greater; and
(v) that meets such other requirements as the Secretary may specify

Appendix C

Federal Legislation: Section 4
Laws Regarding Inducement of Services

SEC. 1156. [42 USC 1320c-5] Obligations of Health Care Practitioners and Providers of Health Care Services; Sanctions and Penalties; Hearings and Review

(a) It shall be the obligation of any health care practitioner and any other person (including a hospital or other health care facility, organization, or agency) who provides health care services for which payment may be made (in whole or in part) under this Act, to assure, to the extent of his authority that services or items ordered or provided by such practitioner or person to beneficiaries and recipients under this Act—

(1) will be provided economically and only when, and to the extent, medically necessary;
(2) will be of a quality which meets professionally recognized standards of health care; and
(3) will be supported by evidence of medical necessity and quality in such form and fashion and at such time as may reasonably be required by a reviewing peer review organization in the exercise of its duties and responsibilities.

(b)(1) If after reasonable notice and opportunity for discussion with the practitioner or person concerned, and, if appropriate, after the practitioner or person has been given a reasonable opportunity to enter into and complete a corrective action plan (which may include remedial education) agreed to by the organization, and has failed successfully to complete such plan, any organization having a contract with the Secretary under this part determines that such practitioner or person has—

(A) failed in a substantial number of cases substantially to comply with any obligation imposed on him under subsection (a), or
(B) grossly and flagrantly violated any such obligation in one or more instances,

such organization shall submit a report and recommendations to the Secretary. If the Secretary agrees with such determination, the Secretary (in addition to any other sanction provided under law) may exclude (permanently or for such period as the Secretary may prescribe, except that such period may not be less than 1 year) such practitioner or person from eligibility to provide services under this Act on a reimbursable basis. If the Secretary fails to act upon the recommendations submitted to him by such organization within 120 days after such submission, such practitioner or person shall be excluded from eligibility to provide services on a reimbursable basis until such time as the Secretary determines otherwise.

(2) A determination made by the Secretary under this subsection to exclude a practitioner or person shall be effective on the same date and in the same manner as an exclusion from participation under the programs under this Act becomes effective under section 1128(c), and shall (subject to the minimum period specified in the second sentence of paragraph (1)) remain in effect until the Secretary finds and gives reasonable notice to the public that the basis for such determination has been removed and that there is reasonable assurance that it will not recur.

(3) In lieu of the sanction authorized by paragraph (1), the Secretary may require that (as a condition to the continued eligibility of such practitioner or person to provide such health care services on a reimbursable basis) such practitioner or person pays to the United States, in case such acts or conduct involved the provision or ordering by such practitioner or person of health care services which were medically improper or unnecessary, an amount not in excess of up to $10,000 for each instance of the medically improper or unnecessary services so provided. Such amount may be deducted from any sums owing by the United States (or any instrumentality thereof) to the practitioner or person from whom such amount is claimed.

(4) Any practitioner or person furnishing services described in paragraph (1) who is dissatisfied with a determination made by the Secretary under this subsection shall be entitled to reasonable notice and opportunity for a hearing thereon by the Secretary to the same extent as is provided in section 205(b), and to judicial review of the Secretary's final decision after such hearing as is provided in section 205(g).

(5) Before the Secretary may effect an exclusion under paragraph (2) in the case of a provider or practitioner located in a rural health professional shortage area or in a county with a population of less than 70,000, the provider or practitioner adversely affected by the determination is entitled to a hearing before an administrative law judge (described in section 205(b)) respecting whether the provider or practitioner should be able to continue furnishing services to individuals entitled to benefits under this Act, pending completion of the administrative review procedure under paragraph (4). If the judge does not determine, by a preponderance of the evidence, that the provider or practitioner will pose a serious risk to such individuals if permitted to continue furnishing such services, the Secretary shall not effect the exclusion under paragraph (2) until the provider or practitioner has been provided reasonable notice and opportunity for an administrative hearing thereon under paragraph (4).

(6) When the Secretary effects an exclusion of a physician under paragraph (2), the Secretary shall notify the State board responsible for the licensing of the physician of the exclusion.

(c) It shall be the duty of each utilization and quality control peer review organization to use such authority or influence it may possess as a professional organization, and to enlist the support of any other professional or governmental organization having influence or

authority over health care practitioners and any other person (including a hospital or other health care facility, organization, or agency) providing health care services in the area served by such review organization, in assuring that each practitioner or person (referred to in subsection (a)) providing health care services in such area shall comply with all obligations imposed on him under subsection (a).

APPENDIX D

FLORIDA LEGISLATION

Appendix D
Florida Legislation

The Florida Anti-Kickback statutes (Fla. Stat §456.054) state:

It is unlawful for:

i) any health care provider or any provider of health care services to offer, pay, solicit, or receive a kickback, directly or indirectly, overtly or covertly, in cash or in kind, for referring or soliciting patients.
ii) violations of this section shall be considered patient brokering and shall be punishable as provided in s. 817.505 (Patient Brokering Act)

The Florida Medicaid Anti-Kickback statutes [Fla. Stat §490.920(2)] state:

It is unlawful for a person to:

i) Knowingly solicit, offer, pay, or receive any remuneration, including any kickback, bribe, or rebate, directly or indirectly, overtly or covertly, in cash or in kind, in return for referring an individual to a person for the furnishing or arranging for the furnishing of any item or service for which payment may be made, in whole or in part, under the Medicaid program, or in return for obtaining, purchasing, leasing, ordering, or arranging for or recommending, obtaining, purchasing, leasing, or ordering any goods, facility, item, or service, for which payment may be made, in whole or in part, under the Medicaid program.

The Florida Patient Brokering Act (Fla. Stat §817.505) states:

It is unlawful to:

i) offer or pay, solicit or receive, a commission, bonus rebate, kickback, or bribe, directly or indirectly, in cash or in kind, or engage in any split-fee arrangement to induce referrals.
ii) aid, abet, advise or otherwise participate in the above prohibited conduct.

The Florida Fee-Splitting laws (Fla. Stat §458.331) prohibit:

i) Paying or receiving any commission, bonus, kickback, or rebate; or

ii) Engaging in any split-fee arrangement in any form whatsoever with a physician, organization, agency, or person, either directly or indirectly, for patients referred to providers of health care goods and services, including, but not limited to, hospitals, nursing homes, clinical laboratories, ambulatory surgical centers, or pharmacies.

APPENDIX E

CENSUS DATA

Appendix E: Census Data

Region and Division U.S. Census Bureau, Population Division, Interim State Population Projections, 2005. Internet Release April 21, 2005.	**Percent distribution of population Census 2000**	**Percent distribution of population Projections 2010**	**Percent distribution of population Projections 2020**	**Percent distribution of population Projections 2030**	**Percent distribution of population change 2000 to 2010**	**Percent distribution of population change 2010 to 2020**	**Percent distribution of population change 2020 to 2030**	**Percent distribution of population change 2000 to 2030**
United States	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Northeast	**19.0**	**18.1**	**17.0**	**15.9**	**8.0**	**5.0**	**1.9**	**5.0**
New England	4.9	4.8	4.6	4.3	3.0	2.1	1.1	2.1
Middle Atlantic	14.1	13.3	12.5	11.6	5.0	2.9	0.8	2.9
Midwest	**22.9**	**21.8**	**20.7**	**19.4**	**10.9**	**7.7**	**3.8**	**7.4**
East North Central	16.0	15.2	14.4	13.4	6.9	4.3	1.5	4.2
West North Central	6.8	6.6	6.3	6.0	4.0	3.3	2.2	3.2
South	**35.6**	**36.8**	**38.0**	**39.4**	**48.5**	**52.1**	**56.5**	**52.4**
South Atlantic	18.4	19.4	20.4	21.5	29.2	32.2	34.7	32.0
East South Central	6.0	5.8	5.7	5.5	3.8	3.4	3.3	3.5
West South Central	11.2	11.6	12.0	12.5	15.6	16.5	18.4	16.8
West	**22.5**	**23.4**	**24.3**	**25.3**	**32.6**	**35.2**	**37.8**	**35.2**
Mountain	6.5	7.0	7.6	8.2	13.0	14.2	15.7	14.3
Pacific	16.0	16.3	16.7	17.1	19.7	21.0	22.1	20.9

New England:	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
Middle Atlantic:	New Jersey, New York, Pennsylvania
East North Central:	Illinois, Indiana, Michigan, Ohio, Wisconsin
West North Central:	Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota
South Atlantic:	Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia
East South Central:	Alabama, Kentucky, Mississippi, Tennessee
West South Central:	Arkansas, Louisiana, Oklahoma, Texas
Mountain:	Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming
Pacific:	Alaska, California, Hawaii, Oregon, Washington

APPENDIX F

OPPT PROVIDERS IN ORLANDO

Appendix F:
OPPT Providers in Orlando

Name of Physical Therapy Provider	Year Provider Opened Practice
Ability Health Services	2006
Ally Physical Therapy Center, Inc.	Unable to determine.
Baker, Heard, Osteen, Davenport	(1980s)
Baseline Rehabilitation	1999
Better Body Physical Therapy	Unable to determine.
Cora Rehabilitation: 14 Locations	4 in 1999, 5 in 2000, 1 for each year 2001 through 2006
Florida Fitness Concepts	1994
Florida Hospital Rehabiliation and Sports Medicine: 13 Locations	(1990s)
HealthSouth Sports Medicine and Rehabilitation Center (Now Select Medical): 9 Locations	(1999-2004)
Jewett Orthopaedic Clinic: 7 Locations	2001
Lake Mary Physical Therapy	1992
Life Skills	Unable to determine.
Mederi (Rita)	Unable to determine.
Metro Rehab of Orlando	Unable to determine.
Mid-Florida Orthopaedics	1991
ORHS Facilities: 7 Locations	1997
Orlando Orthopaedic: 4 Locations	2002
Orlando Pain and Medical Rehab Center	2000
Orlando Physical Therapy	Unable to determine.
Orlando Sports Medicine Group	2003
Physicians' Choice Physical Therapy	2006
Physicians' Injury Care Center: 4 Locations	Unable to determine.
Physio Med of Orlando, Inc.	1998
Physiotherapy Associates	Unable to determine.
Physiotherapy Works	2004
Pro Form Physical Therapy	2002
Regional Orthopaedic Associates: 2 Locations	2001
South Orange Wellness and Injury	Unable to determine.
Sports Specific: 3 Locations	1998
Stanford Orthopaedics	Unable to determine.
VanderSchaaf Chiropractic Clinic	Unable to determine.
Vissers Physical Therapy	2003
Wynne Chiropractic	Unable to determine.

