PHYSICIAN PRACTICE ALIGNMENT AND PERFORMANCE: MULTIVARIATE MODELING WITH PANEL DATA

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

List of Tables

Page

List of Figures

Page

Abstract

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Recognizing differences between current physician practice and optimal organization practice is crucial in order for physicians to develop and implement adaptive strategies designed to optimize performance of their duties. Implementing medical practice realignment strategies are expected to affect change in physician performance, particularly related to earnings and career satisfaction. Few multivariate methods and models incorporate specific exogenous and endogenous factors influencing physicians' earnings and job satisfaction. This research seeks to examine environment in relation to improvements in physicians' practice alignment and identify exogenous and endogenous factors associated with increasing performance measured by income and job satisfaction.

The structural equation model was specified employing a contingency-based strategic adaptation model. Structural equation modeling was performed with data from

the two-wave physician surveys conducted by the Community Tracking Study (CTS) conducted by the Center for Studying Health System Change, in 1996/7 and 1998/9, as well as from the Area Resource File (ARF) for 1997. Four thousand seven hundred and eighty-four complete survey responses were used in the analysis. The model examines the effect of physician practice environment on congruence to and strategies to adapt to the practice environment and subsequent effect on earnings and job satisfaction.

Multivariate analysis indicates that personal, community, and organization characteristics of physician practice associate significantly to perception of practice enhancement, earnings, and job satisfaction. The endogenous latent constructs of perceived enhancers (to practice), practice changes, and accepting new patients are significant and useful additions to analytic models when assessing physician income and job satisfaction. An interesting finding revealed that effective care management and pay for performance incentives were key drivers of perceived enhancers to medical practice. The greater the perceived enhancement the less income and higher the job satisfaction was reported. One finding that reflects a stereotype is; older white male physicians in rural solo practice that graduated from a U.S. medical school are less likely to perceive the need for practice change, less likely to actually change their practice approach, and experience lower income while accepting greater numbers of all patient payment types.

This study provides a new multivariate method for policy makers, researchers and managers to assess physician practice alignment, earnings, and job satisfaction. The study also provides a unique approach for testing and validating the contingency-based

strategic adaptation method of physician performance assessment. Further research using this approach can be useful in understanding physician pay for performance programs.

CHAPTER 1: INTRODUCTION

Physicians play a crucial and central role in the delivery of health care. Studies analyzing physician morale, synonymous with job satisfaction, have revealed recent changes in their reported job satisfaction over recent history. The evolution of the medical market place has influenced those changes. Environmental uncertainty and managed care have substantially affected physician practices while altering the health care delivery system in the United States. However, little is known about how physicians are aligning their practice with the changing health care environment and how such practice alignments influence their earnings and their job satisfaction.

Alignment is the process of change and reorientation of the physician's professional practice methods and approach to patient care with the goal being congruence with the practice environment. The structural relationships among physicians' practice environment, their adaptive alignments and their performance should be studied so strategies can be formed to optimize physician satisfaction and performance. However, much remains to be learned about the relationship between physician contextual practice alignment and performance in terms of earnings, career success, and job satisfaction. In this study, performance is a construct determined by the weight and values of earnings and job satisfaction as viewed by a physician, administrator, or researcher.

The Study Problem

It is often presumed that under managed care pressure, physicians are concerned not only about the effectiveness of care management and their own professional autonomy, but also about their financial compensation (Burdi, 1997, Glymour, 2004, Schulz, 1988). Physicians' career success and their job satisfaction with practice may depend on their perceptions of care management's effectiveness and its impact on their practice autonomy, as well as on the extent to which they are involved in managed care in the practice.

Physicians may perceive their satisfaction as correlated with effective clinical practice. However, Atul Gawande (2002), writing in *Complications*, points out, "Most physicians believe that diagnosis can't be reduced to a set of generalizations—to a 'cookbook.' How often does my intuition lead me astray? The radical implication of the Swedish study [Hede'n, 1996] is that the individualized, intuitive approach that lies at the center of modern medicine is flawed—it causes more mistakes than it prevents." Thus, there may well be conflicts among the core practice beliefs of physicians, the organizations designed by physicians to frame their delivery of health care subsequent to those beliefs, as well as possibly the patient outcomes resulting from physicians' care and society's reactions to the health care received. It is entirely plausible to suspect that such collisions influence measures of physician career satisfaction. Several studies document the relationship between effective clinical practice and satisfaction (Fennig et al., 2000; Konard et al., 1999; Schulz and Schulz, 1988). Physicians' personal characteristics such as how effectively they use the tools of care management, their involvement in managed

care arrangements, and their openness to accepting new patients, contextual factors influencing their practice and career satisfaction are important to study. Examining environmental changes in relation to change over time in physicians' practice alignment and the likelihood of increasing performance measured by earnings and job satisfaction may help identify specific exogenous and endogenous factors influencing their earnings and job satisfaction.

Scope of the Study

The study of physicians' practice and their fulfillment in terms of earnings and job satisfaction should examine a comprehensive list of covariates and their interactive effects on earnings and job satisfaction. The dynamic, analytical model developed here can be validated using panel data gathered from the two-wave physician surveys conducted by the Community Tracking Study of the Center for Studying Health System Change. Specifically, this research will identify physicians' practice alignments and the contextual factors that are conducive to their practice earnings and job satisfaction. The theoretical underpinnings for such a study are found in the literature of contingency theory.

Significance and Objectives of the Study

This study makes substantive and methodological contributions identifying the factors influencing physician performance, particularly related to their earnings and job satisfaction. Furthermore, it will help generate useful information about the practice changes that can enhance physicians' satisfaction with their practice, with implications for also stabilizing the delivery of health care.

In theoretical terms, this study provides insight on the dynamic relationships among the managed care environment, practice-related factors, and reported physicians' job satisfaction. The study yields information on how the alignment of physicians' practice with the environment may enhance their earnings and job satisfaction which contributes to improvement in physician performance. It seeks to identify mechanisms for improving physicians' job satisfaction by taking into account the turbulent healthcare environment. Thoroughly investigating the underlying mechanisms for promoting physician productivity, earnings, and satisfaction will enable predictions of what strategies may maximize practice alignments. Understanding the contingency relationships among the determinants of physician earnings and satisfaction may point toward realistic strategies for promoting effective performance of physicians. For example, the study's framework will delineate such key factors as physicians' perception of their practice environments, and their practice alignment, which may mediate the relationship between contextual (ecological) factors and physicians' earnings and satisfaction. Ultimately, this study sheds important light on how to enhance physician practices in a changing health care environment. The study's behavioral systems approach will also help to generate future empirical research questions and hypotheses.

Methodologically, this study considers various theoretical constructs or latent variables to be assessed for construct validity and reliability before performing a series of structural equation models. Prior research on the aspects of physician practice considered here has concentrated mostly on cross-sectional analysis of physician earnings and job satisfaction. However, the causal sequelae of multiple predictors of physician practice

cannot be delineated from cross-sectional data or correlation analysis. With the two-wave data available from a panel of practicing physicians, multivariate analysis of the determinants of physicians' practice and their success in terms of earnings and satisfaction enables understanding of the causal links among personal and contextual factors, practice alignment, and physician earnings and satisfaction. Little is known about such behavioral response as related to those achievements.

Practically, in a turbulent health care environment, it is hard to keep providers content, productive, committed to practice improvement, and satisfactorily reimbursed. There is an urgent and critical need to formulate reimbursement policies or incentive plans for physicians that will do so. Many different non-monetary incentive and pay for performance plans are being introduced to physicians. This study is an effort to analyze multiple factors that may enhance or obstruct physicians' perceptions of satisfaction and their earnings that constitute the construct called performance. The practical relevance of this research is the prospect of much needed information to guide health care administrators and decision makers to improve physician practice. Using an evidence-based approach, the study identifies mechanisms that work or do not work as strategies to improve physicians' job satisfaction and earnings.

Analytic Approach: Contingency-Based Framework

Examination of the determinants of physician performance under a contingency perspective will contribute new knowledge to explain the variations in physicians' earnings and job satisfaction. This examination will be performed in the context of practice alignment. Important factors in this context are perceived enhancers or obstacles

to the construct called performance. In this theoretical framework, personal and contextual factors are considered the exogenous factors influencing physicians' perceptions of the practice environment and strategies, those adaptive responses that may enhance or obstruct performance, and improvements in income and career satisfaction. The practice alignment activities and perceptions mediate changes in the relationship between the contextual factors related to physicians' performance and is seen in Figure 1. An additional possibility is the direct influence personal and contextual factors may have on performance.

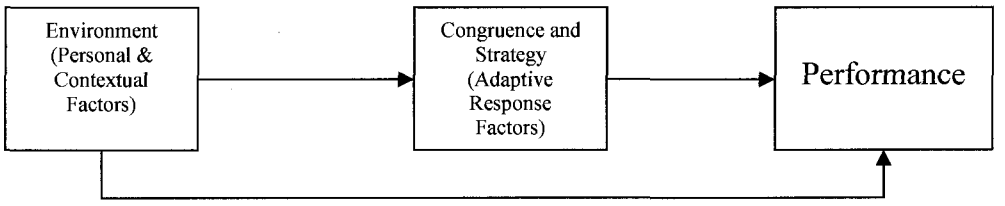


Figure 1: Contingency Perspective of Physician Performance: A Theoretical Framework

Research Questions

The context-adaptive alignment-performance framework, described in Figure 1, leads to the development of a major research question: Can the perceived practice enhancers (effective care management, practice autonomy, and compensation incentives) or the obstacles to effective medical care management directly influence physician performance markers such as career satisfaction and income? To answer that question, this research will further examine how influences of practice alignment influence physicians' earnings and job satisfaction. Specifically, these additional research questions are presented:

1. Do perceived care management effectiveness, practice autonomy, and provisions for incentives influence physicians' practice alignments?
2. Can past practice behavior predict the physician's future practice behavior?
3. Can age, gender, specialty, practice setting, and/or geographic location of the physician practice explain the variations in physicians' perceptions of practice enhancers?
4. Do increased physician earnings positively affect job satisfaction, when other things are held constant?
5. Will perceived practice enhancement, a latent variable, be reflected by compensation, autonomy, care management effectiveness, use of computers to obtain and record data, and utility of practice guidelines, to improve earnings and job satisfaction?
6. Does physicians' practice alignment, a latent variable, which is a common factor shared by a series of practice changes in the workload, hours worked, practice size, practice location, practice specialty, accepting new patients, and accepting Medicaid, directly impact earnings and job satisfaction.

These questions will be empirically examined from panel data obtained from a national survey conducted by the Community Tracking Study for the Center for Studying Health System Change.

Organization of Chapters

This dissertation comprises five additional chapters. Chapter 2 reviews the literature on physician satisfaction. The focus of the literature reviewed first is on parameters of physicians' earnings and satisfaction and how those parameters relate to personal and contextual, and adaptive response factors. Literature highlighting the

relevant components and aspects of the contingency perspective as they apply to those aspects of physicians' experience are presented next. Lastly, the mixed results of literature researching physician satisfaction and earnings related to the construct of performance will be presented.

Chapter 3 begins with a review of the contingency perspective. The basis for a contingency-based adaptation performance model is then presented. This is accomplished through the translation of four key constructs to individual constructs. Then the chapter presents the analytical model. The chapter's last section proposes hypotheses based upon the structural contingency model.

Chapter 4 reviews the research design, data sources, sampling issues, variable measurements, and structural equation model analysis. This chapter also addresses the analytical relationships among the constructs of personal and contextual factors, adaptive response factors, and physician performance.

Chapter 5 presents the study findings. They include results from descriptive statistics, exploratory and factor analysis. Lastly, findings from the structural equation model will be presented.

Chapter 6 summarizes and addresses the findings, including the implications of the research. The chapter's final section will identify and address limitations of the study and suggest future directions and questions for study.

CHAPTER 2: LITERATURE REVIEW

Important subject areas in the literature related to this study will be reviewed and findings presented in this chapter. The first section reviews general literature on contingency approaches assessing performance and satisfaction. The second section begins to focus on physicians' personal and contextual factors related to adaptive response strategies in the context of physician performance. The third section will delve further into the literature of physician adaptive or alignment response strategies related to performance. Then a fourth section presents literature on personal and contextual factors related to physician performance in terms of earnings and satisfaction.

Introduction

This framework works well in assessing organizations and their characteristics. However, the present study focuses on individual physicians and their performance in terms of earnings and satisfaction. An adaptation of the contingency framework to the personal measurement and modeling of job satisfaction utilizes a contingency approach that mediates personal and contextual factors by certain constructs resulting in the variation in earnings and job satisfaction. Together, earnings and job satisfaction are viewed as an individual performance measure.

Many investigators have studied career or job satisfaction. Invariably, the motivation for such study is the presumed link between satisfaction and performance in

terms of professional goals. An important contributor to job satisfaction is believed to be the expectation and influence of financial reimbursement. Classic work by Herzberg (Herzberg, 1959) formulated two broad concepts: hygienes (extrinsic) and motivators (intrinsic), valuable for the understanding of satisfaction. Personal perceptions of work values, relationships with others, and incentives constitute intrinsic factors. Work environment and context describe extrinsic factors (Akroyd, et al., 1994; Koelbel, Fuller, Misener, 1991).

Porter and Lawler (Lawler, Porter, 1967) also developed a systems view of job satisfaction as influenced by both intrinsic and extrinsic factors. The Porter-Lawler performance model emphasizes the probability of effort leading ultimately to a reward coupled with the person's valuation of the reward. Figure 2 describes that performance model.

The Porter-Lawler model is insufficient for this research because it omits the notions of personal and contextual environmental factors, as well as other mediating elements that influence satisfaction. Personal factors, too, can be classified as intrinsic or extrinsic. Intrinsic factors are personal perceptions of work values, incentives, and relationships with others; extrinsic factors relate to context and the work environment (Akroyd et al., 1994; Koelbel, Fuller, & Misener, 1991).

Much has been written about the practice structure of physician organizations. Kennedy and Wofford (1998) examined three models of health care organizations

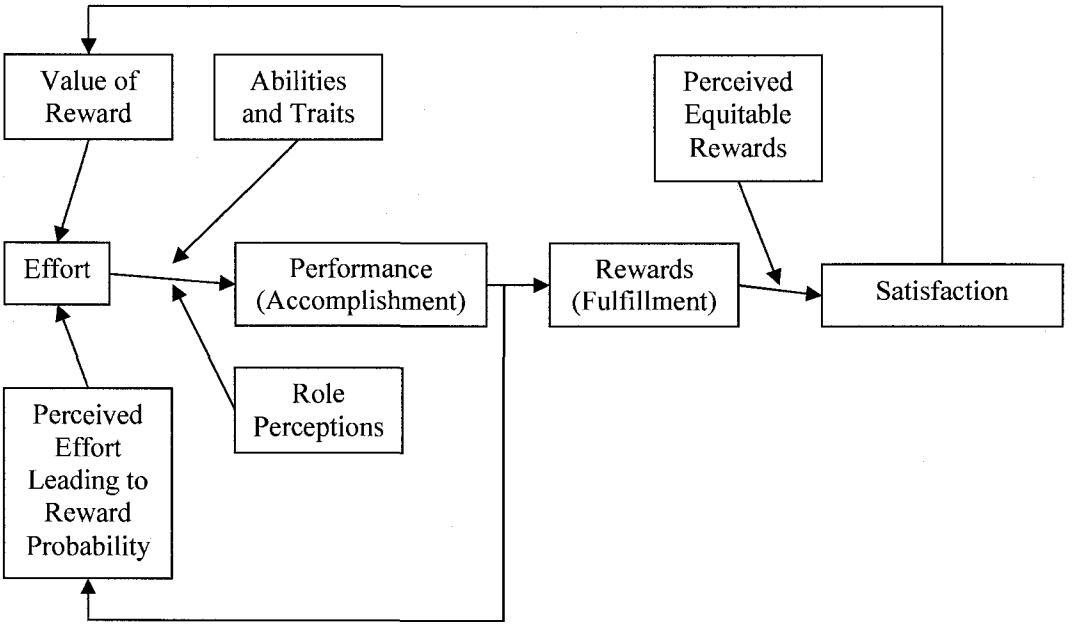


Figure 2: Porter-Lawler Performance Model

in which physicians shared in the success of the enterprise, comparing them in ownership, governance, and funds flow. The authors found that the shared equity model of physician practice could avoid declines in physician productivity and poor morale, and large operating losses.