APPENDIX G

ORHS AND FHS OUTPATIENT REHABILITATION FACILITY LOCATIONS

Appendix G
ORHS and FHS Outpatient Rehabilitation Facility Locations

ORHS Clinic Locations

1. Orlando Regional Medical Center Campus
1301 Sligh Blvd.
Orlando, FL 32806
407-649-6888

2. Orlando Regional Dr. P. Phillips Hospital (Formerly Sand Lake Hospital)
7350 Sandlake Commons Blvd., Ste. 1105
Orlando, FL 32819
407-351-8580

3. Orlando Regional South Seminole Hospital
555 W. State Road 434
Longwood, FL 32750
407-767-5842

4. Orlando Regional: Lucerne Medical Center
100 W. Gore St., Ste. 104
Orlando, FL 32806
407-841-8911

5. Dr. Phillips YMCA: OPENED 2006
7000 Dr. Phillips Blvd.
Orlando, FL 32819
407-351-9417

6. St. Cloud Regional Rehab Services: OPENED 2003
1575 Budinger Ave.
St. Cloud, FL 34769
407-957-8106

7. Orlando Regional: Arnold Palmer Hospital for Children
OPENED 2003

8. Orlando Regional Outpatient Rehabilitation: Orange Avenue Location
CLOSED in 2000

9. Orlando Regional Outpatient Rehabilitation: Wekiva Location
CLOSED 2006

10. Orlando Regional Outpatient Rehabilitation: Winter Park Location
CLOSED end of 2004

11. Orlando Regional Outpatient Rehabilitation: Oviedo Location
CLOSED 2006

Florida Hospital Clinic Locations

1. Florida Hospital Rehabilitation and Sports Medicine: Altamonte
608 East Altamonte Drive, Suite 1100
Altamonte Springs, FL 32701
407-830-3900

2. Florida Hospital Rehabilitation Center: Apopka
205 North Park Avenue, Suite 110
Apopka, FL 32703
407-889-1039

3. Florida Hospital Rehabilitation and Sports Medicine: Celebration Health
400 Celebration Place
Celebration, FL 34747
407-303-4003

4. Florida Hospital Rehabilitation and Sports Medicine: East Orlando
7975 Lake Underhill Road
Suite 300 (Pediatrics) / Suite 345 (Adults)
Orlando, FL 32822
407-303-6733 (Pediatrics)
407-303-8626 (Adults)

5. Florida Hospital Rehabilitation and Sports Medicine: Kissimmee
201 Hilda Street, Suite 12
Kissimmee, FL 34741
407-933-6684

6. Florida Hospital Rehabilitation and Sports Medicine: Lake Mary
100 Waymont Court, Suite 120
Lake Mary, FL 32746
407-323-0399

7. Florida Hospital Rehabilitation and Sports Medicine Maitland: RDV Sportsplex
8701 Maitland Summit Blvd.
Orlando, FL 32810
407-916-4500

8. Florida Hospital Rehabilitation and Sports Medicine: Ocoee
9580 West Colonial Dr.
Ocoee, FL 34761
407-532-6815

9. Florida Hospital Rehabilitation and Sports Medicine: Orlando - Lee Road
5165 Adanson Street
Orlando, FL 32804
407-303-7600

10. Florida Hospital Rehabilitation And Sports Medicine: Orlando - Downtown
601 East Rollins Street
Orlando, FL 32803
407-303-9459 (Fax) 407-303-5688 (Inpatient)
407-303-1928 (Outpatient)

11. Florida Hospital Rehabilitation and Sports Medicine: Oviedo
8000 Red Bug Lake Road
Oviedo, FL 32765
407-359-5211

12. Florida Hospital Rehabilitation and Sports Medicine: Orthopaedic Institute
Winter Park Memorial Hospital
200 N. Lakemont Ave
Winter Park, FL 32792
407-303-5688

13. Florida Hospital Rehabilitation and Sports Medicine: YMCA Crosby Wellness Center
2005 Mizell Avenue
Winter Park, FL 32792
407-646-7711

APPENDIX H

SCRIPTED PHONE INTERVIEWS

Appendix H

Scripted Phone Interview for Physician Offices

Introduction

My name is Joy Bruce. I am a doctoral candidate with Virginia Commonwealth University in Richmond, VA. I am conducting a study in collaboration with the Orlando Regional Healthcare System (ORHS) and the Florida Hospital System (FHS) regarding the use of physical therapy services in the Orlando market. Orthopedic physicians frequently refer patients for physical therapy. Therefore, I am calling the practices of all orthopaedic physicians affiliated with ORHS and FHS to verify information pertaining to the use and/or ownership of physical therapy services. Your direct answers will remain confidential, being made available only to me and to my dissertation advisor, Dianne Jewell, PT, DPT, PhD, CCS. The names of facilities and physicians included in this study will be kept confidential and not shared with anyone outside of the research team. Only aggregate data will be reported in the final dissertation manuscript and any subsequent publication. Your participation is strictly voluntary.

Consent

Would you be willing to participate in my research by answering a few questions about your practice so that I can include this information in my study?

Questions

1. Are you the manager of this physician practice? If not, what is your role?
2. How many years have you served in this role for this practice?

3. Does your practice currently invest in or own physical therapy services to which you make referrals?
4. If yes, in what year did you invest in or take ownership of the physical therapy services?
5. Has your practice previously invested in or owned physical therapy services to which you made referrals?
6. If yes, in which years did you have these ties to physical therapy services?

That was my final question. Do you have any questions about this research?

Thank you for your participation in this study. If you have any questions or would like to receive my research results, please contact me, Joy Bruce at 770-296-7431 or joy_bruce@shepherd.org.

Date of Interview: _____

Scripted Phone Interview for Competing Physical Therapy Providers

My name is Joy Bruce. I am a doctoral candidate with Virginia Commonwealth University in Richmond, VA. I am conducting a study in collaboration with the Orlando Regional Healthcare System (ORHS) and the Florida Hospital System (FHS) regarding the use of physical therapy services in the Orlando market. I am calling the offices of all physical therapy providers to verify information pertaining to the establishment of your practice. Your direct answers will remain confidential, being made available only to me and to my dissertation advisor, Dianne Jewell, PT, DPT, PhD, CCS. The names of facilities and physicians included in this study will be kept confidential and not shared with anyone outside of the research team. Only aggregate data will be reported in the final dissertation manuscript and any subsequent publication. Your participation is strictly voluntary.

Consent

Would you be willing to participate in my research by answering a few questions about your practice so that I can include this information in my study?

1. Are you the manager of this physical therapy practice? If not, what is your role?
2. How many years have you served in this role for this practice?
3. In what year did your practice begin seeing patients?

That was my final question. Do you have any questions about this research?

Thank you for your participation in this study. If you have any questions or would like to receive my research results, please contact me, Joy Bruce at 770-296-7431 or joy_bruce@shepherd.org.

Date of Interview: _____

APPENDIX I

TABLES FROM CHAPTER V

Table 1. Average referrals per physician per year to ORHS (raw data).

PHYSICIAN GROUP	1999	2000	2001	2002	2003	2004	2005
Group 0	21.8	50.3	34.0	27.3	37.0	164.3	162.3*
Group 1	18.1	35.0	38.4	36.5	34.5	47.2	26.2*
Group 2	3.0	3.8	7.0	6.8	13.8	34.0	68.5*
Group 3	3.6	9.9	15.5	16.7	17.8	49.6	39.0*

*Data for 2005 for ORHS are incomplete. Only three-quarters of the year are represented.

Table 2. Breakdown by payer group per physician group (ORHS only).

PHYSICIAN CODE	PAYORCODE	1999	2000	2001	2002	2003	2004	2005*	(blank)	Grand Total
Group 0	Commercial =0	63	120	67	64	104	531	530		1479
(N=4)	Medicare=1	24	66	16	9	27	115	78		335
	Other=2		15	53	36	17	11	41		173
Group 0 Total		87	201	136	109	148	657	649		1987
Group 1	Commercial =0	836	1524	1569	1482	1272	1713	924	1†	9321
(N=47)	Medicare=1	12	61	110	126	225	254	160		948
	Other=2	2	59	127	109	124	251	146		818
Group 1 Total		850	1644	1806	1717	1621	2218	1230	1†	11087
Group 2	Commercial =0	11	13	13	17	49	61	154		318
(N=4)	Medicare=1	1		5		1	28	21		56
	Other=2		2	10	10	5	47	99		173
Group 2 Total		12	15	28	27	55	136	274		547
Group 3	Commercial =0	269	641	801	833	896	2748	2219	2†	8409
(N=79)	Medicare=1	14	105	240	322	293	536	262		1772
	Other=2		35	186	162	221	637	597		1838
Group 3 Total		283	781	1227	1317	1410	3921	3078	2†	12019
Grand Total		1232	2641	3197	3170	3234	6932	5231*	3†	**25640**

* Data for 2005 incomplete. Only three-quarters of year included.

†Missing information on year of referral.

Table 3. Percentage of total by payer group and physician group.

PHYSICIAN CODE	PAYERCODE	1999	2000	2001	2002	2003	2004	2005
Group 0	Commercial =0	72.4%	59.7%	49.3%	58.7%	70.3%	80.8%	81.7%
	Medicare=1	27.6%	32.8%	11.8%	8.3%	18.2%	17.6%	12.0%
	Other=2	0.0%	7.5%	38.9%	33.0%	11.5%	1.7%	6.3%
Group 1	Commercial =0	98.4%	92.7%	86.9%	86.3%	78.5%	77.2%	75.1%
	Medicare=1	1.4%	3.7%	6.1%	7.4%	13.9%	11.5%	13.0%
	Other=2	0.2%	3.6%	7.0%	6.3%	7.6%	11.3%	11.9%
Group 2	Commercial =0	91.7%	86.7%	46.4%	63.0%	89.1%	44.9%	56.2%
	Medicare=1	8.3%	0.0%	17.9%	0.0%	1.8%	20.6%	7.7%
	Other=2	0.0%	13.3%	35.7%	37.0%	9.1%	34.5%	36.1%
Group 3	Commercial =0	95.1%	82.1%	65.3%	63.2%	63.5%	70.1%	72.1%
	Medicare=1	4.9%	13.4%	19.6%	24.5%	20.8%	13.7%	8.5%
	Other=2	0.0%	4.5%	15.2%	12.3%	15.7%	16.2%	19.4%

Table 4. Referrals to FHS by physician group (raw data).

PHYSICIAN CODE	1999	2000	2001	2002	2003	2004	2005	2006	2007	Grand Total
Group 0	26	45	82	76	65	44	38	42	28*	**446**
Group 1	2334	3701	3806	4101	2877	2728	2587	2260	1614*	**26008**
Group 2	125	255	280	185	109	120	179	137	83*	**1473**
Group 3	747	977	1143	1163	1160	1403	1620	1598	986*	**10797**
Grand Total	3232	4978	5311	5525	4211	4295	4424	4037	2711*	**38724**

*Data from 2007 for FHS are incomplete. Only three-quarters of the year are included.

Table 5. Average referrals to FHS per year per physician group (raw data).

PHYSICIAN CODE	1999	2000	2001	2002	2003	2004	2005	2006	2007
Group 0	5.2	9	16.4	15.2	13	8.8	7.6	8.4	5.6*
Group 1	59.8	94.9	97.6	105.2	73.8	69.9	66.3	57.9	41.4*
Group 2	31.3	63.8	70.0	46.3	27.3	30.0	44.8	34.3	20.8*
Group 3	17.4	22.7	26.6	27.0	27.0	32.6	37.7	37.2	22.9*

*Data from 2007 for FHS are incomplete. Only three-quarters of the year are included.

Table 6. Referrals to both hospitals by physician group.

	ORHS and FHS in Aggregate							FHS Only		
	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**Total**
Group 0	113	246	218	185	213	701	687*	42	28**	2433
Group 1	3184	5345	5612	5818	4498	4946	3817*	2260	1614**	37094
Group 2	137	270	308	212	164	256	453*	137	83**	2020
Group 3	1030	1758	2370	2480	2570	5324	4698*	1598	986**	22814
Totals	**4464**	**7619**	**8508**	**8695**	**7745**	**11227**	**9655***	**4037**	**2711****	**64361**

*Only three-quarters of year for ORHS included. No data for ORHS 2006 and 2007.
**Only three-quarters of year for FHS included.

APPENDIX J

COMPARISONS FOR GROUP 1 AND GROUP 3 PHYSICIANS

Appendix J:
Comparisons for Group 1 and Group 3 Physicians

Test 1: Mixed Model Analysis (Aggregate Year 1 versus 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	STATUS	2	Unstructured	3	PHYSID	47
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	988.503
Akaike's Information Criterion (AIC)	994.503
Hurvich and Tsai's Criterion (AICC)	994.782
Bozdogan's Criterion (CAIC)	1005.002
Schwarz's Bayesian Criterion (BIC)	1002.002

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	45.000	51.873	.000
PHYSCD	1	45.000	6.567	.014
STATUS	1	45.000	1.065	.307
PHYSCD * STATUS	1	45.000	.632	.431

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	50.760000	15.818179	45	3.209	.002	18.900551	82.619449
[PHYSCD=1]	42.603636	23.120333	45.000	1.843	.072	-3.963105	89.170378
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-13.6400	10.216049	45.000	-1.335	.189	-34.216180	6.936180
[STATUS=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=1]	11.867273	14.932089	45.000	.795	.431	-18.207499	41.942044
[STATUS=1] * [PHYSCD=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PHYSCD=3]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	3445.599	726.3961
	UN (2,1)	3545.889	870.8466
	UN (2,2)	6255.370	1318.748

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	92.477	13.814	45.000	64.654	120.300
3	43.940	12.959	45	17.840	70.040

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	48.537*	18.941	45.000	.014	10.389	86.686
3	1	-48.537*	18.941	45.000	.014	-86.686	-10.389

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	45.000	6.567	.014

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	64.355	8.580	45.000	47.075	81.636
POST	72.062	11.560	45.000	48.778	95.345

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-7.706	7.466	45.000	.307	-22.744	7.331
POST	PRE	7.706	7.466	45.000	.307	-7.331	22.744

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	45.000	1.065	.307

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	91.591	12.515	45	66.385	116.797
	POST	93.364	16.862	45.000	59.401	127.326
3	PRE	37.120	11.740	45.000	13.475	60.765
	POST	50.760	15.818	45	18.901	82.619

a. Dependent Variable: REFNO.

Test 2: Mixed Model Analysis (ORHS Year 1 versus 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	wave	2	Unstructured	3	PHYSID	16
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	271.115
Akaike's Information Criterion (AIC)	277.115
Hurvich and Tsai's Criterion (AICC)	278.115
Bozdogan's Criterion (CAIC)	284.111
Schwarz's Bayesian Criterion (BIC)	281.111

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	14.000	43.055	.000
PHYSCD	1	14.000	.201	.661
STATUS	1	14	1.297	.274
PHYSCD * STATUS	1	14	2.321	.150

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	46.625000	11.820788	14	3.944	.001	21.271931	71.978069
[PHYSCD=1]	-7.125000	16.717119	14	-.426	.676	-42.979653	28.729653
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-21.6250	11.487862	14	-1.882	.081	-46.264014	3.014014
[STATUS=1]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=0]	24.750000	16.246291	14	1.523	.150	-10.094828	59.594828
[PHYSCD=1] * [STATUS=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	508.1339	192.0566
	UN (2,1)	285.1071	215.3573
	UN (2,2)	1117.848	422.5069

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	41.063	8.284	14.000	23.294	58.831
3	35.813	8.284	14	18.044	53.581

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	5.250	11.716	14.000	.661	-19.878	30.378
3	1	-5.250	11.716	14.000	.661	-30.378	19.878

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	14.000	.201	.661

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	33.813	5.635	14	21.726	45.899
POST	43.063	8.359	14	25.135	60.990

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-9.250	8.123	14	.274	-26.672	8.172
POST	PRE	9.250	8.123	14	.274	-8.172	26.672

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	14	1.297	.274

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	42.625	7.970	14	25.532	59.718
	POST	39.500	11.821	14	14.147	64.853
3	PRE	25.000	7.970	14	7.907	42.093
	POST	46.625	11.821	14	21.272	71.978

a. Dependent Variable: REFNO.

Test 3: Mixed Model Analysis (FHS Year 1 versus 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	STATUS	2	Unstructured	3	PHYSID	38
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	794.862
Akaike's Information Criterion (AIC)	800.862
Hurvich and Tsai's Criterion (AICC)	801.215
Bozdogan's Criterion (CAIC)	810.692
Schwarz's Bayesian Criterion (BIC)	807.692

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	36.000	40.304	.000
PHYSCD	1	36.000	5.081	.030
STATUS	1	36.000	.497	.485
PHYSCD * STATUS	1	36.000	.100	.754

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	47.157895	18.260832	36.000	2.582	.014	10.123211	84.192579
[PHYSCD=1]	44.315789	25.824716	36.000	1.716	.095	-8.059163	96.690742
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-8.842105	12.245476	36.000	-.722	.475	-33.677081	15.992871
[STATUS=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=1]	5.473684	17.317718	36.000	.316	.754	-29.648276	40.595644
[STATUS=1] * [PHYSCD=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PHYSCD=3]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	3368.442	793.9493
	UN (2,1)	3427.531	958.7232
	UN (2,2)	6335.702	1493.339

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	89.789	14.761	36.000	59.853	119.726
3	42.737	14.761	36.000	12.800	72.673

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	47.053*	20.875	36.000	.030	4.716	89.389
3	1	-47.053*	20.875	36.000	.030	-89.389	-4.716

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36.000	5.081	.030

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	63.211	9.415	36	44.116	82.305
POST	69.316	12.912	36.000	43.128	95.503

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-6.105	8.659	36.000	.485	-23.666	11.456
POST	PRE	6.105	8.659	36.000	.485	-11.456	23.666

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36.000	.497	.485

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	88.105	13.315	36.000	61.101	115.109
	POST	91.474	18.261	36.000	54.439	128.508
3	PRE	38.316	13.315	36	11.312	65.320
	POST	47.158	18.261	36.000	10.123	84.193

a. Dependent Variable: REFNO.