Wood and Matthews (1997) stated that many physician group practices had increased expenses and reduced productivity when the practices were acquired by hospitals and integrated delivery systems. Those authors suggested that reviewing and benchmarking practice costs for physician compensation plans, staff, supplies and malpractice insurance could reverse such unfavorable trends in physician practice.

An abundance of industrial research has been conducted on career/job satisfaction, but relatively less is known about physician career satisfaction as influenced

by the factors mentioned above. The following literature review is organized under the constructs framework of context, adaptive response factors involving perceived enhancements and alignment, and performance to examine empirical evidence about the relationships between physician job satisfaction and performance.

Personal & Contextual Factors Related to Adaptive Response

Williams et al. (2003) describe the ideal circumstances for a physician working in ambulatory care as having good relationships with the staff and with colleagues, the ability to control time off, adequate material resources, and autonomy in decision-making. The authors also point out the importance of physicians' job satisfaction for their behavior. They used a sampling frame constructed from the American Medical Association's Physician Master File in the United States, and stratified into geographic regions of high and low penetration by managed care; non-Hispanic white vs. other physician ethnicity; and five specialty groupings. They reported that physicians' perceived stress is negatively related to their job satisfaction, and that job satisfaction is positively associated with physicians' mental health.

Personal contextual factors used in this research are those individual, community, and organizational characteristics associated with each physician. These are exemplified by demographic factors such as years in practice, race, location of the medical school from which the physician graduated, metropolitan statistical area location of practice, and gender. The physician's choice of practice size, exemplified by solo or non-solo practice type is also an important context included in the consideration of the physician's practice environment.

Physician satisfaction varies by gender. For example, female physicians were found to be generally satisfied with their career (Frank et al., 1999). They are more likely than male physicians to be generalists or primary care physicians, but also to be dissatisfied with the amount of time available to spend with patients and colleagues, and with their ability to stay knowledgeable (Collins, Schoen, and Khoransanizadek, 1997). Another study, however, found that female physicians are more likely than male physicians to report satisfaction with their specialties and with patient and colleague relationships (McMurray et al., 1997).

Schulz et al. (1992) surveyed all 850 physicians in Dane County Wisconsin, in 1986 and discovered that age as well as gender accounted for the differences in satisfaction. Other studies also have identified age as influencing physician satisfaction (Burdi and Baker, 1997; Schulz, Girad, and Scheckler, 1992; Leigh et al., 2003). Generally positive satisfaction related to age in a bi-modal way. Physicians with few years of practice and many years of experience expressed satisfaction with their career. Naiveties of newness and acceptance of ones' status explains some of this satisfaction. However, physicians in their middle years of practice expressed the greatest amount of career dissatisfaction. Middle career physicians perceive themselves to have lost the most career satisfaction because of practice influences beyond their control.

Physician satisfaction has been examined in both academic and practice fields for decades. At the end of the 1980s, however, when managed care had transformed the physicians' work environment, Reames and Dunstone (1989) interviewed nineteen physicians to identify the problems they faced: loss of autonomy (i.e., physicians' control

over medical decisions), loss of control over the referral process, the threat of malpractice suits, ethical issues facing physicians in health maintenance organizations, and reduced income. These concerns have been empirically investigated. Burdi and Baker (1997) using a 1991 and 1996 survey of California physicians analyzed the level of physician satisfaction and autonomy. Autonomy was measured as physicians' perceived freedom to undertake eight identified activities of patient care. They found that in 1996 the young physicians were significantly less satisfied with their ability to spend enough time on patient care. Warren, Weitz, and Kulis (1998) surveyed 510 Arizona physicians and found that they were more likely to be satisfied under these conditions: when they themselves wrote the orders that non-physicians must follow, when they were paid what they wanted, when patients had more confidence in them, and when they did not have to subordinate their clinical judgment to that of non-physicians.

Surveying 189 young physicians in the group and staff models of HMOs, Baker et al. (1994) found that the most important factor influencing physician satisfaction is the extent of perceived autonomy. However, neither working hours nor yearly income were found by that study to be significantly related to physician satisfaction. Similarly, in investigating the threat that bureaucratization of medical practice may lead to job dissatisfaction, Schulz et al. (1992) surveyed all 850 physicians in Dane County Wisconsin in 1986 to discover their perceptions about clinical freedom; their satisfaction with income, status in their profession, autonomy, resources, and professional relations; and their overall satisfaction. The authors found that perceptions of clinical autonomy and their specific organizational settings were more predictive of satisfaction than other

factors were. Age and gender, however, also contributed to the differences in satisfaction. Group size highlighted by another author (Hueston, 1998) was noted to influence job satisfaction.

Job satisfaction is, not surprisingly, inversely related to intention to leave the job, to reduce work hours, to change specialty, or to leave direct patient care. Pathman et al. (2002), investigating five physician groups, two specialty clusters and three age groups, found fourteen instances in which physicians in the lowest satisfaction quartile were more likely than those with average satisfaction to anticipate leaving. In only two cases, however, were physicians in the highest satisfaction quartile less likely to anticipate leaving. In nearly all the physician groups, relative dissatisfactions with pay and with relationships with their communities were associated with plans for leaving. For certain specialty and age groups, anticipated departure correlated with relative dissatisfaction with other selected areas of physicians' work.

Other studies have found levels of job satisfaction to be related to the following factors: medical abilities (Weinberg and Engasser, 1996); work stress, workload, religion favored, race/ethnicity, (Frank et al., 1999); specialty (Leigh et al., 2003; Bates et al., 1998; Landon, Reschovsky, and Blumenthal, 2003); professional control (Dunstone and Reames, 2001); specialty training certification (Fennig et al., 2000); practice settings (Breslau, Novack & Wolg, 1978); region (Leigh et al., 2003); managed care penetration (Hadley and Mitchell, 1997); and perceptions of the health care environment (Magee and Hojat, 2001). Physicians that perceive they are asked or required to perform functions beyond their medical competency comfort level report lower levels of job satisfaction.

Higher work loads and perceived work stress are related to lower job satisfaction. Physicians practicing in specialty areas that have a sense of control in their practice report higher levels of job satisfaction. The literature reinforces the linkage between personal and contextual factors and perceived enhancers or perceived obstacles to efforts to align themselves in their professional practice.

Adaptive Response Related to Performance

Perceived Enhancers/Obstacles to Performance

Additional contextual factors playing an important part relating to adaptive response by physicians are conceived here as encompassing the constructs of the ability to perceive the need for change and making changes to the practice. With respect to the construct of perception; effective time management, effective medical care management, and compensation incentive measures describe the difficult to measure notion of perception.

The construct of adaptation response by physicians in this study is comprised of two latent endogenous variables called practice changes and accepting new patients. Practice changes encompass measures that can be changed in response to or anticipation of changes in the numbers and classes of patients seen in the medical practice. These measures involve quantity and type of labor employed, role of the members of the organization, and the style or type of medical practice delivered as a result of market and/or contractual forces. The construct of practice changes is paired with accepting new patients because, in part, of the co-relationship and interdependence of the two. Clearly, changing the number and payer classification mix of patients will induce a change in the

medical practice. Additionally, changing the components of medical practice can impact the willingness and ability to change the mix of patients in the client pool.

Several studies have pointed out the effect of managed care involvement on physician practice and satisfaction. Surveying the attitudes about payment of members of a physician-hospital organization at an urban teaching hospital in 1996 and 1997, Nadler et al. (1999) found that in 1997, physicians were more satisfied with both fee-for-service and capitation methods of payment than they had been in 1996. In both years, however, fee-for-service was favored over capitation. After a year of experience, although satisfaction with capitation had improved, the perceived differences between capitation and fee-for-service had increased as well. In another study, of a large, academic, tertiary care hospital, Tyrance et al. (1999) found that physicians felt more dissatisfied with their ability to care for patients under capitation as compared to fee-for-service patients, especially in terms of their freedom to order necessary tests and make referrals. Multiple logistic regression found that a physician's overall satisfaction was predicted by the following: patient load (Odds Ratio (OR) = 2.7, 95% Confidence Interval (CI) = 1.9-3.9), efficiency in resource utilization (OR = 1.5, 95% CI = 1.1-2.1), perceived employment stability (OR = 1.7, 95% CI = 1.3-2.2), and control over clinical time schedule (OR = 1.6, 95% CI = 1.2-2.0).

Schulz et al. (1997) surveyed all Dane County Wisconsin physicians in active HMO practice in 1986 and again in 1993, and found that primary care physicians were more satisfied than sub-specialists were with their HMO practices, in terms of income and clinical freedom. Declining satisfaction with fee-for-service practice may be

explained by diminishing clinical freedom under insurance companies and increasing micromanagement of patient care.

Using a stratified random sample of 5,704 primary care and specialty care physicians, Linzer et al. (2000) found that of the 2,326 respondents, group and staff HMO physicians reported significantly higher satisfaction with autonomy and with administrative issues than did these other practice types: solo, small group, large group, or academic. The analysis controlled for specialty, gender, ethnicity, full-time versus part-time status, and time pressure during office visits. A study of market-level HMO activities with a national representative sample of physicians younger than 45 who had 2 to 9 years of practice experience in 1991 found no evidence that increased HMO activity adversely affected physician autonomy. The study found only limited evidence that increased HMO activity reduces the satisfaction of specialist physicians, and no evidence that market-level HMO activities affected the satisfaction of generalists (Burdi and Baker, 1997).

In examining the relationships of professional autonomy, compensation, and managed care with physician career satisfaction, Stoddard et al. (2001) analyzed cross-sectional data generated from the 1996-97 Community Tracking Study; a telephone survey of 12,385 physicians. Multivariate analyses demonstrated that, after controlling for all other factors, traditional core professional values and autonomy are the most important determinants of career satisfaction. Relative income was also found to be an important independent predictor. Managed care, as measured by its proportion of patient

revenues was shown to have an indirect negative effect on satisfaction through professional autonomy, but not through the resulting income reduction.

Care management structure is a construct that can be defined in many ways. Yet in most cases, practice structure is the underlying tenet of successful care management. The general structure of physician care management is described by fundamental components of office practice that are universally recognized, adopted, and utilized by physicians in conformed ways. Simply put, care management structure are those people and things required to run a physician office practice. Examples of the fixed components for establishing and maintaining a practice are: office space, clerical support staff, professional liability and business insurance, professional support staff, and support technology, among others.

Over time, managed care penetration into physicians' practices and care delivery has altered behaviors and habits (Baker and Cantor, 1993). In particular, evidence-based health care has become a major driving force for changing patterns of health care (Gray, 1998; Wan, 2001). Managed care has embraced various forms of evidenced based performance as preferred methods of operation. Innovative care management technologies evolved under the pressures for more effective as well as cost-efficient modalities of integrated care. In several research projects funded by the Robert Woods Johnson Foundation (RWJ), investigators using the first-wave nationwide survey of 12,000 practicing physicians, conducted by the Center for Studying Health System Change sought to provide perspective on how health care delivery is changing. Physicians responded to a series of questions about care management technology, their

practice arrangements, problems they face in practicing medicine, and patient and physician satisfaction.

Although many traditional physician practice behaviors persist today, some physicians have adapted to new practice environments in important and interesting ways. The effect of the computer on the ability of the physician to obtain patient data is undeniable (Gillies, et al., 2001). Physician professional practice associations have been established dedicated solely to improving patient care through by applying patient data to the clinical decision-making process. The Society for Medical Decision Making (http://www.smdm.org/) is an example of an established organization dedicated to this proposition. Research in this area has shown that when patient data drives clinical decisions, an association is found with improved outcomes and with improved overall patient and practitioner satisfaction (Waters, et al., 2001). Integrating computerized data automation into clinical practice is a significant and growing trend. Lack of involvement in these care management activities by physicians may be related to earlier lack of involvement in development. Whereas physicians involved at the implementation phase of care management relate positively to that aspect of practice alignment (Waters, et al., 2001). Because of this finding, it is included into the construct of care management effectiveness.

Treatment guidelines, which some physicians refer to affectionately or otherwise as 'cook book medicine', are a standardized, mass application tool to aid care management and effectiveness. Managed care plans have adopted this approach and technology and promoted its use wherever managed care market has achieved

penetration. However, significant numbers of physicians view treatment guidelines as a mechanism designed from outside the profession and foisted upon them. Therefore, rates of its adoption or rejection by physicians may depend upon the degree of physicians' participation in managed care contracts. Many physicians point out that physicians, their medical practice peer groups, and associations create and certainly use their own treatment guidelines. The degree to which physicians see value in and apply treatment guidelines in practice management is shown to impact care management effectiveness (Waters, et al., 2001, Shortell, et al., 2001). The literature suggests that physician created treatment guidelines are preferable. Additional dimensions in treatment guideline effectiveness include patient outcomes, cost and practice efficiency, physician and patient satisfaction, among others.

Profiles comparing practice patterns of medical resources used while treating patients with similar diagnoses to those of other physicians have become increasingly commonplace. The literature is replete with examples showing either the benefits or the lack of effectiveness of this method in influencing physicians' care management (Mosca, et al., 2005; Murff, H.J., et al., 2004; Keating, N.L., et al., 2004). In many instances the sponsor of the practice profile information is what influences its usefulness for care management, perceived or actual, by the physician. The unilateral approaches explored and adopted early on by insurance companies and HMOs are seen by physicians as unhelpful negative influences and generators of hassle factors for physicians (Keating, N.L., et al., 2004; Flock, S.A., et al., 1999). Thus universal guidelines are expected to reduce practice satisfaction. However, physicians view as useful the collaborative

approaches, explored by organizations seeking innovative disease management that can improve both care management effectiveness and patient outcomes (Rossiter et al., 2000). Physician profiling data do appear to stir physicians' competitive instincts. Clinical practice analysis, otherwise called physician profiling, does seem to improve clinical performance (Englert, J., 2001). The literature is unclear however, on the extent to which they influence earnings and job satisfaction.

Patients' attitudes and their interactions with their physicians have changed over time (Potter, S.J., et al., 2005; Choudhry, N.K., et al.; 2005, Murray, E., et al., 2004). Patients' passivity is declining as a proper role for a patient to play in care management. Today many patients are exerting an active role in defining, developing, and executing their care management plans. Because of this tidal change, more physicians adopt and use patient satisfaction surveys, and more researchers are studying physician response to the results of these surveys.

Relationships Between Physicians' Practice Alignment and Performance

Perhaps the most important recent structural change in medical practice is physician participation in integrated care networks. Integrated care ranges from horizontally integrated organizations providing similar services (such as single-specialty practice groups), to vertically integrated systems offering different forms of care to patients across multiple modalities, as in integrated delivery systems.

Analyzing two cross-sectional surveys of physicians, Murray et al., (1997) examined the relationship of open-model versus closed-model practice settings to physician satisfaction, in 1986 and in 1997. In an open-model practice, physicians accept

patients from multiple health plans and insurers; in a closed-model practice, physicians have an exclusive relationship with a single plan such as a staff or group model HMO. Overall, the physicians surveyed in 1997 were less satisfied with every aspect of their professional life than the 1986 physicians had been. Statistical significance was found in three areas: time spent with individual patients, autonomy, and leisure time. In addition, open-model physicians were found to be less satisfied than closed-model physicians with most aspects of practice.

The influence of managed care plans is a major factor affecting physician practice today. Research has show that under managed care, time available to see each patient has decreased (Linzer, 2000). Time pressure is reported, by physicians, as a source of practice dissatisfaction. Linzer et al. (2000) studied the association between HMO time pressure on practices, and job satisfaction. Their study concluded that open model HMO physicians were more intent on leaving their jobs and less satisfied with their practice than were other physicians. The authors recommended that more attention be paid to staff, resources, and the community.

A study by Gillies (2001) discussed problems in physician to system relationships. Their semi-structured, open-ended interview data were analyzed to identify examples of practice alignment that could help to address lack of fit. Another study, by Alexander (2001) found that physician groups drawing larger proportions of their revenue from managed care plans were more committed to the managed care system. This finding may not correlate directly with measures of income and satisfaction. The study reported that physician productivity compensation was negatively related to all

measures of alignment. The authors concluded that balance should be sought between alignment and risk-based reimbursement. The authors also suggest that resource exchanges that promote value-added contributions to physicians while allowing them to retain autonomy improve the relationship between alignment and performance.