Test 4: Mixed Model Analysis (Aggregate Years 1 and 2 versus 4 and 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	STATUS	2	Unstructured	3	PHYSID	47
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	1117.996
Akaike's Information Criterion (AIC)	1123.996
Hurvich and Tsai's Criterion (AICC)	1124.275
Bozdogan's Criterion (CAIC)	1134.495
Schwarz's Bayesian Criterion (BIC)	1131.495

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	45.000	54.030	.000
PHYSCD	1	45.000	6.812	.012
STATUS	1	45	.120	.730
PHYSCD * STATUS	1	45	.446	.508

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	113.5600	34.687696	45.000	3.274	.002	43.695395	183.424605
[PHYSCD=1]	109.5764	50.700593	45.000	2.161	.036	7.460128	211.692599
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-12.8000	17.257603	45.000	-.742	.462	-47.558596	21.958596
[STATUS=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=1]	16.845455	25.224238	45	.668	.508	-33.958768	67.649678
[STATUS=1] * [PHYSCD=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PHYSCD=3]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	21479.69	4528.315
	UN (2,1)	22057.48	5016.996
	UN (2,2)	30080.91	6341.612

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	225.159	32.973	45.000	158.748	291.570
3	107.160	30.931	45.000	44.861	169.459

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	117.999*	45.210	45.000	.012	26.941	209.057
3	1	-117.999*	45.210	45.000	.012	-209.057	-26.941

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	45.000	6.812	.012

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	163.971	21.422	45.000	120.826	207.116
POST	168.348	25.350	45.000	117.290	219.406

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-4.377	12.612	45	.730	-29.779	21.025
POST	PRE	4.377	12.612	45	.730	-21.025	29.779

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	45	.120	.730

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	227.182	31.247	45.000	164.248	290.116
	POST	223.136	36.977	45.000	148.660	297.612
3	PRE	100.760	29.312	45.000	41.723	159.797
	POST	113.560	34.688	45.000	43.695	183.425

a. Dependent Variable: REFNO.

Test 5: Mixed Model Analysis (ORHS Years 1 and 2 versus 4 and 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	STATUS	2	Unstructured	3	PHYSID	16
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	325.120
Akaike's Information Criterion (AIC)	331.120
Hurvich and Tsai's Criterion (AICC)	332.120
Bozdogan's Criterion (CAIC)	338.117
Schwarz's Bayesian Criterion (BIC)	335.117

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	14.000	34.840	.000
PHYSCD	1	14.000	.020	.889
STATUS	1	14	.695	.418
PHYSCD * STATUS	1	14	.514	.485

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	105.3750	26.906709	14	3.916	.002	47.665849	163.084151
[PHYSCD=1]	-17.2500	38.051833	14	-.453	.657	-98.863064	64.363064
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	2.000000	24.168678	14	.083	.935	-49.836659	53.836659
[STATUS=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=1]	24.500000	34.179672	14	.717	.485	-48.808106	97.808106
[STATUS=1] * [PHYSCD=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PHYSCD=3]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	6455.125	2439.808
	UN (2,1)	3786.946	1922.193
	UN (2,2)	5791.768	2189.082

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

				95% Confidence Interval	
PHYSCD	Mean	Std. Error	df	Lower Bound	Upper Bound
1	101.375	24.888	14.000	47.996	154.754
3	106.375	24.888	14.000	52.996	159.754

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	-5.000	35.197	14.000	.889	-80.489	70.489
3	1	5.000	35.197	14.000	.889	-70.489	80.489

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	14.000	.020	.889

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	111.000	20.086	14.000	67.920	154.080
POST	96.750	19.026	14	55.943	137.557

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	14.250	17.090	14	.418	-22.404	50.904
POST	PRE	-14.250	17.090	14	.418	-50.904	22.404

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	14	.695	.418

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	114.625	28.406	14.000	53.701	175.549
	POST	88.125	26.907	14	30.416	145.834
3	PRE	107.375	28.406	14.000	46.451	168.299
	POST	105.375	26.907	14	47.666	163.084

a. Dependent Variable: REFNO.

Test 6: Mixed Model Analysis (FHS Years 1 and 2 versus 4 and 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	STATUS	2	Unstructured	3	PHYSID	38
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	889.528
Akaike's Information Criterion (AIC)	895.528
Hurvich and Tsai's Criterion (AICC)	895.881
Bozdogan's Criterion (CAIC)	905.358
Schwarz's Bayesian Criterion (BIC)	902.358

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	36.000	42.163	.000
PHYSCD	1	36.000	6.336	.016
STATUS	1	36.000	.759	.390
PHYSCD * STATUS	1	36.000	.163	.688

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	105.0526	39.412992	36.000	2.665	.011	25.119378	184.985885
[PHYSCD=1]	116.2105	55.738388	36.000	2.085	.044	3.167835	229.253217
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-17.6842	19.613250	36.000	-.902	.373	-57.461726	22.093305
[STATUS=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=1]	11.210526	27.737325	36.000	.404	.688	-45.043376	67.464428
[STATUS=1] * [PHYSCD=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PHYSCD=3]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	18638.15	4393.055
	UN (2,1)	20421.77	5183.148
	UN (2,2)	29514.30	6956.586

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	218.026	34.220	36.000	148.625	287.427
3	96.211	34.220	36.000	26.809	165.612

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	121.816*	48.394	36.000	.016	23.668	219.964
3	1	-121.816*	48.394	36.000	.016	-219.964	-23.668

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36.000	6.336	.016

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	151.079	22.147	36.000	106.163	195.995
POST	163.158	27.869	36.000	106.637	219.679

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-12.079	13.869	36.000	.390	-40.206	16.048
POST	PRE	12.079	13.869	36.000	.390	-16.048	40.206

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36.000	.759	.390

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	214.789	31.320	36.000	151.269	278.310
	POST	221.263	39.413	36.000	141.330	301.196
3	PRE	87.368	31.320	36.000	23.848	150.889
	POST	105.053	39.413	36.000	25.119	184.986

a. Dependent Variable: REFNO.

Test 7: Mixed Model Analysis (ORHS Insurance Year 1 versus 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PAYCD	3		2		
	PHYSCD * STATUS	4		1		
	PHYSCD * PAYCD	6		2		
	STATUS * PAYCD	6		2		
	PHYSCD * STATUS * PAYCD	12		2		
Repeated Effects	wave	6	Unstructured	21	PHYSID	16
Total		42		33		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	539.831
Akaike's Information Criterion (AIC)	581.831
Hurvich and Tsai's Criterion (AICC)	596.734
Bozdogan's Criterion (CAIC)	653.878
Schwarz's Bayesian Criterion (BIC)	632.878

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	14.000	43.055	.000
PHYSCD	1	14.000	.201	.661
STATUS	1	14.000	1.297	.274
PAYCD	2	14.000	19.855	.000
PHYSCD * STATUS	1	14.000	2.321	.150
PHYSCD * PAYCD	2	14.000	.655	.535
STATUS * PAYCD	2	14.000	5.086	.022
PHYSCD * STATUS * PAYCD	2	14.000	1.449	.268

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	.625000	.564975	14.000	1.106	.287	-.586750	1.836750
[PHYSCD=1]	1.000000	.798995	14.000	1.252	.231	-.713674	2.713674
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-.625000	.690335	14.000	-.905	.381	-2.105621	.855621
[STATUS=1]	0[a]	0	.	.	.	.	.
[PAYCD=0]	32.250000	9.390047	14.000	3.434	.004	12.110351	52.389649
[PAYCD=1]	12.500000	5.033371	14.000	2.483	.026	1.704493	23.295507
[PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=0]	-.125000	.976281	14.000	-.128	.900	-2.218915	1.968915
[PHYSCD=1] * [STATUS=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [PAYCD=0]	-4.875000	13.279532	14.000	-.367	.719	-33.356764	23.606764
[PHYSCD=1] * [PAYCD=1]	-5.250000	7.118261	14.000	-.738	.473	-20.517152	10.017152
[PHYSCD=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PAYCD=0]	-9.500000	9.352652	14.000	-1.016	.327	-29.559443	10.559443
[STATUS=0] * [PAYCD=1]	-10.2500	4.063667	14.000	-2.522	.024	-18.965700	-1.534300
[STATUS=0] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=0] * [PAYCD=0]	22.375000	13.226647	14.000	1.692	.113	-5.993337	50.743337
[PHYSCD=1] * [STATUS=0] * [PAYCD=1]	2.750000	5.746894	14.000	.479	.640	-9.575861	15.075861
[PHYSCD=1] * [STATUS=0] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=1] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=1] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	490.4554	185.3747
	UN (2,1)	-2.366071	19.214051
	UN (2,2)	10.526786	3.978751
	UN (3,1)	3.866071	8.850245
	UN (3,2)	.973214	1.313732
	UN (3,3)	2.205357	.833547
	UN (4,1)	242.9107	171.6255
	UN (4,2)	-12.8393	23.527040
	UN (4,3)	-2.857143	10.680768
	UN (4,4)	720.4911	272.3200
	UN (5,1)	16.741071	86.349858
	UN (5,2)	39.955357	16.542000
	UN (5,3)	-1.151786	5.790713
	UN (5,4)	76.366071	106.4924
	UN (5,5)	212.2679	80.229709
	UN (6,1)	.973214	9.461803
	UN (6,2)	.901786	1.406468
	UN (6,3)	.473214	.646721
	UN (6,4)	8.830357	11.704092
	UN (6,5)	6.071429	6.430415
	UN (6,6)	2.553571	.965159

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	13.688	2.761	14.000	7.765	19.610
3	11.938	2.761	14.000	6.015	17.860

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	1.750	3.905	14.000	.661	-6.626	10.126
3	1	-1.750	3.905	14.000	.661	-10.126	6.626

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	14.000	.201	.661

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	11.271	1.878	14.000	7.242	15.300
POST	14.354	2.786	14.000	8.378	20.330

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-3.083	2.708	14.000	.274	-8.891	2.724
POST	PRE	3.083	2.708	14.000	.274	-2.724	8.891

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	14.000	1.297	.274

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PAYCD

Estimates[a]

PAYCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
COMMERCIAL	31.438	5.149	14.000	20.394	42.481
MEDICARE	6.219	2.175	14.000	1.554	10.883
MEDICAID	.781	.299	14.000	.141	1.422

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PAYCD	(J) PAYCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
COMMERCIAL	MEDICARE	25.219*	5.367	14.000	.001	10.632	39.806
	MEDICAID	30.656*	5.125	14.000	.000	16.728	44.584
MEDICARE	COMMERCIAL	-25.219*	5.367	14.000	.001	-39.806	-10.632
	MEDICAID	5.438	2.146	14.000	.072	-.396	11.271
MEDICAID	COMMERCIAL	-30.656*	5.125	14.000	.000	-44.584	-16.728
	MEDICARE	-5.438	2.146	14.000	.072	-11.271	.396

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
2	14.000	19.855	.000

The F tests the effect of PAYCD. This test is based on th linearly independent pairw ise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

4. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Low er Bound	Upper Bound
1	PRE	14.208	2.657	14.000	8.511	19.906
	POST	13.167	3.940	14.000	4.716	21.618
3	PRE	8.333	2.657	14.000	2.636	14.031
	POST	15.542	3.940	14.000	7.091	23.993

a. Dependent Variable: REFNO.

5. PAYCD * PHYSCD[a]

PAYCD	PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
					Low er Bound	Upper Bound
COMMERCIAL	1	35.063	7.282	14.000	19.445	50.680
	3	27.813	7.282	14.000	12.195	43.430
MEDICARE	1	4.750	3.076	14.000	-1.847	11.347
	3	7.687	3.076	14.000	1.091	14.284
MEDICAID	1	1.250	.422	14.000	.344	2.156
	3	.313	.422	14.000	-.593	1.218

a. Dependent Variable: REFNO.

6. PAYCD * STATUS[a]

PAYCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
COMMERCIAL	PRE	31.938	5.537	14.000	20.063	43.812
	POST	30.938	6.710	14.000	16.545	45.330
MEDICARE	PRE	1.438	.811	14.000	-.302	3.177
	POST	11.000	3.642	14.000	3.188	18.812
MEDICAID	PRE	.438	.371	14.000	-.359	1.234
	POST	1.125	.399	14.000	.268	1.982

a. Dependent Variable: REFNO.

7. PAYCD * PHYSCD * STATUS[a]

PAYCD	PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
						Lower Bound	Upper Bound
COMMERCIAL	1	PRE	41.125	7.830	14.000	24.332	57.918
		POST	29.000	9.490	14.000	8.646	49.354
	3	PRE	22.750	7.830	14.000	5.957	39.543
		POST	32.875	9.490	14.000	12.521	53.229
MEDICARE	1	PRE	.625	1.147	14.000	-1.835	3.085
		POST	8.875	5.151	14.000	-2.173	19.923
	3	PRE	2.250	1.147	14.000	-.210	4.710
		POST	13.125	5.151	14.000	2.077	24.173
MEDICAID	1	PRE	.875	.525	14.000	-.251	2.001
		POST	1.625	.565	14.000	.413	2.837
	3	PRE	1.71E-014	.525	14.000	-1.126	1.126
		POST	.625	.565	14.000	-.587	1.837

a. Dependent Variable: REFNO.

Test 8: Mixed Model Analysis (ORHS Insurance Years 1 and 2 versus 4 and 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PAYCD	3		2		
	PHYSCD * STATUS	4		1		
	PHYSCD * PAYCD	6		2		
	STATUS * PAYCD	6		2		
	PHYSCD * STATUS * PAYCD	12		2		
Repeated Effects	WAVE	6	Unstructured	21	PHYSID	16
Total		42		33		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	721.321
Akaike's Information Criterion (AIC)	763.321
Hurvich and Tsai's Criterion (AICC)	778.225
Bozdogan's Criterion (CAIC)	835.369
Schwarz's Bayesian Criterion (BIC)	814.369

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	14.000	32.556	.000
PHYSCD	1	14.000	.056	.816
STATUS	1	14.000	.514	.485
PAYCD	2	14.000	14.034	.000
PHYSCD * STATUS	1	14.000	.363	.556
PHYSCD * PAYCD	2	14.000	1.132	.350
STATUS * PAYCD	2	14.000	3.310	.067
PHYSCD * STATUS * PAYCD	2	14.000	.687	.519

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	7.500000	3.601680	14.000	2.082	.056	-.224835	15.224835
[PHYSCD=1]	-2.625000	5.093545	14.000	-.515	.614	-13.549567	8.299567
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	4.625000	6.843516	14.000	.676	.510	-10.052881	19.302881
[STATUS=1]	0[a]	0	.	.	.	.	.
[PAYCD=0]	63.625000	22.595581	14.000	2.816	.014	15.162299	112.087701
[PAYCD=1]	19.250000	9.327080	14.000	2.064	.058	-.754597	39.254597
[PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=0]	-7.875000	9.678193	14.000	-.814	.429	-28.632659	12.882659
[PHYSCD=1] * [STATUS=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [PAYCD=0]	.500000	31.954977	14.000	.016	.988	-68.036609	69.036609
[PHYSCD=1] * [PAYCD=1]	-11.6250	13.190483	14.000	-.881	.393	-39.915772	16.665772
[PHYSCD=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PAYCD=0]	4.625000	22.789555	14.000	.203	.842	-44.253735	53.503735
[STATUS=0] * [PAYCD=1]	-16.5000	9.429189	14.000	-1.750	.102	-36.723598	3.723598
[STATUS=0] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=0] * [PAYCD=0]	34.500000	32.229298	14.000	1.070	.303	-34.624970	103.624970
[PHYSCD=1] * [STATUS=0] * [PAYCD=1]	10.125000	13.334886	14.000	.759	.460	-18.475487	38.725487
[PHYSCD=1] * [STATUS=0] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=1] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=1] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	4324.054	1634.339
	UN (2,1)	221.3750	360.3042
	UN (2,2)	408.9821	154.5807
	UN (3,1)	192.3036	374.1240
	UN (3,2)	423.0536	160.5388
	UN (3,3)	444.6250	168.0525
	UN (4,1)	2020.402	1201.021
	UN (4,2)	150.9375	332.3868
	UN (4,3)	125.9196	345.6484
	UN (4,4)	3726.205	1408.373
	UN (5,1)	589.9464	512.5151
	UN (5,2)	510.6607	202.7800
	UN (5,3)	523.8393	209.8899
	UN (5,4)	653.5179	485.2194
	UN (5,5)	769.9643	291.0191
	UN (6,1)	-175.473	185.0728
	UN (6,2)	77.598214	58.836538
	UN (6,3)	86.866071	61.925916
	UN (6,4)	-127.250	169.6396
	UN (6,5)	88.892857	79.195219
	UN (6,6)	103.7768	39.223938

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	32.625	8.437	14.000	14.529	50.721
3	35.458	8.437	14.000	17.362	53.555

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	-2.833	11.932	14.000	.816	-28.426	22.759
3	1	2.833	11.932	14.000	.816	-22.759	28.426

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	14.000	.056	.816

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	36.125	6.898	14.000	21.331	50.919
POST	31.958	6.363	14.000	18.311	45.606

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	4.167	5.809	14.000	.485	-8.293	16.627
POST	PRE	-4.167	5.809	14.000	.485	-16.627	8.293

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	14.000	.514	.485

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PAYCD

Estimates[a]

PAYCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
COMMERCIAL	81.344	13.745	14.000	51.864	110.824
MEDICARE	14.250	5.863	14.000	1.674	26.826
OTHER	6.531	3.359	14.000	-.673	13.736

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PAYCD	(J) PAYCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
COMMERCIAL	MEDICARE	67.094*	13.146	14.000	.000	31.367	102.821
	OTHER	74.813*	14.132	14.000	.000	36.404	113.221
MEDICARE	COMMERCIAL	-67.094*	13.146	14.000	.000	-102.821	-31.367
	OTHER	7.719	3.297	14.000	.104	-1.241	16.679
OTHER	COMMERCIAL	-74.813*	14.132	14.000	.000	-113.221	-36.404
	MEDICARE	-7.719	3.297	14.000	.104	-16.679	1.241

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
2	14.000	14.034	.000

The F tests the effect of PAYCD. This test is based on th linearly independent pairw ise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

4. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	36.458	9.755	14.000	15.537	57.380
	POST	28.792	8.999	14.000	9.491	48.092
3	PRE	35.792	9.755	14.000	14.870	56.713
	POST	35.125	8.999	14.000	15.825	54.425

a. Dependent Variable: REFNO.

5. PAYCD * PHYSCD[a]

PAYCD	PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
COMMERCIAL	1	86.938	19.438	14.000	45.247	128.628
	3	75.750	19.438	14.000	34.059	117.441
MEDICARE	1	7.688	8.292	14.000	-10.097	25.472
	3	20.813	8.292	14.000	3.028	38.597
OTHER	1	3.250	4.750	14.000	-6.939	13.439
	3	9.813	4.750	14.000	-.376	20.001

a. Dependent Variable: REFNO.

6. PAYCD * STATUS[a]

PAYCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
COMMERCIAL	PRE	92.625	16.439	14.000	57.366	127.884
	POST	70.063	15.261	14.000	37.332	102.793
MEDICARE	PRE	8.875	5.056	14.000	-1.969	19.719
	POST	19.625	6.937	14.000	4.746	34.504
OTHER	PRE	6.875	5.272	14.000	-4.431	18.181
	POST	6.188	2.547	14.000	.725	11.650

a. Dependent Variable: REFNO.