An alignment strategy used by physicians is to become an employee of a health care delivery organization. An example of this is the physician who is employed by a hospital. The common term for this practice is a hospitalist. The hospitalist movement began in the late 1990's. Freed (2004) defines a hospitalist as, "physicians who spend at least 25% of their professional time serving as the physicians-of-record for inpatients, during which time they accept "hand-offs" of hospitalized patients from primary care providers, returning the patients to their primary care providers at the time of hospital discharge." A possible contributing factor causing the rise of the hospitalist movement are resident programs emphasizing and demonstrating the viability of pure hospital practice as a career choice. Exposure of residents to this type of practice causes them to consider and in some cases choose this type of medical practice. Resident satisfaction with these types of training programs has been studied by Chung (2002) and positive scores have been noted. Implementing these programs in a hospital yields the intended impact of cost reduction, less resource utilization, and improvements in quality of care. In addition to these results, Halpert (2000) reported high job satisfaction among the primary care internists and house staff associated with the hospitalist program.

Many authors study and associate practice satisfaction in direct relationship to patient satisfaction with care. Chang (2006) and Linn (1985) span two decades of

research in patient satisfaction and physician job satisfaction. These authors report findings similar to other authors. Improving physician and patient satisfaction resulted in economic, social, and psychological benefits, and improvements in perceived quality of care. Adaptive response factors studied included improved time, technology, and techniques to communicate with patients, improved use of ancillary staff as physician extenders, and practicing with physicians in organized care delivery systems. No researchers have studied hospitalist's alone with respect to the role of a physician practice highly aligned to the construct of performance. Yet, it seems reasonable to infer that specialist roles, such as hospitalists, that match the organization and practice demands of the practice setting, would have higher performance ratings in terms of earnings and job satisfaction.

Performance Relationships Related to Personal & Contextual Factors

Income was a major factor reportedly influencing physicians' job satisfaction in several studies (Schulz, Girad, and Scheckler; 1992; Stoddard et al., 2001). The longer physicians have practiced the more likely their assessment of their role and reward is solidified. Their level of career satisfaction and income are correlated with their education, training, practice location and practice longevity. The changing health care practice environment forces re-evaluations by physicians of their place in the system. The structure of health care systems in the United States has been changing significantly over time (Kemper et al., 1996; Ginsburg and Lesser, 2001). Among the important changes are Medicare's prospective payment system, a major shift from fee-for-service arrangements to more contractually prescribed third-party payment systems, increased

market penetration by managed care, development of varying forms of physician-hospital practice, and organizational changes in how physician practices are managed. These examples as well as others in health care financing carry significant consequences, and both actual and perceived threats to physicians' practice revenues and satisfaction.

Physicians, perceiving that participation in a physician directed organization for delivery of medical care that will benefit both their practices and patient care, may align their practices accordingly. On the other hand, if physicians believe it is inevitable to participate in non-physician structured delivery of medical care which may or may not be detrimental to their practices and patient care, they may capitulate, give up autonomy, and join the managed care practice movement and seek methods to manage their practice income in the new practice environments. After a history of participating in non-physician directed care delivery systems, it is expected that physicians may receive stable financial and fringe benefits. Stability, though, is not to be equated with maintaining or increasing one's income or satisfaction.

This paper does not presume that money is all that matters to physicians. Reliable patient revenue of course is necessary for paying debt, payroll, and other operating expenses; and for physicians to survive, thrive, and serve their communities. Beyond those uses of income, however, if physicians are also comfortable and pleased with their fit to the practice environment, their overall professional satisfaction is hypothesized to be positive. The physician-environment fit is thus assumed to be a major driving force of physicians' satisfaction and productivity and warrants further exploration.

An examination of the relationship between physician compensation and productivity conducted by Tufano (2001) focused on physicians and physician leaders perceptions. Five themes emerged from the interviews: 1) financial incentives did not substantially affect their own behavior; 2) financial incentives did affect a variety of physician behaviors; 3) four factors drive productivity: a) financial incentives, b) demand-side factors, c) systems and infrastructure, and d) individual and group attributes; 4) physician compensation systems are evolving toward production coupled with new metrics; and 5) practice culture, practice size, and specialty mix are important.

Summary of the Literature

Although previous studies have investigated many factors influencing the variation in physician job satisfaction, the results have been inconclusive as far as the effects of managed care plan participation on physician practice are concerned (Burdi and Baker, 1997; Murray et al., 2001; Baker and Cantor, 1993; Powell, 2001; Kletke, 2000). Similarly inconsistent are the findings on gender, age, specialty, practice settings, medical liability insurance, and ownership of the practice as factors affecting physicians' practice.

There are conflicting studies of how physician compensation affects career satisfaction. The determinants of physician career satisfaction may not be fully identified because the causal relationships are not well specified among physicians' perceptions of work settings, managed care environment, and career satisfaction. This conceptual dilemma is compounded by the diverse sample sizes and sampling frames used by researchers, and by inadequate analytical methods of handling data. Moreover, most

physician satisfaction studies rely on cross-sectional designs, which cannot capture the dynamic nature of job satisfaction. This is the major gap in the literature this study proposes to address. That is, how to determine the important dynamic causal factors and relationships important to physician career satisfaction and earnings.

CHAPTER 3: THEORETICAL FRAMEWORK

Introduction

The problems with physician practice alignment in relation to performance, outlined in Chapter 1, identified elements used in the contingency framework. The contingency perspective is frequently used in organization analysis of performance. This chapter, with reference to the literature, adapts the contingency framework of organization analysis to individual physician performance in the context of health care delivery systems. The chapter progresses along three main themes. The first is the introduction and an overview of the contingency perspective; the second part identifies four key organizational constructs translated into an individual physician framework; the last part presents the proposed analytical model and the hypotheses derived.

Overview of the Contingency Perspective

Contingency can be regarded as a school of thought growing out of general systems theory. From the rational, open-system perspective, organizations are created to attain specific goals. Additionally, it is thought that individuals similarly have specific goals and particular states of being they seek to achieve. Included among many possible personal goals are knowing that you have performed to the best of your ability and have the satisfaction of a job well done. Organizations as rational systems, and also people have defining functional characteristics such as information acquisition, efficiency,

optimization, implementation, and design. People as well as organizations operate within clearly specified limits that describe constraints, authority, rules, directives, jurisdiction, performance programs, and coordination. It is not coincidental that behavior of organizations and of people fall within the same descriptive categorical and analytical terms used for analysis.

Pioneering administrative management theorists such as Frederick Taylor (scientific), Frederick Herzberg (motivational), Henri Fayol (administrative), Max Weber (bureaucracy), and Herbert Simon (administrative behavior) attempted to identify basic features of organizational structure and individual behavior that are common to all endeavors.

We have learned since that conditional generalizations should be developed in order to make sense of and specify the limits of applicability to certain types of organizational and personal behavior. This is a major insight that underpins the contingency approach used in this research. Lawrence and Lorsch (1967) explained that organizations, divisions within organizations, and conceivably individuals within organizations, confront and interact with varying environments. They assumed that organizations, in the interest of effectiveness, would adapt to the environment in order to thrive. This assumption is no less cogent when applied to physician practice behavior.

Introduction of the Contingency-Based, Adaptation Performance Model

Ginsberg and Venkatraman (1985) proposed four key contingency constructs: 1) environment, 2) strategy, 3) congruency, and 4) performance. A powerful influence in contingency is strategic choice. Decisions are made through trading certain items for

others in an effort to achieve optimal satisfaction. In this case, Ginsberg and Venkatraman point the direction in the search that is for optimal career performance. Individual physicians as solo or group practitioners conduct themselves to respond appropriately both to the demand for care and to environmental constraints. Personal and contextual factors recognized in the environment are processed and analyzed with respect to their professional situations. In one sense, they are asking the same question of themselves that New York's ex-mayor Ed Koch asked of the voters, "How'm I doing today?" This simple question begets a conditional response from physicians themselves as well as from patients. That invites repositioning of physicians relative to their practice environment. Similarly, the proposed contingency-based model links environment and context, strategic perceived influencing factors and congruency or adaptive response, to physician's performance. Congruency or the adaptive alignment element is a key element mediating the relationship between the context and performance of physicians. Physician's choice to do something or do nothing with respect to their practice may affect such achievement.

The intended contribution of this analysis is the introduction of the use of contingency principles to analyze individual physician performance. Performance as measured from the perspective of the physician. This is not the traditional perspective of performance measurement. This research proposes two measures that embody personal performance that physicians readily identify. The first is the objective measure of income. This is a tangible reward for performing a physicians' task. The other is the intangible measure job satisfaction. Combining these two measures as a method to

describe performance in the proposed model will reveal dynamic tension between the two as well as influences other measure have both in a direct and indirect way.

Jay Galbraith (1973) wrote, "There is no one best way to organize." The heart of the contingency approach here is to assume that the best way to organize a medical practice and practice medicine depends on the nature of a physicians' practice environment. That approach can be described by the following non-standard paraphrase for defining performance: The best way for a physician to achieve career satisfaction and optimal income depends on the nature of the health care practice environment in which the physician operates and to which he or she adapts.

Conceptualization of Four Key Constructs: Translation to Individual Constructs

Constructs are abstract concepts that are defined by numerical variables although they are not directly measurable (Bacharach, 1989). An overview of contingency's major constructs (environment, strategy, congruency, and performance) follows. Their relationships to individual behavior and modeling are also discussed.

Environment

Scott (1981, 1992) has written about the nature of rational, natural, and open systems in the environment. The environment consists of all components (persons, groups, and organizations) among which exchanges of inputs and outputs are made (Zey-Ferrell, 1992). In the world of physician practice, environmental variables would include: a) community characteristics, b) organization characteristics, c) care management policies, d) level of available technology, e) compensation policies, f) physician manpower supply, g) laws, regulations, ethics, and h) others. To quote Hall

and Fagen (1956), "For a given system, the environment is the set of all objects a change in whose attributes affect the system and also those objects whose attributes are changed by the system. Ultimately it depends on the intentions of the one who is studying the particular universe as to which of the possible configurations of objects is to be taken as the system." Clearly the construct of environment is consistent and adaptable to the personal and contextual components of this research.

Strategy

The concept of strategy involves a pattern of responses to environmental contingency. For example, organizations in the physician practice environment exercise control over the criteria by which individual physicians are admitted and rewarded. In some extreme cases organizations wield sufficient power to eliminate certain participant characteristics or identities. Some physicians would say that aptly describes the health maintenance organization (HMO) world of health care. Of the three strategy categories: corporate, business, and functional (Grant and King, 1982; Hofer and Schendel, 1978), functional strategy is particularly applicable in this research, since it focuses on maximizing productivity. Choices and actions involving medical practice organization changes, accepting new categories of patients, employing effective care management technology, and executing negotiating strategies for compensation are examples of physicians' functional practice strategies. Individual practice adaptive alignment and perception of the practice environment as adaptive factors are proposed here to be related to the construct of performance as measured by earnings and job satisfaction. Adaptive

strategies can be either proactive or reactive. The theoretical model considered in this study considers physician strategy to be reactive to changes in the environment.

Congruency

Individual physician practice adaptive alignment or "fit" is here considered synonymous with the term congruency. Another term, co-alignment, refers to joint agreement between the physician as a practitioner and the greater environment in which the physician practices. This research focuses on the individual physician to practice alignment, or fit. In the context of the broader environment, organizations in which the physicians are employed are recognized to have effects on their employees, but the assumption here is that the internal organizational environment is fixed. Organizations as entities can change to accommodate employees and employees can change to accommodate their employers. In this study no consideration is given to how a practice organization aligns to "fit" the physician or vice versa. Congruency is between the physician as the unit of analysis and the complete environment in which the practitioner operates. In this study, the dual role of the physician practitioner that performs a job function and an owner or manager that dictates policy and procedures that impact the employee's daily practice life are separated. This study concerns itself with the aspects of physician congruency as a medical practitioner.

In an open, rational, structural, systems approach, optimal performance occurs when the individual practitioner aligns with the environment in much the same fashion as a key matches the lock. The interactive approach presumes that practice alignment interacts with personal and environmental factors and perceptions, as well as adaptive

strategies to affect performance – here, physicians' achievement of earnings and job satisfaction which, in turn, is assumed to have a strong positive association with patient care outcomes.

Performance

Performance in terms of earnings and job satisfaction is the criterion here for assessing whether or not the physician fits the practice environment. Higher performance equates to better fit, and vice-versa. Just as organizations strive to adapt, survive, and thrive in their environments, physicians similarly seek to be fulfilled in their careers. Performance as used in this study is a construct defined numerically by earnings and job satisfaction. Earnings are easily quantified. Job satisfaction however, is a subjective measure. Job satisfaction measures for physicians are still being developed. Stamps and Cruz (1994) created a Likert-type physician satisfaction scale that has been used in academic studies (Stamps and Cruz, 1994). Their attitudinal survey used six dimensions; 1) personal factors, 2) assessment perception of resources, 3) concern with peer reviews, 4) measure of global or general satisfaction, 5) perception of specific state-level regulation, and 6) measure or perceptions of Massachusetts as a practice location.

The Agency for Healthcare Research and Quality sponsors the Physician Worklife Survey (PWS), which is designed to study the effect of healthcare work conditions on physician stress and satisfaction, and ultimately on the quality of care and on medical errors. Much of the research on physician satisfaction has been directed toward assessing its effects on patient care, outcomes, and health system impacts. Though the PWS survey is widely accepted, Williams et al. (1999) refined the PWS measurement of physicians'

job satisfaction and concluded that measuring physician satisfaction continues to be a complex effort.

Most of the literature analyzing physicians' job satisfaction, earnings, and performance restricts itself to reporting the relationships of respondent categories to one another. Research by Leigh (2002) using the Community Tracking Study (CTS) dataset compared physician career satisfaction across eight covariates. Though differences in satisfaction were detected among the variables, after controlling for work hours, income emerged as the most important predictor of being 'very satisfied'.

Another study, of career satisfaction categorizing primary care and specialist physicians, was conducted by Landon (2003). That study found little difference in changes in satisfaction between the two groups. This study, using CTS data, did not include income among the variables influencing satisfaction, but included practice environment, professional autonomy, and market-level changes to regress against levels of satisfaction. This method, presuming regressible relationships, stands in contrast to Williams' (1999) assertion of complex relations among the factors involved in career satisfaction. It is evident from considering those two studies utilizing similar data that the issue of income's effect on job satisfaction remains unclear.

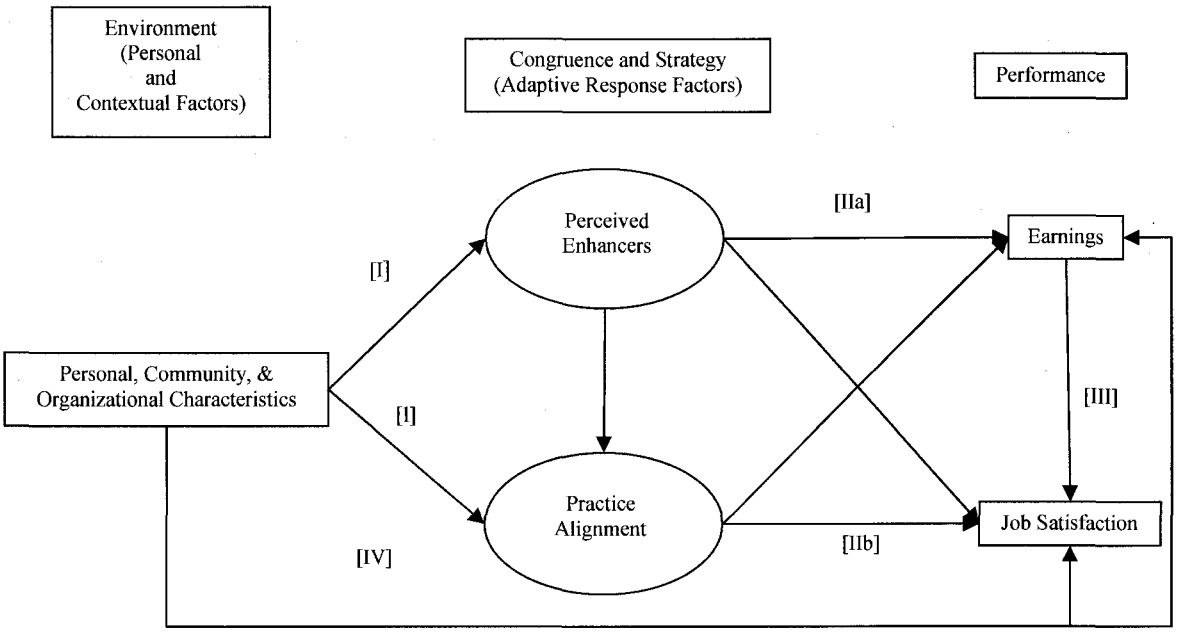
As stated previously, higher performance equates to better fit. This research proposes to use two measures attributable to the output as a result of the physicians' job. The measures are income and self reported job satisfaction. A summary literature reviewed indicated that on some level the physicians' ability to provide effective medical care is a measure of fulfillment and is one of the many factors contributing to career

satisfaction and levels of income. In conclusion, this research intends to identify whether or not better fulfillment of physicians' desire for effective medical care management and other measures contribute to increasing career satisfaction and income. And, as these two measures increase in value, by proxy indicate a better physician fit to their environment.

Analytical Model

Physician practice achievement in terms of job satisfaction as well as income is a complex study subject. Therefore, a model for assessing that construct should account for as many of the factors and as much variation as possible. A search of the literature reveals few contingency models assessing physician performance in those terms. The literature reviewed here indicates that contingency relationships can be described among the many complex elements comprising the physician practice environment. Following the principle of contingency perspective, then, this research proposes to analyze the variation in physician performance contingent upon practice alignment and the perceived enhancers or obstacles, considering a variety of contextual and personal factors.

The system presented in Figure 3, comprises interdependent components, or four major causal linkages. They are: 1) the influences of personal, community, and organizational characteristics on perceptions and alignment, 2) the direct effects of perceptions and of alignment on earnings and job satisfaction, 3) the influence of earnings on job satisfaction, and 4) the direct effect of personal, community, and organizational characteristics on job satisfaction and earnings. Within the construct of



Note: Numerals I, II, III, & IV identify major

Figure 3: Contingency Perspective of Physician Performance: A Theoretical Framework, Detailed

adaptive response, a link between perceived enhancers or obstacles and practice alignment is also proposed.

Verstappen (2003) reported in a study that performance problems identified in physician practice could be modified. In that study, a practice-based, multifaceted strategy using guidelines, feedback, and social interactions resulted in modest improvements in practice alignment. However, the cross-sectional nature of the data limits our ability, at this time, to generate testable hypotheses about this relationship.

Theoretical Development of the Research Hypotheses

Under the theoretically specified framework (Figure 3), four major hypotheses are formulated for empirical testing in this study. The first hypothesis is developed from the idea that certain characteristics of physicians and their practice organization affect perception of the practice environment, strategies to deal with that environment, and changes made to better fit that practice environment.

Certain demographic variables: years in practice, sex, race, and location of practice are a few of the measurable physician characteristics that are used to formulate the first hypothesis. Gender and age are easily identified characteristics, which Magee (2001) studied in relation to physician discontent. The study found that twenty-three percent of the survey respondents would not choose medicine again as a career. Of those respondents, most were older physicians.

On the basis of these analyses and those in the literature review, it is hypothesized that personal characteristics and environmental contextual factors directly influence adaptive response capability. The hypotheses that follow are presented in the alternative form. In general, it is hypothesized that personal, organizational, and community characteristics directly influence how physicians will respond to environmental pressures and make practice alignments.

Hypothesis 1A: Physicians' greater practice experience in years has a negative association with the perceived ability to change and align their professional practice.

Hypothesis 1B: Physicians' race, other than white, has a negative association with the perceived ability to change and align their professional practice.

Hypothesis 1C: Physician's medical school graduation status, non-United States or non-Puerto Rico, has a negative association with the perceived ability to change and align their professional practice.

Hypothesis 1D: Solo medical practice has a negative association with the perceived ability to change and align professional practice.

Hypothesis 1E: Non-metropolitan medical practice has a negative association with the perceived ability to change and align professional practice.

Social scientists use a cognitive decision model when studying decision-making. The theory of reasoned decision-making is a well-tested model that has been used to explain and predict a wide variety of decisions (Ajzen, et al., 1980). In this model, intention is determined by individual attitudes and subjective norms. The model is a linear regression equation:

$$I = \acute{\alpha}_1 + \beta_1 Aact + \beta_2 SN + e_1$$

Where: I is the intention to act in a certain way, Aact is the individual's attitude toward action, and SN is the subjective norm one believes one's peers would expect one to follow.

Empirical research shows that attitudes and subjective norms as well as closely held beliefs influence intentions. Other research by Rogers (1983) cites two additional characteristics that influence change adoption – in our case, practice alignment. Those characteristics are relative advantage and complexity. Concepts that are embodied in physician practice change include concepts such as effective care management structure,

incentives to change care practice, first adopter of new office practice methods and resources, and so on.

As explained by Leigh (2002), aligning practice hours may invoke the marginal utility theory of work from economics. That is, assuming that leisure is preferred to work, then increasing one's practice hours to match the demands of the payers and patients in the market is likely to increase disutility or work dissatisfaction. Disutility in this sense indicates the level of dissatisfaction associated by the physician with the hours of service demanded by the practice. From another perspective, to the extent that physicians conform to the theory put forth by von Neumann and Morgenstern (1944), they will choose to align their practice along the courses of action that maximize expected utility or satisfaction. Magee and Hojat (2001) noted in their survey analysis that physicians' dissatisfaction also can be predicted by their negative perceptions of the health care environment. Bates (1998) had previously noted a similar link to the emergence of health maintenance organizations (HMOs) in the practice environment. Bates' study noted a lack of enthusiasm by physicians as an ever-increasing percentage of their patient revenue categories switch to capitated payment. However, the construction of this hypothesis also addresses how HMO adverse selection may influence physician adaptive response. That is, HMO strategies to enroll healthy members and discourage enrollment of sicker and so more costly patients may increase leisure utility for physicians as their percentage of capitated HMO patients increases.

In a study of open model practices, where physicians accept patients from multiple health plans and insurers, and closed model practices, where physicians have an

exclusive relationship with a single health plan, it was found that open model physicians were less satisfied than their counter parts in closed models. Of note in this study by Murray (2001), were the effects of the factors leisure time, incentives, and total earnings for the closed model physicians. In contrast, a study by Linzer (2000) that looked at time pressure in the context of HMO practice and satisfaction found that HMO physicians were less satisfied than physicians in other practice settings. Key elements of that study's findings were the implications of new patient visits, time length of patient visits, capability of support staff, and community factors for affecting job satisfaction.

Possible practice changes involve the scope of practice, a change in role from patient advocate to insurance company policy enforcer, rationer of care, changing the physician-to-patient ratio, the use of physician extenders, and other financial and administrative aspects of medical practice. A study by St. Peter (1999) looked at physicians' assessments of the changes in the scope of care provided by primary care physicians and at their assessments of the appropriateness of scope expectations. They found that the care that primary care physicians were expected to provide went beyond their level of comfort and the parameters of their expertise. To put it differently, physicians were uncomfortable with activity being required of them to meet administrative and financial constraints.

Care management structure is another way to describe scope of practice, which has been studied extensively. A study by Shortell (2001) set out to identify the factors most strongly associated with practice alignment, and principally physician commitment to shared alignment. The paper also examined factors associated with the consequences

of alignment. A conclusion of the paper is that health care organizations, in general, need to build, maintain, and expand physician practices in order to achieve successful alignment. A logical deduction would be that individual physician practices would have to behave similarly in order to function satisfactorily in the health care environment. Other researchers have recommended appropriate physician and management involvement in financial incentives and technology implementation in order to improve physician practice alignment (e.g., Waters, 2001).

Gillies (2001) identified numbers of barriers to practice alignment: environment, culture, information systems, physician leadership, group-system membership, compensation and productivity, care management practices, group strategy, and accountability. Group-system membership as it relates to autonomy was also researched by Baker (1993), who examined the perceived reduction in autonomy caused by increasing HMO influence and its relation to satisfaction. The author expected to find that exposure to managed care reduced job satisfaction among both self-employed and employed physicians, but found that managed care is not associated with regrets or dissatisfaction among physicians. However, an opposite conclusion was reached by Sturm (2002), while looking at the effects of managed care and financing on practice constraints and career satisfaction in primary care. This author found that solo and dual physician practitioners were those least satisfied with their careers. Factors attributed to HMO impact were time pressure, lack of clinical freedom, income pressure, and lack of continuity of care. This study stressed the physicians' role as gatekeeper as a highly significant predictor of dissatisfaction. Interestingly, the source of practice revenue was

not significantly associated with career satisfaction. Another study by Landon (2003) produced similar results.

Clearly the items involved in practice alignment and the perceptions of personal and contextual factors that might motivate a physician to change practice behavior are complex and unsettled. The second hypothesis, presented in alternative form, is designed to link the abstract with the concrete and shed light on those questions.

Hypothesis 2: Optimizing physician practice strategies that are suitable (congruent) for the physician practice environment maximize practice-environment fit via practice alignment and improves earnings and satisfaction. (This hypothesis will be detailed as Hypothesis 2A through 2D below.

Hypothesis 2A: Increasing the number of physicians, nurse practitioners, and other physician extenders on staff decreases earnings and job satisfaction.

Hypothesis 2B: The increasing percentage of prepaid and capitated revenue decreases earnings and decreases satisfaction.

Hypothesis 2C: Increasing the percentage of practice patients enrolled in managed care decreases earnings and decreases satisfaction.

Hypothesis 2D: Accepting increasing numbers of Medicare, Medicaid, and privately insured patients, that is patient payer categories with no price negotiation, into the practice decreases income and decreases job satisfaction.

It has been said by physicians that money matters to them and that is why the first journal they pick up is *Medical Economics*. Income, keyed to incentives, was studied by Grumback (1998) among primary care physicians. The study concluded that financial

incentives that pressured physicians to compromise care were associated with job dissatisfaction, whereas incentives that motivated quality of patient care and patient satisfaction were associated with higher levels of physician satisfaction.

A survey reported in the February 15, 2005 issue of *Group Practice Journal*, sponsored by the American Medical Group Association and reported on their WEB site (http://www.amga.org/MediaAlerts/article_mediaAlerts.asp?k=180) found that twenty percent of separations from the practice group are due to compensation issues. Quitting a practice is a proxy indicator of a physicians' job dissatisfaction.

The literature supporting the above hypotheses generally relates income pressure to the context of a changing health care market, and literature supporting the first hypothesis relates income to satisfaction in terms of life-cycle stages of a physician's career. Little research, however, explores the parsimonious or pure relationship between income and satisfaction *per se*. The following hypothesis has been proposed to address that deficiency in the literature.

Hypothesis 3: Higher physicians' earnings are positively associated with job satisfaction, holding physician and community characteristics constant.

Many authors have examined environmental and contextual variables such as years in medical practice, age, solo or group practice, race, foreign medical school graduate, and practice location, as well as the financial and demographic make-up of the physician's practice. These are usually studied in the context of other influencing or confounding variables.

A study by Leigh (2002) analyzed career satisfaction across specialties, as well as considering age, income, and geographical region. This study found that both younger and older physicians were very satisfied, and physicians of middle age were least satisfied. Perhaps younger physicians still enjoy freshness and optimism, and older physicians who have successfully navigated a career nearing completion can enjoy that satisfaction. On the other hand, physicians in the middle of their careers are rightfully concerned with their practice environment; they are evaluating perceived external benefits or obstacles to their careers and making adjustments to their practice accordingly.

Geographical location was found by Leigh (2002) to be associated with very high levels of satisfaction. Rural, town, New England, and west, north, and central metropolitan statistical areas (MSA) were specific geographic locations cited positively. This finding that both rural and urban geographic locations are associated with very positive levels of satisfaction presents a curiosity. Pastor (1989) found that job satisfaction among half of all rural physicians in Minnesota was rated as well-satisfied. Another interesting finding in this study was that salary or income was not a source of dissatisfaction. This fits well with the proposed theoretical framework that earnings do not impact adaptive response factors.

In the 1990's HMOs were successful in reducing physicians' income by about nine percent (Hadley, 1999). An additional consequence of HMO penetration is accelerated retirement of physicians. Kletke (2000) reports that many older physicians have found it preferable to retire rather than adapt their practices to an environment with

a high degree of managed care penetration. Additional research by Powell (2001) reported that an earnings decline of ten dollars per patient care hour motivates 11,000 physicians to retire early. It is clear that as managed care penetrates the market and drives down physician earnings, physician performance with respect to job satisfaction is probably declining.

Research conducted earlier by Bates (1998), and confirmed by Leigh (2002) found significant differences in physician work satisfaction across medical specialties. Bates (1998) also had identified practice setting as an important factor related to work satisfaction. Physicians in private practice were most satisfied with their overall practice situation. However, physicians practicing in health maintenance organizations were most satisfied with their autonomy in clinical decision making. Effective care management or autonomy in clinical decision making, as part of the perceived enhancers of adaptive response factors, has its effect moderated by practice alignment. Thus, to the extent health maintenance organizations impair practice alignment by means of rules or contract obligations, earnings and satisfaction will be proportionally reduced.

Scant research is available on the relationship of race to practicing physicians' job satisfaction. Most of the literature researched reports on academic medical faculty job satisfaction with respect to racial status. An example of this is data reported by Price (2005) reveals that faculty recorded visible (race/ethnicity, foreign-born status, gender) and invisible (religion, sexual orientation) dimensions of discrimination. Visible dimensions provoke bias and cumulative advantages or disadvantages in the workplace. Minority and foreign-born faculty report ethnicity-based disparities in recruitment and

bias in promotion. Ethnic differences in prior educational opportunities lead to disparities in exposure to career options, and qualifications for and subsequent recruitment to training programs and faculty positions in addition to structural barriers (poor retention efforts, lack of mentorship) that diminish professional satisfaction. Glymour (2005) reported black physicians did not differ significantly from white physicians in job or career satisfaction and stress measures. Significant racial and ethnic variations were found with autonomy, patient care issues, relations with staff, and relations with the community, pay, and resources. Though race is thought to be an important factor impacting job satisfaction, Buchbinder (2001) found that race had no impact at all on the 55% turnover of primary care physicians from practices over a four year period.

The variables age, years in practice, race, foreign medical school graduate, and rural or urban practice location mentioned above, shroud any direct appreciable detection of the possible direct effects of strategies for and practice adaptations on income and satisfaction. This is seen in figure 3 by the direct line of influence from personal, community and organizational characteristics to job satisfaction and earnings that bypasses practice alignment and perceived obstacles or perceived enhancers to practice alignment. Moreover, for all the research in this area represented by the recent work of Sturm (2002), Landon (2003), and Leigh (2002), such possible direct relationships have been lightly discussed and analyzed. Metropolitan Statistical Areas have a positive influence on satisfaction, so there is direction. However, not all MSA's as Leigh (2002) reports have positive relationships with satisfaction. Geographically opposite MSA's,

East, Southeast, South Central, and Southwest did not show a positive relationship with satisfaction. To be thorough and possibly provide an easily identified, early warning group of variables related to physician performance, the following hypotheses, presented in alternative form, are generated to test the strength of those relationships in a structural equation model.

Hypothesis 4A: Metropolitan Statistical Area of practice has a negative association with physician earnings and satisfaction.

Hypothesis 4B: Increased managed care penetration into the physicians' practice has a negative association with physician earnings and satisfaction.

Hypothesis 4C: Increased physician experience in practice years has a negative association with physician earnings and satisfaction.

Hypothesis 4D: Non-white physician race has a negative association with physician earnings and satisfaction.

Hypothesis 4E: Solo physician practice type has a negative association with physician earnings and satisfaction.

Hypothesis 4F: Graduating from a foreign medical school has a negative association with physician earnings and satisfaction.

Summary

Understanding the factors and causes related to determining physician performance, defined as higher earnings and high job satisfaction measures is not easy. This dissertation uses a new contingency based framework to detail these underpinnings and relationships associated with physician performance. I find it plausible that

physician performance as measured by career satisfaction and income may have declined over the past decade. This model may be applied to other similar data of a different time to measure any change in performance. It is clear that the physicians' practice environment has changed remarkably over the past decade and a half. The direct observation of increased hassle factors brought on by increasing insurance plan control over physicians' practice lives, competitive medical marketplaces, difficult dealings with growing government sponsored health plans, and changing physician reimbursement methods in the context of a changing medical marketplace contribute to performance changes for physicians.

The impact of changing levels of physician performance on the health care system is difficult to evaluate. Some evidence suggests that patient satisfaction is directly correlated to physician satisfaction (Linn et al., 1985, Chang et al., 2006). When physician and patient satisfaction of the healthcare system decline, it may be more difficult to attract top students into the field of medicine. The stakes, as measured by physician performance, for physicians, patients, and the health care system in general are great. It may become increasingly difficult to optimize overall health system performance without attending to optimizing physician performance first. Additionally, policy officials and health system researchers may need to focus on other health care providers, such as pharmacists and nurses, in order to maximize performance of the labor component inputs of our health care system in addition to changing care delivery structures and reimbursement methods. By understanding fully the drivers of physician satisfaction, using the measures of income and job satisfaction, participant providers and

policy makers may work better in the direction of designing and selecting strategies to improve the entire healthcare system in this country.