7. PAYCD * PHYSCD * STATUS[a]

PAYCD	PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
						Lower Bound	Upper Bound
COMMERCIAL	1	PRE	104.875	23.249	14.000	55.011	154.739
		POST	69.000	21.582	14.000	22.712	115.288
	3	PRE	80.375	23.249	14.000	30.511	130.239
		POST	71.125	21.582	14.000	24.837	117.413
MEDICARE	1	PRE	2.875	7.150	14.000	-12.460	18.210
		POST	12.500	9.810	14.000	-8.541	33.541
	3	PRE	14.875	7.150	14.000	-.460	30.210
		POST	26.750	9.810	14.000	5.709	47.791
OTHER	1	PRE	1.625	7.455	14.000	-14.365	17.615
		POST	4.875	3.602	14.000	-2.850	12.600
	3	PRE	12.125	7.455	14.000	-3.865	28.115
		POST	7.500	3.602	14.000	-.225	15.225

a. Dependent Variable: REFNO.

Test 9: Mixed Model Analysis (Post Hoc Aggregate Year 1 versus 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	STATUS	2	Unstructured	3	PHYSID	61
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	1292.733
Akaike's Information Criterion (AIC)	1298.733
Hurvich and Tsai's Criterion (AICC)	1298.944
Bozdogan's Criterion (CAIC)	1310.045
Schwarz's Bayesian Criterion (BIC)	1307.045

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	59.000	54.554	.000
PHYSCD	1	59.000	6.898	.011
STATUS	1	59.000	2.099	.153
PHYSCD * STATUS	1	59.000	2.082	.154

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	49.000000	13.208507	59.000	3.710	.000	22.569839	75.430161
[PHYSCD=1]	35.607143	19.495736	59.000	1.826	.073	-3.403734	74.618020
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-17.5758	8.235586	59.000	-2.134	.037	-34.055126	-1.096389
[STATUS=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=1]	17.540043	12.155712	59.000	1.443	.154	-6.783480	41.863566
[STATUS=1] * [PHYSCD=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PHYSCD=3]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	4011.100	738.5034
	UN (2,1)	3765.107	794.7846
	UN (2,2)	5757.334	1060.011

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	84.589	12.428	59.000	59.721	109.457
3	40.212	11.448	59.000	17.305	63.119

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	44.377*	16.897	59.000	.011	10.567	78.188
3	1	-44.377*	16.897	59.000	.011	-78.188	-10.567

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	59.000	6.898	.011

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	57.998	8.136	59	41.717	74.279
POST	66.804	9.748	59.000	47.298	86.309

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-8.806	6.078	59.000	.153	-20.967	3.356
POST	PRE	8.806	6.078	59.000	.153	-3.356	20.967

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	59.000	2.099	.153

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	84.571	11.969	59.000	60.622	108.521
	POST	84.607	14.339	59.000	55.914	113.300
3	PRE	31.424	11.025	59.000	9.363	53.485
	POST	49.000	13.209	59.000	22.570	75.430

a. Dependent Variable: REFNO.

Test 10: Mixed Model Analysis (Post Hoc ORHS Years 1 and 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	STATUS	2	Unstructured	3	PHYSID	38
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	687.520
Akaike's Information Criterion (AIC)	693.520
Hurvich and Tsai's Criterion (AICC)	693.873
Bozdogan's Criterion (CAIC)	703.350
Schwarz's Bayesian Criterion (BIC)	700.350

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	36	59.318	.000
PHYSCD	1	36	1.107	.300
STATUS	1	36.000	3.781	.060
PHYSCD * STATUS	1	36.000	6.944	.012

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	36.684211	6.569994	36.000	5.584	.000	23.359645	50.008776
[PHYSCD=1]	-4.263158	9.291374	36	-.459	.649	-23.106939	14.580623
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-21.6316	6.680042	36.000	-3.238	.003	-35.179332	-8.083826
[STATUS=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=1]	24.894737	9.447006	36.000	2.635	.012	5.735321	44.054153
[STATUS=1] * [PHYSCD=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PHYSCD=3]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	753.8626	177.6871
	UN (2,1)	363.0789	144.3465
	UN (2,2)	820.1316	193.3069

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

				95% Confidence Interval	
PHYSCD	Mean	Std. Error	df	Lower Bound	Upper Bound
1	34.053	5.501	36	22.895	45.210
3	25.868	5.501	36	14.711	37.026

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	8.184	7.780	36	.300	-7.595	23.963
3	1	-8.184	7.780	36	.300	-23.963	7.595

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36	1.107	.300

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	25.368	4.454	36.000	16.335	34.402
POST	34.553	4.646	36	25.131	43.975

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-9.184	4.724	36.000	.060	-18.764	.395
POST	PRE	9.184	4.724	36.000	.060	-.395	18.764

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36.000	3.781	.060

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	35.684	6.299	36.000	22.909	48.459
	POST	32.421	6.570	36.000	19.096	45.746
3	PRE	15.053	6.299	36.000	2.278	27.828
	POST	36.684	6.570	36.000	23.360	50.009

a. Dependent Variable: REFNO.

Test 11: Mixed Model Analysis (Post Hoc FHS Year 1 versus 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	STATUS	2	Unstructured	3	PHYSID	40
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	795.388
Akaike's Information Criterion (AIC)	801.388
Hurvich and Tsai's Criterion (AICC)	801.741
Bozdogan's Criterion (CAIC)	811.218
Schwarz's Bayesian Criterion (BIC)	808.218

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	38.933	38.772	.000
PHYSCD	1	38.933	5.069	.030
STATUS	1	34.011	.464	.500
PHYSCD * STATUS	1	34.011	.004	.947

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	44.278938	18.626352	39.634	2.377	.022	6.622856	81.935020
[PHYSCD=1]	45.746617	25.998667	38.728	1.760	.086	-6.852452	98.345687
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-6.728938	13.064333	34.013	-.515	.610	-33.278491	19.820615
[STATUS=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=1]	1.203383	17.983389	34.011	.067	.947	-35.342827	37.749592
[STATUS=1] * [PHYSCD=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PHYSCD=3]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	3332.683	764.5699
	UN (2,1)	3428.983	936.0983
	UN (2,2)	6427.207	1496.553

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	87.263	14.479	38.285	57.960	116.566
3	40.914	14.633	39.574	11.331	70.498

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	46.348*	20.585	38.933	.030	4.709	87.988
3	1	-46.348*	20.585	38.933	.030	-87.988	-4.709

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	38.933	5.069	.030

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	61.025	9.128	38.000	42.547	79.503
POST	67.152	12.999	38.728	40.853	93.452

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-6.127	8.992	34.011	.500	-24.400	12.146
POST	PRE	6.127	8.992	34.011	.500	-12.146	24.400

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	34.011	.464	.500

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	84.500	12.909	38.000	58.368	110.632
	POST	90.026	18.138	37.760	53.299	126.752
3	PRE	37.550	12.909	38.000	11.418	63.682
	POST	44.279	18.626	39.634	6.623	81.935

a. Dependent Variable: REFNO.

Test 12: Mixed Model Analysis (Post Hoc Aggregate Years 1 and 2 versus 4 and 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	STATUS	2	Unstructured	3	PHYSID	61
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	1456.411
Akaike's Information Criterion (AIC)	1462.411
Hurvich and Tsai's Criterion (AICC)	1462.622
Bozdogan's Criterion (CAIC)	1473.723
Schwarz's Bayesian Criterion (BIC)	1470.723

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	59.000	57.656	.000
PHYSCD	1	59.000	7.111	.010
STATUS	1	59.000	.158	.692
PHYSCD * STATUS	1	59.000	1.509	.224

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	107.4848	29.406318	59.000	3.655	.001	48.642941	166.326756
[PHYSCD=1]	95.336580	43.403680	59.000	2.197	.032	8.486016	182.187144
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-16.2121	13.511760	59.000	-1.200	.235	-43.249090	10.824848
[STATUS=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=1]	24.497835	19.943337	59.000	1.228	.224	-15.408689	64.404360
[STATUS=1] * [PHYSCD=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PHYSCD=3]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	23787.58	4379.648
	UN (2,1)	23149.49	4537.424
	UN (2,2)	28536.14	5253.930

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	206.964	29.674	59.000	147.586	266.342
3	99.379	27.334	59.000	44.684	154.074

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	107.585*	40.345	59.000	.010	26.856	188.315
3	1	-107.585*	40.345	59.000	.010	-188.315	-26.856

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	59.000	7.111	.010

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	151.190	19.814	59.000	111.542	190.838
POST	155.153	21.702	59.000	111.728	198.578

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-3.963	9.972	59.000	.692	-23.916	15.990
POST	PRE	3.963	9.972	59.000	.692	-15.990	23.916

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	59.000	.158	.692

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	211.107	29.147	59.000	152.784	269.430
	POST	202.821	31.924	59.000	138.941	266.701
3	PRE	91.273	26.848	59.000	37.549	144.996
	POST	107.485	29.406	59.000	48.643	166.327

a. Dependent Variable: REFNO.