CHAPTER 4: METHODOLOGY

This chapter presents the analytical methods used to examine the relationships between personal and contextual factors, adaptive response, and physician performance in terms of earnings and satisfaction. The chapter also describes the research design, data sources, sample, variables, modeling plan, and model specification, and elaborates on hypothetical relationships.

Research Design

The purpose of this research is to explore and identify relationships involved in the construct of physician performance in earnings and satisfaction at the individual physician level. The approach starts with general principles of contingency theory. Adaptations to individual behavior are generated, and hypotheses are proposed. The deductive, generated hypotheses are then modeled and tested.

This correlational, panel design is used to identify and study the selected relationships. The design is non-experimental because there is no intervention or control group. Such a design is not typical of a traditional cross-sectional study. Endogenous latent variables called practice alignment and perceived enhancers were created. Practice alignment was created by calculations of percentage changes in practice-related factors, exemplified by the percentage change in managed care practice, percentage change in

gatekeeper role, and others shown in a table one, defining and detailing the study variables.

The latent variable, perceived enhancers, was assessed using contextual variables described in the literature review above. These concerned years of practice experience, gender, physician race, solo or group practice, place of medical school graduation, and geographical location of practice. It also included measures for effectiveness of care management and compensation incentives (Bates, 1998, Leigh, 2002, Landon, 2003, Sturm, 2002). To be complete in building the latent variable, perceived enhancers, measures for the effective use of time was also included.

The advantage in using a structural equation correlation design is the ability to examine relationships among many variables in a single study. Multiple hypotheses about relationships between and among variables can be tested simultaneously. Acknowledgement is made that this study design cannot determine causality (Grady & Wallston, 1988; Spector, 1981). Yet, correlational approaches such as this can reveal valuable information while only supposing that relationships exist between exogenous and endogenous variables. That is, the stronger the association between the two variables, the more it supports a causal link between them. This approach is additionally useful when examining results of previous studies using regression methods. The advantage of this approach over single-outcome regression analysis is the ability to analyze multiple outcomes within a single model.

Little is known about behavioral response in relation to performance. What is known from the literature has been gleaned using primarily Chi-Square, odds ratio, and

regression techniques. Chi-Square tests the cross-table relationship or the independence of the row and column effects. The hypothesis tested with Chi-Square is whether or not two different samples (survey responses) are different enough in some characteristic or behavior that we can generalize from our samples that the populations from which we draw the samples are also different in that characteristic or behavior. Use of Chi-Square is optimal only when observations are independent, that is, no category or response is dependent upon or influenced by another. Because there is suspicion that response variables may be influenced by each other, a structural correlation model provides advantages in the analysis.

Structural equation modeling is a flexible and powerful extension of the general linear model. The data used for this research are not all continuous. In the event that some data are non-normal, the asymptotically distributed free (ADF) estimation method requires very large samples, usually containing more than a thousand cases. Power estimation involving latent variable analysis frameworks was studied by Muthén and Curran (1997) in the context of modeling experimental designs. Their assessment of power requirements in multiple-time-point models shows that sample sizes greater than one thousand cases have calculated power values of one. The number of cases used in this research, over four thousand, provides sufficient power for analysis in structural equation modeling (Hox, J.J. and Bechger, T.M. 1998; Bollen, K.A. 1989). In cases where the distribution of the data fits the distribution assumptions of the structural equation model, five cases are needed for each parameter estimated. The number of

cases used for this research and the nature of distributions of the variables are acceptable when analyzed using structural equation methods.

Data Sources

The data were drawn from the two-wave physician surveys conducted by the Community Tracking Study (CTS) conducted by the Center for Studying Health System Change, in 1996/7 and 1998/9, as well as from the Area Resource File (ARF) for 1997. In this study, the survey, designed to be representative of physicians providing direct patient care in the continental United States and in selected communities, followed a complex design with 60 sites and a small, independently drawn national sample (Kemper, 1996; Metcalf, et al., 1996). The 60 sites (51 metropolitan areas and 9 non-metropolitan areas) were randomly selected to form the core of the CTS and to be representative of the nation as a whole. The data were from the first round of the physician survey (Community Tracking Study Physician Survey, 1996-1997: [United States] (ICPSR 2597)). Selected metropolitan sites, based on Metropolitan Statistical Areas (MSA) as defined by the Office of Management and Budget; the Bureau of Economic Analysis Economic Areas were used to define non-metropolitan sites.

Primary care physicians were over-sampled. A 1996/7 sample of over 20,000 physicians was obtained, of whom 18,947 were eligible for the survey. Between August 1996 and August 1997, 12,385 physicians were interviewed by telephone, representing a response rate of 65 percent (Keil, 1998). The data used for the research are based on responses from the 12,107 physicians (7015 primary care physicians and 5092 specialists) who had been in practice for at least two years. The rate of non-response to individual

items in the survey was very low, typically less than three percent. Missing values for some independent variables were imputed. Additional information on the survey can be found elsewhere (Keil, et al., 1998).

The second round of sampling and questionnaires was administered to physicians in the 60 CTS sites and to a supplemental national sample of households. The survey instrument collected information on physician supply and specialty distribution, practice arrangements and physician ownership of practices, physician time allocation, sources of practice revenue, levels and determinants of physician compensation, provision of charity care, career satisfaction, physicians' perceptions of their ability to deliver care, physician views on the effects of care management strategies, and various other aspects of physicians' practice. For primary care physicians (PCPs), the instrument also provided vignettes of clinical presentations for which there was no prescribed method of treatment, and asked PCPs to state the percentage of patients for whom they would recommend the course of action specified in each particular vignette. Part 3, the Site and County Crosswalk Data File, identifies the counties that constitute each site. Part 4, the Physician Survey Summary File, contains site-level estimates and standard errors for selected physician characteristics, e.g., the percentage of physicians who were foreign medical school graduates, mean age of physicians, and mean percentage of patient care revenue from Medicaid. Methodology used to collect data in the second round, 1998/9, was comparable to that for the previous data collection.

The Community Tracking Study (CTS) is sponsored by the Robert Wood Johnson Foundation. It is a national study designed to track changes in the health care system and

the effects of the changes on care delivery and on individuals.

The Area Resource File (ARF) is a massive, county-level database that combines information from over 75 primary data sources, including the di-cennial census, the American Medical Association's Physician Master File, and the National Center for Health Statistics' mortality and natality data files. The county is used as the basic geographical unit of aggregation in this database simply because it is the smallest unit for which much healthcare data are available. All U. S. counties are included in the ARF, with over 7,000 broadly defined variables available for each. Additional information about the ARF is available on-line at http://www.arfsys.com.

Sampling

The CTS sites were selected using stratified sampling with probability proportional to population size. The supplemental CTS sample, selected with stratified random sampling, was included in the survey to increase the precision of national estimates. The sample frame was developed by combining lists of physicians from the American Medical Association and the American Osteopathic Association. In the site sample and the supplemental sample, the sample design involved randomly selecting both physicians who had been part of the Round 1 survey and physicians who had not. About 58 percent of the Round 2 respondents also participated in Round 1. Primary care physicians were over-sampled in the site sample.

The sample universe included physicians practicing in the 48 states of the contiguous United States who provided direct patient care for at least 20 hours per week, and were not federal employees or specialists in fields for which the primary focus was

not direct patient care, or graduates of foreign medical schools who were only temporarily licensed to practice in the United States. Residents, interns, and fellows were excluded.

From the original two CTS samples a subset of those panels was selected consisting of approximately 5,000 (4,784) physicians with complete information in both 1996/7 and 1998/9 surveys. The sample, as in the CTS data, included active office and hospital-based physicians, not employed by the federal government, who spent at least 20 hours per week in direct patient care in the continental United States. Using the city/county Federal Information Processing Standards (FIPs) codes, the survey data were merged with the Area Resource File (ARF) to identify area characteristics such as managed care penetration, aging population, socioeconomic conditions, and physician-population ratio that may influence physician practice. The data are longitudinal and enriched. Such data are not typically used in the investigation of physician characteristics.

Measurement of Variables

Endogenous Performance Variables

Physician performance is defined in terms of these endogenous variables: 1) 1995 and 1997 net income of physicians, after expenses but before taxes (INCOMET), and 2) general overall satisfaction with overall medical career in 1998 (CARSAT).

Endogenous Latent Variables

The construct, practice alignment, consists of two endogenous latent variables. They are a) accepting new patients, and b) practice changes.

The endogenous latent variable, accepting new patients, is composed of three indicators: 1) changes in whether the practice accepts new patients who are insured through Medicare, including Medicare managed care plans (CMCARE); 2) changes in whether the practice accepts new patients who are insured through Medicaid, including Medicaid managed care plans (CMCAID); and 3) changes in whether the practice accepts new patients who are insured through private or commercial insurance plans, including managed care plans and HMOs with whom the practice has contracts (CPRIV).

A second endogenous latent variable, practice changes, comprises five indicators: 1) the percentage of change in managed care practice (CMCPRACT), calculated by subtracting the percentage of the practice's patient care revenue from all managed care, time zero, (PMC0) from the percentage of the practice's patient care revenue from all managed care (PMC); 2) the change in the percentage of patients where the physician serves as the primary care gatekeeper from the 1996/7 survey to the 1998/9 survey (CPCTGATE) where CPCTGATE = PCTGATE0 – PCTGATE; 3) the change in the percentage of practice revenue that is prepaid or capitated (CPCAPREV) calculated by the difference in percentage of a practice's patient care revenue paid on a capitated or other pre-paid basis (PCAPREV – PCAPREV0); 4) the change in the number of physicians, including self, at the practice from 1996/7 to 1997/8 (CNPHYS); and 5) the change in the numbers of physician assistants, nurse practitioners, nurse midwives, and

clinical nurse specialists employed by the practice, including all locations, from 1996/7 to 1997/8 (CNASSIST).

The third endogenous latent variable labeled perceived enhancers, comprises six contextual control variables, an index of effective care management (EFCAREMT), an incentive compensation index (INCENTCP), and an index of effective time management (EFTIMEMT). These variables are described below, and in Appendix B. The index of effective care management is constructed from five indicators. The incentive compensation index is constructed from four different indicators. The index of effective time management is constructed from four indicators. Details of these indices can be found in Appendix B. The components of these indices are based on the reported perceived effects or perceived impacts of the variables in question.

Six contextual variables associated with perceived enhancers are: 1) practice experience, in years (YEARS); 2) race, either white or other (RACE); 3) solo or multiple practice (SOLO); 4) graduate of a U.S./Puerto Rico or foreign medical school (FMG); 5) geographical location categorized as large, small, or non-metropolitan areas (MSA); and 6) gender (GENDER).

The five variables making up the effective care management practices index are: 1) the effect of the results of using practice profiles comparing the physicians' pattern of using medical resources to treat patients with those of other physicians in the practice of medicine (EFPROFL); 2) the effect of using of formal written practice guidelines such as those generated by physician professional organizations, insurance companies, HMOs, or government agencies, to practice medicine (EFGUIDE); 3) the size an effect reminders

have on physicians received from either a medical group, insurance company, or an HMO, alerting the physician about specific preventive services that may be due individual patients in the physicians' practice (EFRMNDR); 4) the effect of using a computer to obtain information about treatment alternatives or recommended guidelines in the practice of medicine (EFTREAT); and 5) the effect of using computers to obtain or record clinical data such as medical records and laboratory results for the practice (EFDATA).

The incentive compensation index is created from the following four variables: 1) whether physicians' compensation is affected by their individual productivity (SPROP0); 2) whether physician compensation is affected by patient satisfaction (SSAT0); 3) whether physician compensation is affected by specific measurements of the quality of care (SQUAL0); and 4) whether physician compensation is affected by practice profiling (SPROF0).

The effective time management index is created from the following four variables: 1) number of weeks the physician practices medicine in the year (WKSWRK); 2) hours per week conducting medically related activities (HRSMED); 3) hours of charity care donated in the prior month (HRFREE); and 4) percent of patient care time spent in the main practice location (PPATMNRE).

The weighting values for the three indices were obtained using Eigenvalues from a vari-max rotation sum of squares loadings calculation.

Analysis Modeling Plan

A series of analyses will be presented. The first analysis will be exploratory in nature. Examination of the data in this part of the plan focuses on first understanding each variable and dealing with vagaries such as inconsistent survey data collection. Then, examining the relationships between pairs and combinations of variables will be conducted. That will begin to develop a coherent picture of the data. Finally, exploration of the network of data relationships will lead to correlational or causal relationships which inferences. This is an attempt to seek and understand the network of relationships in the data.

Structural equation modeling is selected for this analysis because of an advantage over linear regression. Causal modeling and path analysis provides a means to distinguish direct, indirect, and total effects of one variable on another. By considering each type of effect, it leads to a more complete understanding of the relationship between variables. Linear regression analysis does not accommodate indirect effects easily. Typical regression analysis requires the regression coefficient to be an estimate of the direct effect of a variable on the dependent variable.

Model Specification

A reasonable starting point for model specification is to assume that the structural equations are linear in the parameters. Specifying the model will draw upon knowledge of the research presented in the literature reviewed. Attention is paid to what endogenous variables have direct effects on other endogenous variables. Another consideration will be, are there error terms in one equation that may correlate with errors of another?

Additionally, what latent variables are related to which indicators? By letting the literature guide model specification the research will avoid an under-identified model produced if only the data alone were used to produce the model.

Exploratory Analysis

Variables are examined in terms of normality and distribution. This is accomplished through descriptive and univariate analysis. Descriptive statistics and distribution properties of all variables in this study are obtained using SPSS Graduate Pack 13.0 for Windows. The data are analyzed to observe deviation from normal distributions by evaluating kurtosis and skewness. The Shapiro-Wilk statistic employed by SPSS is used to observe these normal distribution and symmetry tendencies. Values of variables that appear unreasonable, extreme, or incorrectly coded are considered for deletion. Ordinal or nominal variables are examined through the use of frequency tables and bar charts.

Assessing the appropriateness of maximum likelihood and general least square estimates uses tests of normality. Skewness values larger than zero indicate data skewed to the right of a normal distribution curve. Data with skewness values less than zero indicate a skewed to the left of a normal distribution shape. Kurtosis values greater than three indicate a problem with data distribution tails that are thinner than normal. Values of kurtosis less than negative three indicate the opposite; distribution tails that are thicker, or fatter, than normal distribution tails. The Kolmogorov-Smirnov test is the test of normality that a variable is normally distributed. The test statistic, Kolmogorov-Smirnov (K-S), must be greater than zero and less than or equal to one. The normality hypothesis

is rejected with a low K-S Z score with a p-value less than or equal to 0.05, for α-0.05 level of significance.

Confirmatory Factor Analysis

Theoretical constructs are not directly measurable. So, to measure the constructs such as practice alignment or perceived obstacles, observable variables are utilized. In this research, the measurement model specified the linear relationship between the observable variables and the latent constructs, including correlated and/or uncorrelated measurement errors. The following formula and model for exogenous and endogenous variables is described:

For exogenous latent and observable variables, the equation is:

$$X=\Lambda_{\chi}\xi+\delta$$

Where

X is a (qxl) vector of the observable variable:

Λ_{χ} is a (qxs) matrix of factor loading, relating the observed x's to the latent ξ's;

ξ is a (sxl) vector of common factors; and

δ is a (qxl) vector of residuals or unique factors with the assumption that q>s.

For endogenous latent and observable variables, the equation is:

$$Y= \Lambda_{y}\eta+\varepsilon,$$

where;

Y is a (pxl) vector of the observable variable;

Λ_{y} is a (pxr) matrix of factor loading, relating the observed y's to the latent η's;

η is a (rxl) vector of common factors; and

ε is a (pxl) vector of residuals or unique factors with the assumption that p>r.

In this study, two latent concepts are used as endogenous variable: perceived enhancers (η_1) and practice alignment (η_2). This results in two separate measurement models for endogenous variables that must be evaluated. The measurement models can be expressed as $Y= \Lambda_y\eta+\varepsilon$, where Λ_y is the coefficient relating Y to η, and ε is the measurement error for Y. Measurement errors associated with the observed variables for each latent variable are identified. These errors occur from imperfect measurements and may cause grave bias in the estimation if it is not taken into account.

Structural Equation Analysis

The purpose of this study is to examine relationships of personal and contextual factors and adaptive response factors of physicians and their practice to physician performance. The construct of performance consists of earnings and job satisfaction. Structural equation modeling with latent variables is the analytic approach used in this study. Analysis of moment (AMOS) software, (AMOS 5.0.1, Smallwaters Corp.), issued in 2003 is used to conduct the multivariate Linear Structural Relations (LISREL) method.

The LISREL model is employed because the construct of performance can be measured by related indicators. The measurement model of physician performance specifies the relations between observed and latent variables when correlated measurement errors are considered. LISREL validates the measurements model's goodness-of-fit for the underlying constructs before they are incorporated into the structural equation model (SEM). Lastly, LISREL measurements detect correlated errors

and allow the study to address them (Bollen, 1989; Jöreskog and Sörbom, 1979; Bollen, and Long, 1993).

Linear structural relations (LISREL) is the statistical approach to this study's data analysis and theory construction. This method reveals possible linkages between exogenous variables and endogenous latent variables factored from observed variables in the measurement model. The structural equation model is expressed mathematically as:

$$H=B\eta+\varsigma,$$

where:

η is a vector of latent endogenous variables;

B is a matrix of coefficients relating the endogenous variables to one another; and

ς is a vector of errors in the equations, indicating that the endogenous variables to one another.

In this study, relationships among personal and contextual factors, adaptive response factors, and performance need to be specified. The control variables, practice experience in years, race, type of practice, foreign medical graduate status, metropolitan statistical area (MSA), and gender are to be included in the analysis to detect possible spurious relationships between adaptive response factors and performance. Figure 4 describes the structural equation model.

The structural equation model with latent variables and the measurement models are analyzed using a correlation matrix. Jöreskog and Sörbom (1989) pointed out that when analyzing a covariance matrix in social science applications, the units of measurement in the observed variables are often arbitrary and may have no definite

meaning. The authors therefore recommended for the sake of convenience and interpretation, a correlation matrix be used. This is common practice in structural equation modeling and will be followed in this study. A risk associated when using a correlation matrix is that chi-square tests (χ^2), goodness-of-fit measures, and standard errors might be incorrect; though, they may be asymptotically true. The authors further stated that the conditions under which one can judge whether results are asymptotically correct are complicated and little guidance is given on how to make this judgment. A correlation matrix generates a series of correlations; polyserial, polychoric, and Pearson product moment. These are generated for all continuous and ordinal variables in the model. This type of correlation matrix series is used to produce precise parameter estimates. Using this series is more precise than using the Pearson product moment correlation alone. The correlation matrix is calculated using list-wise deletion where all cases with missing observations are first deleted. It is important to use a matrix with no missing variables.

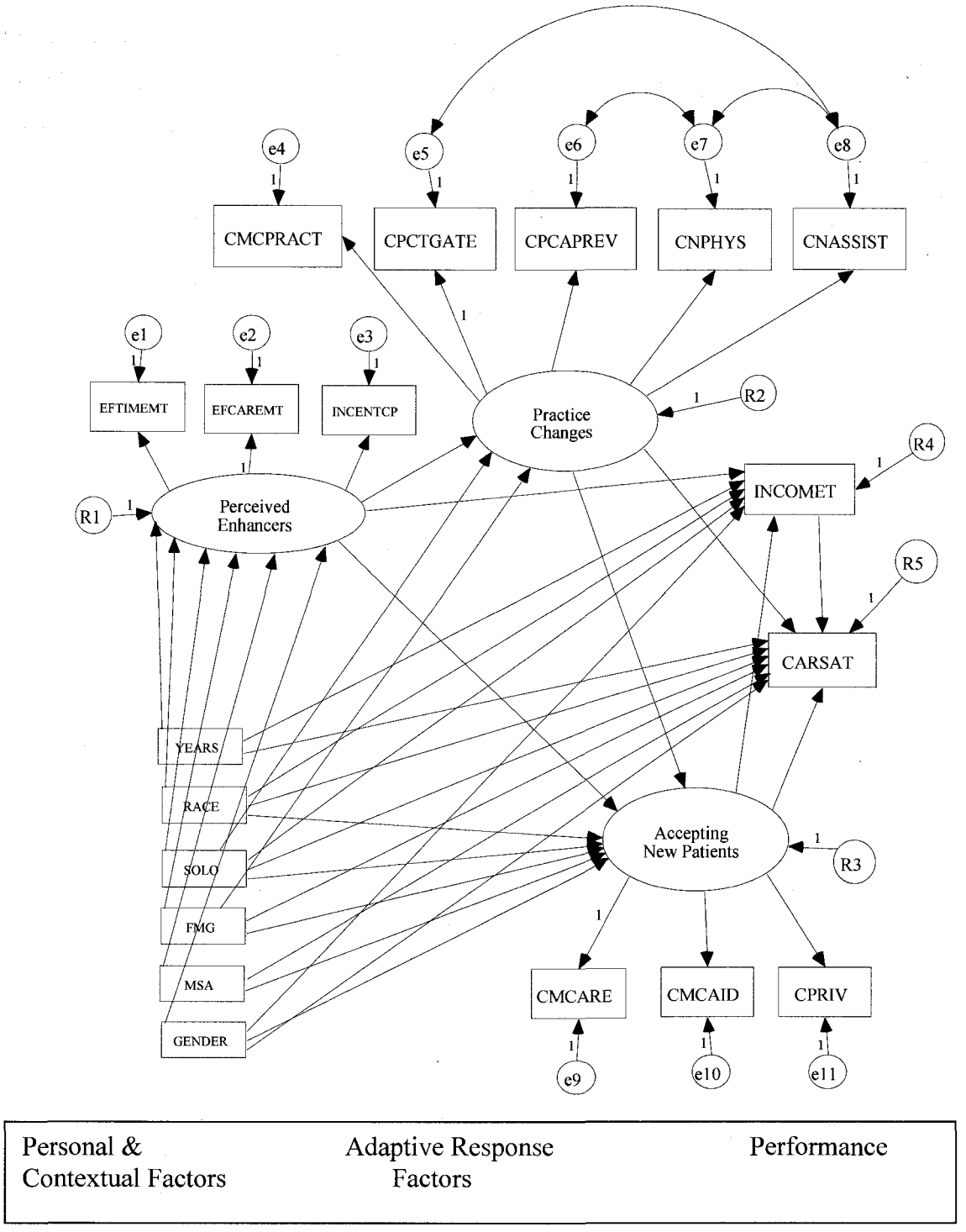


Figure 4: Structural Equation Model with Indicators Describing Relationship between Personal and Contextual Factors, Adaptive Response, and Performance.

Measurement and structural equation models are examined to determine whether the estimated coefficients and associations among latent variables display the mathematical sign (+/-) and magnitude in conformance to the study hypotheses. The model will first be fitted with variables in their original metrics. After initial fitting, a standardized solution will be obtained so that latent variables and observed variables are scaled to have standard deviations of variation equal to one. Evaluation of the models will use statistical measures of fit.

Model fit testing is done to determine whether the covariance structure implied by the conceptual model is equal to the actual covariance structure of the data, or $\sum=\sum(\theta)$ (Bollen, 1989). The Chi-Square (χ^2) test is an overall test of the residuals in $[\sum=\sum(\theta)]$, assuming no difference exists between the population and the sample. Another way of viewing the χ^2 test is a simultaneous test of differences between observed and predicted covariances among variables (Long, 1983). When χ^2 is small and the p-value is larger than the critical value of χ^2, determined by degrees of freedom (d.f.) at the chosen level of significance, the model is well fit. The χ^2 approximation assumes data without kurtosis and a sufficiently large sample size. It is noted that as sample size increases, smaller and smaller differences between observed and predicted covariances become statistically significant. Because of this, models using very large sample sizes with positive degrees of freedom will be rejected because of provision of statistically unacceptable fit (Long, 1983). This study utilizes a large sample so a better indicator of model fit is the χ^2/d.f. ratio. The χ^2/d.f. ratio reduces problems of excessive statistical power in χ^2 when a large

sample size is used. Bollen (1989) indicates general consensus on a good fit for the model is a χ^2/d.f. ratio of five or less.

Goodness of Fit Index (GOF) and the adjusted GOF (AGFI) are additional measures of overall model fit (Jöreskog & Sörbom, 1989). The GOF measures the relative amount of covariance and variance in the matrix of sample data that is predicted by the covariance structure matrix implied by the theoretical model. The AGFI adjusts for the degrees of freedom relative to the number of variables.

Another author (Hoelter, 1983) argued a value called Critical-N is a better indicator of fit. Hoelter contends a Critical-N value of 200 or better indicates a satisfactory fit. An additional method to assess model fit is by examination of the root mean square residual (RMSEA). By measuring the average of the fitted residuals model fit is determined. The average of the fitted residuals should be near zero for a well-fitted model.

Measures of overall model fit to the data do not equate to the quality of the model judged by other internal or external criteria. Care is taken not to rely on GOF and AGFI measures alone for it is possible to have a very well fit model though the relationships in the model are very poorly determined (Jøreskog and Sørbom, 1989). Recalling the literature, while assessing model fit is part of the assessment of model validity.

Building a specified and well fitting model is an iterative process. The method to accomplish this is: 1) elimination of observed indicators making no significant contribution to latent variables; 2) replacing or adding variables that measure latent variables better; and 3) freeing the parameter (λ or ε) that results in the greatest reduction

of the chi-square value in order to improve model fit. Fixed and constrained parameters in the model can each be measured by modification indices. Modification indices measure how much a chi-square value is expected to decrease if a particular parameter is set free and the model re-estimated.

Gamma coefficients, which are the effects of exogenous variables on endogenous ones, beta coefficients that measure effects endogenous variables on other endogenous variables, as well as regression coefficients are tested for statistical significance. Values associated with hypothesis testing are empirically examined in a one-tailed test for statistical significance at a 0.05 or lower level. Conclusions produced from multivariate analysis of hypotheses formulated in Chapter 3 are stated as the net effect a given predictor has on an endogenous variable while another variable or variables are simultaneously controlled.

Summary

Structural Equation Modeling (SEM) is the method chosen to analyze the data used in this dissertation. It is widely applied in the field of behavioral science. It can be thought of as a combination of factor analysis and regression or path analysis. SEM is most useful when theoretical constructs, as those utilized in this paper, are represented by latent factors. The relationships between the proposed theoretical constructs are represented by regression or path coefficients between the factors. The SEM model used in this study implies a structure for the covariances between the observed variables. Through the use of SEM the model can be extended through this inclusion of observed

variables. By using SEM, a convenient framework for multivariate statistical analysis is established.

The SEM is visualized through a graphical path diagram which allows refinement in an iterative process of model specification and re-specification. The strength of the SEM approach lies in the ability to specify and estimate more complicated relationships than simple linear regression. With this methodology intervening variables between the independent and dependent variables, and latent factors as well, can be accounted for in the final analysis. The number of observations used for this dissertation exceeds the typical required sample size of two hundred cases (Bollen, 1989, 1993; Hoogland, 1997). An additional advantage of using the SEM approach is if the data, upon exploration, if continuous, reveal non-normal distribution properties. In this case, SEM allows an alternative estimation method called asymptotically distribution free (ADF). If this is the case, then the data would support the analysis using a thousand or more cases. However, if certain continuous non-normal data did not have a thousand cases available then SEM offers a maximum likelihood estimation approach that produces good estimates with four hundred cases (Chou, 1995).

The SEM approach used in this study also tackles the problem of ordinal categorical data analysis. It is likely the data set contains data of this nature so; the proposed approach in SEM is to consider ordinal categorical measurements as imprecise observations on continuous normally distributed variables. With that assumption, it is possible to compute polychoric correlations, which are the estimated correlations among

the unobserved normal variables. Then using asymptotically distribution free estimations, model estimations are produced.

The SEM methodology used anticipates using the root mean square error of approximation (RMSEA) to assess goodness of fit. It is anticipated that a RMSEA of less than 0.05 will be required to indicate a well fit model. A low RMSEA coupled with confidence interval calculations to test if the RMSEA is significantly larger than the lower bound will indicate a true fitting model.

The SEM methodology answers two common criticisms of SEM, namely statistical assumptions and needed sample size. Also, this methodology addresses a concern using the issue of causal interpretation. This proposal concludes with the proposition and understanding that structural equation modeling does not transform correlational data into causal conclusions. At this opportunity, it is important to remind the reader that the fact that a SEM model has been corroborated by the data does not mean that it has been proven true. It just has not been falsified. This is in keeping with the functional branch of scientific inquiry. That is the science of uniformity; a search for lawful relationships within a homogeneous population.

CHAPTER 5: RESULTS

This chapter presents the results of the study. Results will be derived from data analysis that includes exploratory analysis, confirmatory factor analysis, and structural equation modeling. To begin with, exploratory analysis results of descriptive statistics, univariate analysis, and correlation analysis are presented. Next, confirmatory factor analysis is performed to explore and validate the integrity of the measurement instruments. Then, structural equation modeling is performed to test the research hypotheses and validate the overall model fit.

Exploratory Analysis

This exploratory approach seeks to reveal information from the data about the relationships between environmental, congruence and strategy, and performance in the context of physician earnings and job satisfaction. This approach seeks to shed light on these relationships in the data with the understanding that there's a wide range of explanations that are plausible for the proposed relationships between the model variables. To begin with, the data will be inspected for outliers and missing data points. Additionally, gaps, multiple peaks, and skewness within specific variables will be assessed.

Data described in Chapter 4, from the two-wave physician CTS surveys were merged by unique physician identifier. This resulted in a panel data set that contained

only respondents that completed the survey in both time frames. Questionnaires with missing responses to variables were dropped at this time. The end result of this data cleansing reduced the number of physician responses from over 12,000 to 4,784 fully completed questionnaires. This data set was subsequently merged with the Area Resource File for 1999 based upon matching FIPS codes listed in the questionnaire.

Descriptive Analysis

Data used in this study comes from a stratified sample of physicians licensed to practice in the continental United States. The population list is created and maintained by combining the American Medical Association (AMA) Masterfile and the American Osteopathic Association (AOA) membership file. There are no other comparable national physician databases or registries like these two. However, one could construct for comparison purposes, a national population database by aggregating all State Boards of Medical licensure records. These records do not contain comparable data regarding details of medical practice organization and activity like the data contained in the Center for Studying Health System Change survey database used in this study. State licensure records would only allow national comparison of the two databases between basic demographic items such as practice location, length of licensure, medical school affiliation, and perhaps age, sex, and race of the physician.

Descriptive statistics for categorical variables are presented in Table 1. Most direct patient care practitioners in the study are white US trained male physicians that practice in large metropolitan areas. They are evenly split between

Table 1. Descriptive Statistics for Categorical Variables (N=4784)

Variable	Description	Frequency Counts	Percent	Cumulative Percent
RACE	0:Other	866	18.1	18.1
	1:White	3918	81.9	100.0
SOLO	0:Multiple	2301	48.1	48.1
	1:Solo	2483	51.9	100.0
FMG	0:U.S.	3821	79.9	79.9
	1:Foreign	963	20.1	100.0
MSA	1:Non-Metro	386	8.1	8.1
	2:Small Metro	150	3.1	11.2
	3:Large Metro	4248	88.8	100.0
GENDER	0:Female	864	18.1	18.1
	1:Male	3920	81.9	100.0
SPROD0	0:Productivity doesn't affect compensation	2607	54.5	54.5
	1:Productivity does affect compensation	2177	45.5	100.0
SSAT0	0:Patient satisfaction doesn't affect compensation	4038	84.4	84.4
	1:Patient satisfaction does affect compensation	746	15.6	100.0
SQUAL0	0:Quality measure doesn't affect compensation	4149	86.7	86.7
	1:Quality measure does affect compensation	635	13.3	100.0
SPROF0	0:Profiling doesn't affect compensation	4259	89.0	89.0
	1:Profiling affects compensation	525	11.0	100.0
BDCERT	1:Certified	4115	86.0	86.0
	2:Eligible	449	9.4	95.4
	3:Neither	220	4.6	100.0

solo and multiple practice types. It is also interesting to note that 86% of the physicians studied are self reported as certified in some specialty. After understanding the relationships of physicians' in this contingency model in general to income and career

satisfaction, future analysis could focus on subsets of select specialties and sub-specialties. Positions were evenly split the on the issue of whether or not productivity affected compensation. Additionally, it was surprising to find that physicians did not think 84.4% of the time, that patient satisfaction affected compensation. This finding mirrors the fact in which physicians do not think compensation is affect by specific measurements of quality of care.