Test 13: Mixed Model Analysis (Post Hoc ORHS Years 1 and 2 versus 4 and 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	STATUS	2	Unstructured	3	PHYSID	38
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	805.811
Akaike's Information Criterion (AIC)	811.811
Hurvich and Tsai's Criterion (AICC)	812.164
Bozdogan's Criterion (CAIC)	821.641
Schwarz's Bayesian Criterion (BIC)	818.641

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	36.000	54.812	.000
PHYSCD	1	36.000	.259	.614
STATUS	1	36.000	.084	.773
PHYSCD * STATUS	1	36.000	3.278	.079

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	81.105263	15.068567	36.000	5.382	.000	50.544793	111.665733
[PHYSCD=1]	-5.473684	21.310172	36.000	-.257	.799	-48.692716	37.745347
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-13.7895	12.825989	36.000	-1.075	.289	-39.801786	12.222838
[STATUS=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=1]	32.842105	18.138688	36.000	1.811	.079	-3.944859	69.629070
[STATUS=1] * [PHYSCD=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PHYSCD=3]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	6052.728	1426.642
	UN (2,1)	3620.643	1043.785
	UN (2,2)	4314.173	1016.860

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	85.158	15.221	36.000	54.288	116.028
3	74.211	15.221	36	43.340	105.081

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	10.947	21.526	36.000	.614	-32.710	54.604
3	1	-10.947	21.526	36.000	.614	-54.604	32.710

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36.000	.259	.614

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	81.000	12.621	36.000	55.404	106.596
POST	78.368	10.655	36.000	56.759	99.978

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	2.632	9.069	36.000	.773	-15.762	21.025
POST	PRE	-2.632	9.069	36.000	.773	-21.025	15.762

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36.000	.084	.773

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	94.684	17.848	36.000	58.486	130.882
	POST	75.632	15.069	36.000	45.071	106.192
3	PRE	67.316	17.848	36	31.118	103.514
	POST	81.105	15.069	36.000	50.545	111.666

a. Dependent Variable: REFNO.

Test 14: Mixed Model Analysis (Post Hoc FHS Years 1 and 2 versus 4 and 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PHYSCD * STATUS	4		1		
Repeated Effects	STATUS	2	Unstructured	3	PHYSID	40
Total		11		7		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	935.287
Akaike's Information Criterion (AIC)	941.287
Hurvich and Tsai's Criterion (AICC)	941.621
Bozdogan's Criterion (CAIC)	951.279
Schwarz's Bayesian Criterion (BIC)	948.279

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	38.000	41.372	.000
PHYSCD	1	38.000	6.025	.019
STATUS	1	38.000	.600	.443
PHYSCD * STATUS	1	38.000	.076	.785

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	100.3000	38.082943	38.000	2.634	.012	23.205113	177.394887
[PHYSCD=1]	111.8000	53.857414	38.000	2.076	.045	2.771365	220.828635
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-13.6500	18.396565	38.000	-.742	.463	-50.891900	23.591900
[STATUS=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=1]	7.150000	26.016672	38.000	.275	.785	-45.518000	59.818000
[STATUS=1] * [PHYSCD=1]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PHYSCD=3]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	18562.61	4258.556
	UN (2,1)	20400.08	5012.075
	UN (2,2)	29006.21	6654.481

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

				95% Confidence Interval	
PHYSCD	Mean	Std. Error	df	Lower Bound	Upper Bound
1	208.850	33.236	38.000	141.568	276.132
3	93.475	33.236	38.000	26.193	160.757

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	115.375*	47.002	38.000	.019	20.224	210.526
3	1	-115.375*	47.002	38.000	.019	-210.526	-20.224

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	38.000	6.025	.019

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	146.125	21.542	38.000	102.515	189.735
POST	156.200	26.929	38.000	101.686	210.714

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-10.075	13.008	38.000	.443	-36.409	16.259
POST	PRE	10.075	13.008	38.000	.443	-16.259	36.409

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	38.000	.600	.443

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	205.600	30.465	38.000	143.926	267.274
	POST	212.100	38.083	38.000	135.005	289.195
3	PRE	86.650	30.465	38.000	24.976	148.324
	POST	100.300	38.083	38.000	23.205	177.395

a. Dependent Variable: REFNO.

Test 15: Mixed Model Analysis (Post Hoc ORHS Insurance Year 1 versus 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PAYCD	3		2		
	PHYSCD * STATUS	4		1		
	PHYSCD * PAYCD	6		2		
	STATUS * PAYCD	6		2		
	PHYSCD * STATUS * PAYCD	12		2		
Repeated Effects	WAVE	6	Unstructured	21	PHYSID	38
Total		42		33		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	1484.566
Akaike's Information Criterion (AIC)	1526.566
Hurvich and Tsai's Criterion (AICC)	1531.329
Bozdogan's Criterion (CAIC)	1618.447
Schwarz's Bayesian Criterion (BIC)	1597.447

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	36.000	59.318	.000
PHYSCD	1	36.000	1.107	.300
STATUS	1	36.000	3.781	.060
PAYCD	2	36.000	17.115	.000
PHYSCD * STATUS	1	36.000	6.944	.012
PHYSCD * PAYCD	2	36.000	2.597	.088
STATUS * PAYCD	2	36.000	1.557	.225
PHYSCD * STATUS * PAYCD	2	36.000	3.735	.034

a. Dependent Variable: REFNO.

Estimates of Fixed Effects[b]

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	4.473684	2.262240	36.000	1.978	.056	-.114351	9.061719
[PHYSCD=1]	-.578947	3.199290	36.000	-.181	.857	-7.067408	5.909514
[PHYSCD=3]	0[a]	0	.	.	.	.	.
[STATUS=0]	-4.210526	2.253515	36.000	-1.868	.070	-8.780867	.359815
[STATUS=1]	0[a]	0	.	.	.	.	.
[PAYCD=0]	18.473684	5.424501	36.000	3.406	.002	7.472287	29.475082
[PAYCD=1]	4.789474	3.366959	36.000	1.422	.163	-2.039035	11.617983
[PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=0]	.842105	3.186952	36.000	.264	.793	-5.621333	7.305544
[PHYSCD=1] * [STATUS=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [PAYCD=0]	.210526	7.671402	36.000	.027	.978	-15.347799	15.768852
[PHYSCD=1] * [PAYCD=1]	-2.736842	4.761599	36.000	-.575	.569	-12.393812	6.920128
[PHYSCD=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[STATUS=0] * [PAYCD=0]	-6.210526	5.609208	36.000	-1.107	.276	-17.586528	5.165476
[STATUS=0] * [PAYCD=1]	-2.789474	3.085750	36.000	-.904	.372	-9.047665	3.468717
[STATUS=0] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[STATUS=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=0] * [PAYCD=0]	21.473684	7.932619	36.000	2.707	.010	5.385588	37.561781
[PHYSCD=1] * [STATUS=0] * [PAYCD=1]	.894737	4.363909	36.000	.205	.839	-7.955682	9.745155
[PHYSCD=1] * [STATUS=0] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=1] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=1] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=1] * [STATUS=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=0] * [PAYCD=2]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1] * [PAYCD=0]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1] * [PAYCD=1]	0[a]	0	.	.	.	.	.
[PHYSCD=3] * [STATUS=1] * [PAYCD=2]	0[a]	0	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

b. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	727.9854	171.5878
	UN (2,1)	2.866959	15.795963
	UN (2,2)	12.327485	2.905616
	UN (3,1)	.267544	6.015679
	UN (3,2)	2.745614	.906736
	UN (3,3)	1.789474	.421783
	UN (4,1)	297.6754	107.2867
	UN (4,2)	-.396199	12.378928
	UN (4,3)	-.736842	4.717908
	UN (4,4)	447.4883	105.4740
	UN (5,1)	80.884503	50.388991
	UN (5,2)	25.121345	7.579459
	UN (5,3)	2.200292	2.434964
	UN (5,4)	87.384503	40.757123
	UN (5,5)	116.5731	27.476543
	UN (6,1)	-45.5775	44.988982
	UN (6,2)	2.638889	5.787077
	UN (6,3)	1.269006	2.208652
	UN (6,4)	-7.176901	34.786594
	UN (6,5)	-.790936	17.744972
	UN (6,6)	97.236842	22.918943

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	11.351	1.834	36.000	7.632	15.070
3	8.623	1.834	36.000	4.904	12.342

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	2.728	2.593	36.000	.300	-2.532	7.988
3	1	-2.728	2.593	36.000	.300	-7.988	2.532

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36.000	1.107	.300

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	8.456	1.485	36.000	5.445	11.467
POST	11.518	1.549	36.000	8.377	14.658

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	-3.061	1.575	36.000	.060	-6.255	.132
POST	PRE	3.061	1.575	36.000	.060	-.132	6.255

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36.000	3.781	.060

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PAYCD

Estimates[a]

PAYCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
COMMERCIAL	23.132	3.413	36.000	16.209	30.054
MEDICARE	4.539	1.086	36.000	2.338	6.741
OTHER	2.289	.817	36.000	.632	3.947

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PAYCD	(J) PAYCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
COMMERCIAL	MEDICARE	18.592*	3.253	36	.000	10.424	26.761
	OTHER	20.842*	3.608	36.000	.000	11.782	29.902
MEDICARE	COMMERCIAL	-18.592*	3.253	36	.000	-26.761	-10.424
	OTHER	2.250	1.326	36.000	.295	-1.079	5.579
OTHER	COMMERCIAL	-20.842*	3.608	36.000	.000	-29.902	-11.782
	MEDICARE	-2.250	1.326	36.000	.295	-5.579	1.079

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
2	36.000	17.115	.000

The F tests the effect of PAYCD. This test is based on th linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

4. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	PRE	11.895	2.100	36.000	7.636	16.153
	POST	10.807	2.190	36.000	6.365	15.249
3	PRE	5.018	2.100	36.000	.759	9.276
	POST	12.228	2.190	36.000	7.787	16.670

a. Dependent Variable: REFNO.

5. PAYCD * PHYSCD[a]

PAYCD	PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
COMMERCIAL	1	28.526	4.827	36	18.737	38.316
	3	17.737	4.827	36.000	7.947	27.527
MEDICARE	1	3.316	1.535	36.000	.202	6.430
	3	5.763	1.535	36.000	2.649	8.877
OTHER	1	2.211	1.156	36.000	-.134	4.555
	3	2.368	1.156	36.000	.024	4.713

a. Dependent Variable: REFNO.

6. PAYCD * STATUS[a]

PAYCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
COMMERCIAL	PRE	23.500	4.377	36.000	14.623	32.377
	POST	22.763	3.432	36.000	15.804	29.723
MEDICARE	PRE	1.474	.570	36.000	.319	2.629
	POST	7.605	1.751	36.000	4.053	11.157
OTHER	PRE	.395	.217	36.000	-.045	.835
	POST	4.184	1.600	36.000	.940	7.428

a. Dependent Variable: REFNO.