Table 2 reveals that most practitioners accept all Medicare and private pay patients. However, approximately only 40% of the participants accepted all Medicaid patients. When it came to observing changes in the rate at which they accepted Medicare, Medicaid, and private patients, greater than 60% of the respondents reported no change in the rate to of patient acceptance. Approximately 2% or fewer reported large reductions in the types of patients accepted. For most physicians, regarding the effect of physician profiling on their practice, they reported small to moderate impact. The implementation and use of treatment guidelines also revealed that most physicians reported a small to moderate impact of that approach on their practice. Less than 10% of the physicians reported a large or very large implementation of the use of treatment reminders in their practice. Physicians reported 52.7% of the time that the use of computers, to obtain or record clinical data such as medical records and lab results, had little to no effect in their practice of medicine. Overall, 77.5% of physicians reported that they were satisfied or very satisfied with their career and were split evenly between the two categories.

Table 2. Descriptive Statistics for Interval Variables (N=4784)

Variables	Description	Frequency Counts	Percent	Cumulative Percent
NWMCARE (Median=4)				
	1:None accepted	632	13.2	13.2
	2:Some accepted	607	12.7	25.9
	3:Most accepted	694	14.5	40.4
	4:All accepted	2851	59.6	100.0
NWMCARE0 (Median=4)				
	1:None accepted	581	12.1	12.1
	2:Some accepted	528	11.0	23.2
	3:Most accepted	676	14.1	37.3
	4:All accepted	2999	62.7	100.0
NWMCAID (Median=3)				
	1:None accepted	1218	25.5	25.5
	2:Some accepted	1099	23.0	48.4
	3:Most accepted	518	10.8	59.3
	4:All accepted	1949	40.7	100.0
NWMCAID0 (Median=3)				
	1:None accepted	1091	22.8	22.8
	2:Some accepted	1148	24.0	46.8
	3:Most accepted	490	10.2	57.0
	4:All accepted	2055	43.0	100.00
NWPRIV (Median=4)				
	1:None accepted	203	4.2	4.2
	2:Some accepted	573	12.0	16.2
	3:Most accepted	850	17.8	34.0
	4:All accepted	3158	66.0	100.0
NWPRIV0 (Median=4)				
	1:None accepted	194	4.1	4.1
	2:Some accepted	519	10.8	14.9
	3:Most accepted	870	18.2	33.1
	4:All accepted	3201	66.9	100.0
CMCARE (Median=0)				
	-3:Large reduction in Medicare accepted	110	2.3	2.3

Table 2 – continued.

Variables	Description	Frequency Counts	Percent	Cumulative Percent
	-2:Medium reduction in Medicare accepted	165	3.4	5.7
	-1:Small reduction in Medicare accepted	458	9.6	15.3
	0:No change in Medicare accepted	3113	65.1	80.4
	1:Small increase in Medicare accepted	561	11.7	92.1
	2:Medium increase in Medicare accepted	245	5.1	97.2
	3:Large increase in Medicare accepted	132	2.8	100.0
CMCAID (Median=0)				
	-3:Large reduction in Medicaid accepted	68	1.4	1.4
	-2:Medium reduction in Medicaid accepted	212	4.4	5.9
	-1:Small reduction in Medicaid accepted	499	10.4	16.3
	0:No change in Medicaid accepted	3047	63.7	80.0
	1:Small increase in Medicaid accepted	597	12.5	92.5

Table 2 – continued.

Variables	Description	Frequency Counts	Percent	Cumulative Percent
	2:Medium increase in Medicaid accepted	242	5.1	97.5
	3:Large increase in Medicaid accepted	119	2.5	100.0
CPRIV (Median=0)				
	-3:Large reduction in private accepted	63	1.3	1.3
	-2:Medium reduction in private accepted	204	4.3	5.6
	-1:Small reduction in private accepted	583	12.2	17.8
	0:No change in private accepted	3013	63.0	80.7
	1:Small increase in private accepted	611	12.8	93.5
	2:Medium increase in private accepted	246	5.1	98.7
	3:Large increase in private accepted	64	1.3	100.0
EFPROFL0 (Median=2)				
	0:No Effect	974	20.4	20.4
	1:Very Small	746	15.6	36.0
	2:Small	1392	29.1	65.1
	3:Moderate	1200	25.1	90.1
	4:Large	396	8.3	98.4
	5:Very Large	76	1.6	100.0
EFGUIDE0 (Median=2)				
	0:No Effect	525	11.0	11.0
	1:Very Small	715	14.9	25.9

Table 2 – continued.

Variables	Description	Frequency Counts	Percent	Cumulative Percent
	2:Small	1312	27.4	53.3
	3:Moderate	1415	29.6	82.9
	4:Large	608	12.7	95.6
	5:Very Large	209	4.4	100.0
EFRMNDR0 (Median=1)				
	0:No Effect	2272	47.5	47.5
	1:Very Small	477	10.0	57.5
	2:Small	829	17.3	74.8
	3:Moderate	766	16.0	90.8
	4:Large	355	7.4	98.2
	5:Very Large	85	1.8	100.0
EFTREAT0 (Median=2)				
	0:No Effect	1202	25.1	25.1
	1:Very Small	894	18.7	43.8
	2:Small	1511	31.6	75.4
	3:Moderate	816	17.1	92.5
	4:Large	267	5.6	98.0
	5:Very Large	94	2.0	100.0
EFDATA0 (Median=2)				
	0:No Effect	930	19.4	19.4
	1:Very Small	568	11.9	31.3
	2:Small	1025	21.4	52.7
	3:Moderate	1086	22.7	75.4
	4:Large	749	15.7	91.1
	5:Very Large	426	8.9	100.0
CARSAT (Median=4)				
	1:Very Dissatisfied	223	4.7	4.7
	2:Dissatisfied	789	16.5	21.2
	3:Neither Satisfied/Dissatisfied	63	1.3	22.5
	4:Satisfied	1863	38.9	61.4
	5:Very Satisfied	1846	38.6	100.0

Descriptive statistics for continuous variables are listed in Table 3. On average, the reporting physicians had been practicing for approximately 21 years, worked approximately 48 weeks per year, and spent the about 54 hours each week, related to medical activities. They reported donating approximately 8 hours per month to charity care. The average percent of patient care time spent in their main practice location was approximately 97%. In general, these 48-year-old physicians earned, on average, $171,275 per year before taxes.

Univariate Analysis

All study variables were analyzed for normality distribution using graphical tests, the Schapiro – Wilk statistic, and the Kolmogorov – Smirnov (Lillefores) test for normality of continuous variables.

Graphical tests were the first conducted, including histograms and Q – Q plots. This was done in order to visualize the frequency distributions of univariate indicators. Q – Q plots revealed normal distribution through a linear plot. A linear plot indicates distribution is normal, and a nonlinear plot indicates a distribution that is not a normal. Most of these plots had a significant linear component as exemplified by the plot for care management effectiveness, shown in Figure 5.

Few Q – Q plots, as exemplified by the plot for the variable describing the effective management of time, exhibited small deviations from linearity. This is shown in Figure 6.

Table 3. Descriptive Statistics for Continuous Variables (N=4784)

Variable (+)	Mean	95% C.I.*	Minimum	Maximum
Years	21.40	21.1-21.60	4.00	80.00
CMCPRACT	2.40	1.78-3.02	-100.00	100.00
CPCTGATE	0.73	0.12-1.35	-100.00	100.00
CPCAPREV	0.34	-0.21-0.90	-100.00	100.00
CNPHYS	4.87	2.05-7.69	-996.00	996.00
CNASSIST	-1.43	-3.73-0.87	-997.00	997.00
PMC	46.35	45.35-47.13	0.00	100.00
PMC0	43.95	43.16-44.74	0.00	100.00
PCTGATE	24.81	23.92-25.70	0.00	100.00
PCTGATE0	24.08	23.18-24.96	0.00	100.00
PCAPREV	19.52	18.75-20.28	0.00	100.00
PCAPREV0	19.17	18.40-19.94	0.00	100.00
NPHYS	41.76	37.64-45.88	1.00	997.00
NPHYS0	36.89	33.03-40.74	1.00	997.00
NASSIST	11.46	9.33-13.60	0.00	997.00
NASSIST0	12.89	10.44-15.34	0.00	997.00
EFCAREMT	1.06	1.04-1.07	0.00	2.73
INCENTCP	0.094	0.089-0.099	0.00	0.60
EFTIMEMT	195.63	194.79-196.47	81.76	814.74
WKSWRK	47.74	47.64-47.83	-8.00	52.00
HRSMED	54.40	53.95-54.86	10.00	150.00
HRFREE	7.73	7.19-8.28	0.00	522.00
PPTMNRE	97.67	97.38-97.95	-9.00	100.00
INCOMET	171,275.93	168,759.09-173,792.76	0.00	400,000.00
AGE	48.42	48.14-48.71	30.00	102.00

*C.I.: Confidence Interval
+ See variable units description in Appendix B

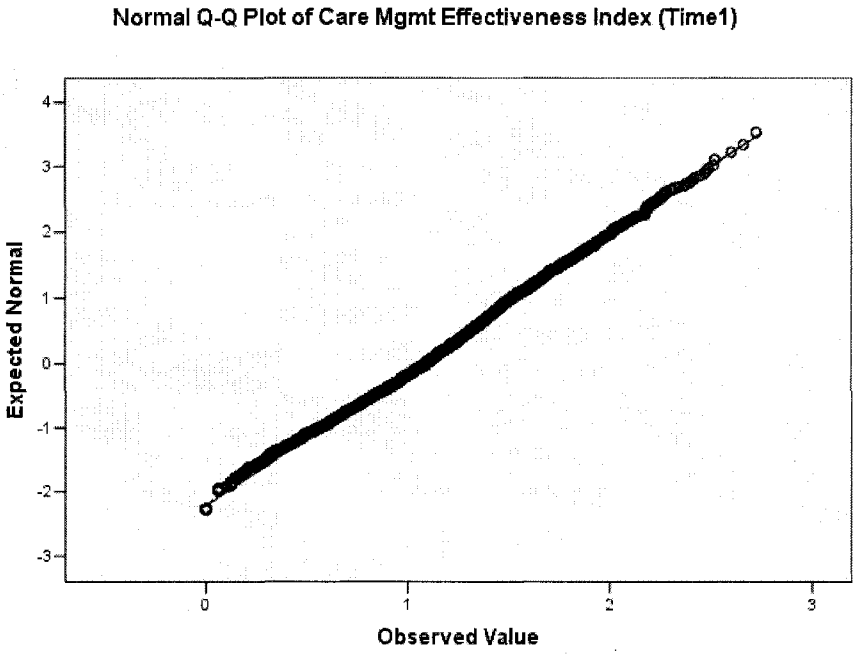


Figure 5: Normality Plot for EFCAREMT

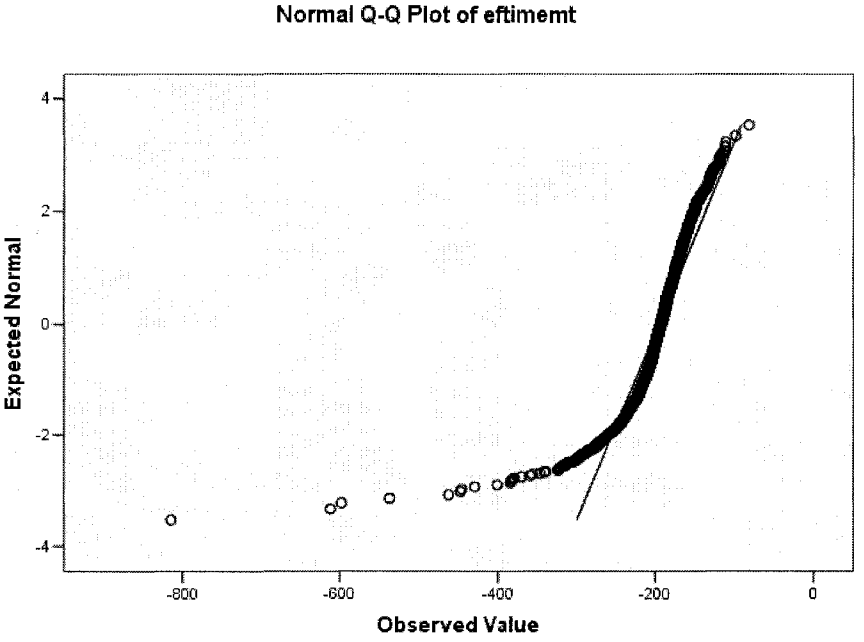


Figure 6: Normality Plot for EFTIMEMT

The skewness test statistics in Table 4 indicate all but two variables do not exhibit characteristics of perfectly normal distributions of data. In light of this finding, consideration was given to the need to transform the data, by taking the square root of the variables, in order to induce normality.

The non-transformed continuous variables were tested for skewness, kurtosis, and normality. Normality was also assessed using the Kolmogorov-Smirnov (Lillefores) (KS) test. Table 4 lists statistics for skewness and kurtosis associated with the continuous variables. Skewness, as a test of normal distribution of data, should have values close to zero for normally distributed data. Ten of the twenty-five variables examined had skewness values approaching zero. The other fifteen variables tended to have positive skewness values which indicate a shift to the right, meaning a longer distribution tail on the right side of the plot. Examination of the kurtosis values reveals that twenty of the twenty-five variables had positive kurtosis statistics. This indicated distribution curves that clustered more and had longer distribution tails than data with a normal distribution. An example of this is the distribution curve for CNPHYS shown in Figure 7.

Table 4. Test of Skewness and Kurtosis for Continuous Variables

Skewness Variables	Statistic	Std. Error	Z-value
YEARS	0.764	0.035	21.83
CMCPRACT	-0.184	0.035	-5.26
CPCTGATE	-0.150	0.035	-4.29
CPCAPREV	-0.241	0.035	-6.89
CNPHYS	1.796	0.035	51.31
CNASSIST	-2.990*	0.035	-85.43
PMC	0.132	0.035	3.77
PMC0	0.258	0.035	7.37
PCTGATE	0.971	0.035	27.74
PCTGATE0	1.075	0.035	30.71
PCAPREV	1.464	0.035	41.83
PCAPREV0	1.549	0.035	44.26
NPHYS	5.152	0.035	147.20
NPHYS0	5.489	0.035	156.83
NASSIST	11.086	0.035	316.74
NASSIST0	9.946	0.035	284.17
EFCAREMT	-0.053	0.035	-1.51*
INCENTCP	2.017	0.035	57.63
EFTIMEMT	-4.735*	0.035	-135.29
WKSWRK	-5.068	0.035	-144.80
HRSMED	0.764	0.035	21.83
HRFREE	11.986	0.035	342.46
PPTMNRE	-5.224	0.035	-149.26
INCOMET	0.907	0.035	25.91
AGE	0.772	0.035	22.06
Kurtosis Variables	Statistic	Std. Error	Z-value

Table 4 – Continued.