7. PAYCD * PHYSCD * STATUS[a]

PAYCD	PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
						Lower Bound	Upper Bound
COMMERCIAL	1	PRE	34.474	6.190	36	21.920	47.027
		POST	22.579	4.853	36.000	12.737	32.421
	3	PRE	12.526	6.190	36.000	-.027	25.080
		POST	22.947	4.853	36.000	13.105	32.790
MEDICARE	1	PRE	.684	.805	36.000	-.949	2.318
		POST	5.947	2.477	36.000	.924	10.971
	3	PRE	2.263	.805	36.000	.630	3.897
		POST	9.263	2.477	36.000	4.240	14.287
OTHER	1	PRE	.526	.307	36.000	-.096	1.149
		POST	3.895	2.262	36.000	-.693	8.483
	3	PRE	.263	.307	36.000	-.359	.886
		POST	4.474	2.262	36.000	-.114	9.062

a. Dependent Variable: REFNO.

Test 16: Mixed Model Analysis (Post Hoc ORHS Insurance Years 1 and 2 versus 4 and 5)

Model Dimension[a]

		Number of Levels	Covariance Structure	Number of Parameters	Subject Variables	Number of Subjects
Fixed Effects	Intercept	1		1		
	PHYSCD	2		1		
	STATUS	2		1		
	PAYCD	3		2		
	PHYSCD * STATUS	4		1		
	PHYSCD * PAYCD	6		2		
	STATUS * PAYCD	6		2		
	PHYSCD * STATUS * PAYCD	12		2		
Repeated Effects	WAVE	6	Unstructured	21	PHYSID	38
Total		42		33		

a. Dependent Variable: REFNO.

Information Criteria[a]

-2 Restricted Log Likelihood	1846.266
Akaike's Information Criterion (AIC)	1888.266
Hurvich and Tsai's Criterion (AICC)	1893.029
Bozdogan's Criterion (CAIC)	1980.146
Schwarz's Bayesian Criterion (BIC)	1959.146

The information criteria are displayed in smaller-is-better forms.

a. Dependent Variable: REFNO.

Fixed Effects

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	36.000	54.812	.000
PHYSCD	1	36.000	.259	.614
STATUS	1	36.000	.084	.773
PAYCD	2	36.000	18.939	.000
PHYSCD * STATUS	1	36.000	3.278	.079
PHYSCD * PAYCD	2	36.000	2.771	.076
STATUS * PAYCD	2	36.000	4.339	.020
PHYSCD * STATUS * PAYCD	2	36.000	2.234	.122

a. Dependent Variable: REFNO.

Covariance Parameters

Estimates of Covariance Parameters[a]

Parameter		Estimate	Std. Error
Repeated Measures	UN (1,1)	4577.269	1078.873
	UN (2,1)	203.6257	170.3151
	UN (2,2)	219.0819	51.638092
	UN (3,1)	94.581871	171.7631
	UN (3,2)	214.9401	51.802508
	UN (3,3)	230.0819	54.230817
	UN (4,1)	2463.759	709.3102
	UN (4,2)	155.4576	129.1581
	UN (4,3)	105.5848	130.8589
	UN (4,4)	2630.880	620.1044
	UN (5,1)	497.2749	245.3875
	UN (5,2)	268.0219	67.444358
	UN (5,3)	258.5789	67.370703
	UN (5,4)	486.1418	192.9419
	UN (5,5)	419.5643	98.892260
	UN (6,1)	-269.466	216.5427
	UN (6,2)	49.502924	47.072953
	UN (6,3)	91.929825	49.903754
	UN (6,4)	-83.5892	161.2024
	UN (6,5)	52.846491	64.736542
	UN (6,6)	352.9298	83.186357

a. Dependent Variable: REFNO.

Estimated Marginal Means

1. PHYSCD

Estimates[a]

PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	28.386	5.074	36.000	18.096	38.676
3	24.737	5.074	36.000	14.447	35.027

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PHYSCD	(J) PHYSCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
1	3	3.649	7.175	36.000	.614	-10.903	18.201
3	1	-3.649	7.175	36.000	.614	-18.201	10.903

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36.000	.259	.614

The F tests the effect of PHYSCD. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

2. STATUS

Estimates[a]

STATUS	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE	27.000	4.207	36.000	18.468	35.532
POST	26.123	3.552	36.000	18.920	33.326

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) STATUS	(J) STATUS	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
PRE	POST	.877	3.023	36.000	.773	-5.254	7.008
POST	PRE	-.877	3.023	36.000	.773	-7.008	5.254

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
1	36.000	.084	.773

The F tests the effect of STATUS. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

3. PAYCD

Estimates[a]

PAYCD	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
COMMERCIAL	61.750	8.935	36.000	43.628	79.872
MEDICARE	10.513	2.780	36.000	4.875	16.151
OTHER	7.421	2.246	36.000	2.866	11.976

a. Dependent Variable: REFNO.

Pairwise Comparisons[b]

(I) PAYCD	(J) PAYCD	Mean Difference (I-J)	Std. Error	df	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
COMMERCIAL	MEDICARE	51.237*	8.361	36.000	.000	30.242	72.231
	OTHER	54.329*	9.322	36.000	.000	30.921	77.736
MEDICARE	COMMERCIAL	-51.237*	8.361	36.000	.000	-72.231	-30.242
	OTHER	3.092	2.280	36.000	.550	-2.632	8.816
OTHER	COMMERCIAL	-54.329*	9.322	36.000	.000	-77.736	-30.921
	MEDICARE	-3.092	2.280	36.000	.550	-8.816	2.632

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

b. Dependent Variable: REFNO.

Univariate Tests[a]

Numerator df	Denominator df	F	Sig.
2	36.000	18.939	.000

The F tests the effect of PAYCD. This test is based on th linearly independent pairw ise comparisons among the estimated marginal means.

a. Dependent Variable: REFNO.

4. PHYSCD * STATUS[a]

PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Low er Bound	Upper Bound
1	PRE	31.561	5.949	36.000	19.495	43.627
	POST	25.211	5.023	36.000	15.024	35.397
3	PRE	22.439	5.949	36.000	10.373	34.505
	POST	27.035	5.023	36.000	16.848	37.222

a. Dependent Variable: REFNO.

5. PAYCD * PHYSCD[a]

PAYCD	PHYSCD	Mean	Std. Error	df	95% Confidence Interval	
					Low er Bound	Upper Bound
COMMERCIAL	1	73.000	12.636	36.000	47.372	98.628
	3	50.500	12.636	36.000	24.872	76.128
MEDICARE	1	6.632	3.931	36.000	-1.342	14.605
	3	14.395	3.931	36.000	6.421	22.368
OTHER	1	5.526	3.177	36.000	-.916	11.969
	3	9.316	3.177	36.000	2.873	15.758

a. Dependent Variable: REFNO.

6. PAYCD * STATUS[a]

PAYCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
COMMERCIAL	PRE	69.211	10.975	36.000	46.952	91.469
	POST	54.289	8.321	36.000	37.414	71.165
MEDICARE	PRE	6.526	2.401	36.000	1.657	11.396
	POST	14.500	3.323	36.000	7.761	21.239
OTHER	PRE	5.263	2.461	36.000	.273	10.254
	POST	9.579	3.048	36.000	3.398	15.760

a. Dependent Variable: REFNO.

7. PAYCD * PHYSCD * STATUS[a]

PAYCD	PHYSCD	STATUS	Mean	Std. Error	df	95% Confidence Interval	
						Lower Bound	Upper Bound
COMMERCIAL	1	PRE	88.474	15.521	36.000	56.995	119.952
		POST	57.526	11.767	36.000	33.661	81.391
	3	PRE	49.947	15.521	36.000	18.469	81.426
		POST	51.053	11.767	36.000	27.188	74.918
MEDICARE	1	PRE	3.053	3.396	36.000	-3.834	9.939
		POST	10.211	4.699	36.000	.680	19.741
	3	PRE	10.000	3.396	36.000	3.113	16.887
		POST	18.789	4.699	36.000	9.259	28.320
OTHER	1	PRE	3.158	3.480	36.000	-3.900	10.215
		POST	7.895	4.310	36.000	-.846	16.636
	3	PRE	7.368	3.480	36.000	.311	14.426
		POST	11.263	4.310	36.000	2.522	20.004

a. Dependent Variable: REFNO.

VITA

Joy Ann Bruce was born on June 23, 1971, in Park Ridge, Illinois, and is an American citizen. She graduated from Mills E. Godwin High School, Richmond, Virginia, in 1989. She received her Bachelor of Arts in Germanic Language from the University of Virginia, Charlottesville, Virginia, in 1993. She received her Master of Science in Physical Therapy from North Georgia College and State University, Dahlonega, Georgia, in May 2000. Following graduation from physical therapy school, she worked as a physical therapist for Southern Regional Medical Center in Riverdale, Georgia; Shepherd Center in Atlanta, Georgia; Thoms Rehabilitation Hospital in Asheville, North Carolina; Haywood Regional Medical Center in Clyde, North Carolina; and Mission Hospitals in Asheville, North Carolina. In 2006, she returned to North Georgia College and State University to become an Assistant Professor in the Department of Physical Therapy where she was an instructor in cardiovascular and pulmonary rehabilitation, wound and burn care, neurological rehabilitation, and orthoses and prostheses. In 2008 she left her academic appointment, and she now works full-time as a physical therapist and clinical researcher with Shepherd Center in Atlanta, Georgia. In 2008, she received her clinical specialist certification in neurological rehabilitation from the American Physical Therapy Association.