YEARS	0.261	0.071	3.68**
CMCPRACT	2.568	0.071	36.17**
CPCTGATE	6.154	0.071	86.68**
CPCAPREV	8.009	0.071	112.80**
CNPHYS	65.657	0.071	924.75**
CNASSIST	113.412	0.071	1,597.35**
PMC	-0.949	0.071	-13.37**
PMC0	-0.910	0.071	-12.82**
PCTGATE	-0.434	0.071	-6.11**
PCTGATE0	-0.185	0.071	-2.61**
PCAPREV	1.163	0.071	16.38**
PCAPREV0	1.395	0.071	19.65**
NPHYS	27.998	0.071	394.34**
NPHYS0	32.278	0.071	454.62**
NASSIST	134.064	0.071	1,888.23**
NASSIST0	104.543	0.071	1,472.44**
EFCAREMT	-0.187	0.071	-2.63**
INCENTCP	2.630	0.071	37.04**
EFTIMEMT	66.240	0.071	932.96**
WKSWRK	52.242	0.071	735.80**
HRSMED	2.453	0.071	34.55**
HRFREE	225.524	0.071	3,176.39**
PPTMNRE	31.316	0.071	441.07**
INCOMET	0.453	0.071	6.38**
AGE	0.367	0.071	5.17**

* significant at Z = 1.96 level; distribution is normal

**** not significant at Z = 1.96 level; distribution is not normal**

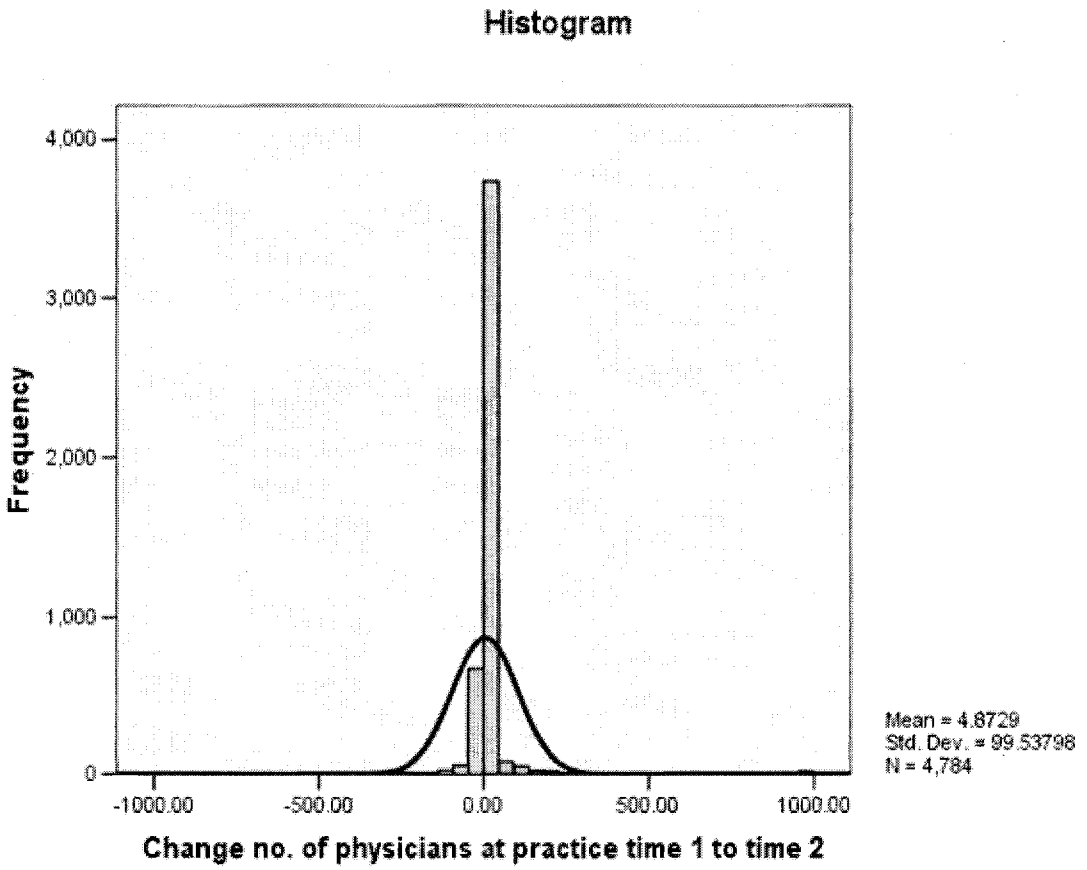


Figure 7: Normal Distribution Histogram for CNPHYS

Lastly, the KS test was used to assess each continuous variable for univariate normality. The results are shown in Table 5. If the Z statistic for the KS test has a significance value of less than 0.05, then the variable does not have a normal distribution. As seen in Table 5 below, none of the variables exhibit normality when assessed with the KS test.

Table 5. Test of Normality for Continuous Variables
Kolmogorov-Smirnov Test

Variables	Z Statistic	d.f.	Sig.
YEARS	6.372	4783	0.000
CMCPRACT	7.683	4783	0.000
CPCTGATE	19.148	4783	0.000
CPCAPREV	15.130	4783	0.000
CNPHYS	27.311	4783	0.000
CNASSIST	29.395	4783	0.000
PMC	5.806	4783	0.000
PMC0	6.256	4783	0.000
PCTGATE	17.455	4783	0.000
PCTGATE0	17.148	4783	0.000
PCAPREV	16.193	4783	0.000
PCAPREV0	16.626	4783	0.000
NPHYS	26.946	4783	0.000
NPHYS0	27.618	4783	0.000
NASSIST	30.398	4783	0.000
NASSIST0	30.484	4783	0.000
EFCAREMT	2.268	4783	0.000
INCENTCP	28.301	4783	0.000
EFTIMEMT	8.336	4783	0.000
WKSWRK	15.131	4783	0.000
HRSMED	8.933	4783	0.000
HRFREE	23.769	4783	0.000
PPTMNRE	35.782	4783	0.000
INCOMET	8.457	4783	0.000
AGE	6.206	4783	0.000

Further analysis was done using the continuous variables transformed by taking the square root and compared to the analysis without making the transformation. The results were examined and the conclusion was that performing a transformation on the data did not alter the conclusions of the analysis or make it easier to interpret the data. Therefore, all analysis and results of this study are based on non-transformed data.

Correlation Analysis

A Pearson correlation matrix of all the indicators associated with congruence and strategy (adaptive response factors) described in Figure 3 is presented in Tables 6 through 8. Results show significant positive relationships between changes in the number of nursing assistants and number of physicians with respect to change in the percent of prepaid revenue from an increasing percentage of managed-care penetration into the practice. Significant negative relationships are revealed between the number of nursing assistants in the practice, change in prepaid capitated revenue, the physician's role as gatekeeper in conjunction with managed-care penetration into the practice and compensation incentives. This seems to indicate that as measures of productivity, patient satisfaction, quality of care, and practice profiling are perceived by the physician to be important, attempts are made to reduce staff and the percentage of managed-care influencing the physicians practice. This appears to be a trade-off made by physicians in response to pay for performance initiatives. In conjunction with this observation, it is noteworthy that changes in private, Medicaid, and Medicare patient load, do not correlate significantly with changes in staff and percent of managed-care penetration and prepaid revenue in the practice setting.

As one would expect, changes in the number of private, Medicare, and Medicaid patients correlate highly. Response to incentives correlates positively with effective care and time management. This might indicate that incentives do impact medical care management by physicians. However, the negative relationship between effective care management and effective time management reveals an interesting proposition. It may

Table 6. Pearson Correlations for Congruence & Strategy Variables

Variable	CNASSIST	CNPHYS	CPCAPREV	CPCTGATE	CMCPRACT
CNASSIST	1.000	0.373**	0.038**	0.035*	0.024
CNPHYS	0.373**	1.000	0.104**	0.011	0.082**
CPCAPREV	0.038**	0.104**	1.000	0.082**	0.414**
CPCTGATE	0.035*	0.011	0.0825**	1.000	0.154**
CMCPRACT	0.024	0.082**	0.4143**	0.154**	1.000
CPRIV	0.026	0.024	-0.002	-0.011	-0.017
CMCAID	0.030*	0.017	0.010	0.024	0.015
CMCARE	-0.010	0.002	-0.005	0.0281	-0.030*
INCENTCP	-0.062**	-0.002	-0.041**	-0.082**	-0.047**
EFCAREMT	-0.022	-0.025	-0.018	-0.027	-0.050**
EFTIMEMT	-0.014	-0.003	0.009	-0.006	-0.009

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Table 7. Pearson Correlations for Congruence & Strategy Variables

Variable	CPRIV	CMCAID	CMCARE
CNASSIST	0.026	0.030*	-0.010
CNPHYS	0.0240	0.017	0.001
CPCAPREV	-0.002	0.010	-0.005
CPCTGATE	-0.011	0.024	0.028
CMCPRACT	-0.017	0.015	-0.030*
CPRIV	1.000	0.236**	0.312**
CMCAID	0.236**	1.000	0.327**
CMCARE	0.312**	0.327**	1.000
INCENTCP	-0.003	0.002	0.0121
EFCAREMT	-0.016	-0.001	0.017
EFTIMEMT	0.002	-0.009	-0.000

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Table 8. Pearson Correlations for Congruence & Strategy Variables

Variable	INCENTCP	EFCAREMT	EFTIMEMT
CNASSIST	-0.062**	-0.0216	-0.0139
CNPHYS	-0.002	-0.025	-0.003
CPCAPREV	**-0.0414**	-0.018	0.009
CPCTGATE	-0.082**	-0.027	-0.006
CMCPRACT	-0.047**	-0.050**	-0.009
CPRIV	-0.003	-0.016	0.002
CMCAID	0.002	-0.001	-0.009
CMCARE	0.012	0.017	-0.000
INCENTCP	1.000	0.249**	0.0515**
EFCAREMT	0.249**	1.000	-0.0519**
EFTIMEMT	0.051**	-0.0519**	1.000

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

indicate that better medical care results in less effective use of time resources by physicians.

In summary, it can be seen from Tables 6, 7, and 8 that most variables represent their constructs independently. Although the individual measures of changes in Medicare, Medicaid, and private patient load in a physician practice are highly correlated and may present a problem with multicollinearity, it is important to investigate individual impacts of these variables on income and career satisfaction at this point in time to guard against this influence. It may be useful in further investigations to combine these three variables into a single variable representing patient workload changes.

Confirmatory Factor Analysis

The measurement models specifying linear relationships between the observed variables and the latent constructs were validated using confirmatory factor analysis. Further description is given in Appendix A.

Three different latent variables describing two latent endogenous constructs are reported in the Table 9.

Analysis shows that for the construct perceived enhancers, the variable relating to incentive compensation (INCENTCP) has the highest influence through its regression estimation (0.632) on that latent construct. This point is confirmed by the high factor score weight associated with this relationship. The factor score weight is interpreted to mean when the value of INCENTCP increases by a unit of one, the value of the latent construct Perceived Enhancers increases by a value of 0.49 units. Likewise, when the value of YEARS increases by a unit of one, the value of the latent construct Perceived Enhancers decreases by a unit of The variables for effective time management (EFTIMEMT), effective care management (EFCAREMT), and incentive compensation (INCENTCP) dominate over the context variables of race, years of practice, solo practice, gender, and foreign medical school graduation status.

When one looks at the relationship between the construct of practice changes and the variables associated with it, change in the percent of managed care practice (CMCPRACT) dominates. Change of the percent of the practice care revenue paid on a capitated or prepaid basis (CPCAPREV) as well as the change in the role of the physician as a gatekeeper (CPCTGATE) come in a distant second and third with respect to influencing the construct of practice changes.

Table 9. Maximum Likelihood Estimates for the Measurement Models of Latent Constructs

Latent Variables and Their Indicators	Regression Estimation Lambda(+)	Critical Ratio (CR)	Squared Multiple Correlation	Factor Score Weights
Perceived Enhancers				
YEARS	-0.084	-3.980**		-0.001
RACE	-0.171	-7.140**		-0.053
SOLO	-0.472	-14.451**		-0.113
FMG	0.203	8.317**		0.062
MSA	0.069	3.513**		0.015
GENDER	-0.072	-3.571**		-0.022
EFTIMEMT	0.055	2.018	0.002	0.000
EFCAREMT	0.391	Constrained	0.152	0.078
INCENTCP	0.636	14.506**	0.400	0.493
Practice Changes				
CMCPRACT	0.816	Constrained	0.786	0.737
CPCTGATE	0.186	5.797**	0.030	0.032
CPCAPREV	0.507	6.287**	0.218	0.119
CNPHYS	0.104	4.309**	0.009	0.002
CNASSIST	0.038	1.832	0.001	0.000
INCOMET	0.013	0.795	0.001	0.000
CARSAT	0.008	0.418	0.012	0.022
Accepting New Patients				
CMCARE	0.658	Constrained	0.434	0.322
CMCAID	0.496	15.744**	0.246	0.187
CPRIV	0.476	15.788**	0.225	0.182
INCOMET	-0.014	-1.356	0.001	0.000
CARSAT	-0.018	-0.903	0.012	-0.004

** $p < 0.001$ level of significance
• $p < 0.01$ level of significance
+ standardized

The variables change in accepting Medicare patients (CMCARE), change in accepting Medicaid patients (CMCAID), and change in accepting private patients (CPRIV), all evenly contributed to the construct of accepting new patients. A slightly higher influence from CMCARE was revealed. Income and career satisfaction were

considered in the model specification process to be derived from changes in the physicians' medical practice and thus would not be expected to have any influence on changes of patient mix.

The use of a variety of goodness of fit measures is employed to assess whether or not the specified models, based on previous literature and research, tends to represent the relationships described. In Table 10, four different assessment measures are used in addition to the Hoelter Index that assesses adequacy of sample size needed for the model.

Table 10. Goodness-of-Fit Statistics for the Measurement Models

Constructs	Chi Square	DF	AGFI	CFI	RMSEA	Hoelter's Index *
Perceived Enhancers	638.900	22	0.946	0.804	0.077	302
Practice Alignment: Practice Changes, Accepting New Patients	42.057	28	0.997	0.995	0.010	5,491

* Hoelter's Index at 0.01 level.

The overall model fit indices indicate that the model with correlated measurement errors fits the data reasonably well, with the adjusted goodness of fit index (AGFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA) all very close to their desired values. When AGFI and CFI have a value of one, the model is perfectly fit to the data. The values in the Table 10 indicate a very close fit.

When the RMSEA value is approximately 0.05 or less, the model fits very well. We see the construct of practice alignment fits extremely well as the RMSEA value is 0.010. However, the RMSEA value of 0.077 indicates a reasonable fit with possible room for improvement. It was noted in Table 7, those variables that were the strongest

predictors for the construct perceived enhancers included context variables like Years, Race, Solo, and Gender that do not appear to contribute to the prediction for the value of the construct. It is possible that by simple removing these variables from the model that the RMSEA for perceived enhancers would drop. However, they will not be dropped at this time as previous literature suggests their importance for retention.

The last value to consider is the Hoelter Index (HI). This value tells the reader the largest sample size acceptable at the 0.01 level for the stated Chi-Square value and degrees of freedom. The Hoelter Index in conjunction with the relatively low Chi-Square for a large sample size indicates the study sample size of 4,784, used to model practice changes and accepting new patients needs little change in the model in order to improve the model. However, an HI of 302 with the larger Chi-Square value of 638.9 would indicate room for slight improvement in the measurement model for the latent construct perceived enhancers. Similarly, re-specification of the model by removing variables such as Years, Race, and so on, is not warranted at this time because the indirect influences of these variables on earnings and satisfaction are sought based on the theoretical framework. If after the full research structural equation model is run and analyzed, these indirect effects from the context variables remain weak to non-existent, then re-specification of the measurement model and subsequent change to the structural equation model can be undertaken in future research.

Based upon the measures of fit and sample size used to conduct this study, the measurement models appear to be valid and can be used to construct a full research structural equation model.

Structural Equation Modeling

A structural equation model (SEM) comprised of the measurement components linking relationships between exogenous and endogenous variables was assembled. Analysis was performed to examine research questions and hypotheses stated earlier in chapter one.

The variables YEARS, RACE, SOLO, FMG, MSA, and GENDER were treated as independent exogenous variables. Theoretically, they may be viewed as causal factors that affect congruence and strategy through the latent endogenous variables Perceived Enhancers, Practice Changes, and Accepting New Patients. Likewise, as indicated by previous literature review, they may be viewed to have direct affect on income (INCOMET) and career satisfaction (CARSAT).

Other indirectly observed variables such as EFTIMEMT, EFCAREMT, and INCENTCP inform the latent construct of perceived enhancers. The concept of perception is important because perception of the need to adapt the physician office practice theoretically precedes the actual practice alignment. Practice alignment is the strategy to adapt or become congruent with the practice environment. An interesting relationship to observe subsequent to running the model is the strength of the direct relationships Practice Changes and Accepting New Patients has on the performance metrics of income and career satisfaction compared to the independent exogenous variables of YEARS, RACE, SOLO, FMG, MSA, and GENDER. The figure 8 depicts the relationships between three endogenous latent variables and six independent

exogenous variables to income and satisfaction. The bold arrows indicate direct relationships that are significant at the 0.001 level.

When reviewing Figure 8, observe, the most influential construct is perceived enhancers. All six contextual variables load significantly on this construct. Two other variables, effective care management, and financial incentives for practice, are closely related to the concept of perceived enhancers. It is clear, that perceived enhancers drives practice changes, as well as income. It is interesting to note that none of the three constructs, practice changes, perceived enhancers, and accepting new patients has a significant impact on career satisfaction directly.

When analyzing the construct called practice changes it's a very clear to see that the percentage of change in managed care practice (CMCPRACT), contributes the greatest amount of influence to that construct. The second largest influence is the change of practice revenue that is prepaid or capitated (CPCAPREV).

Five of the six personal and contextual factors in the model had significant and direct relationships with career satisfaction. Only two had a significant and a direct relationship with income.

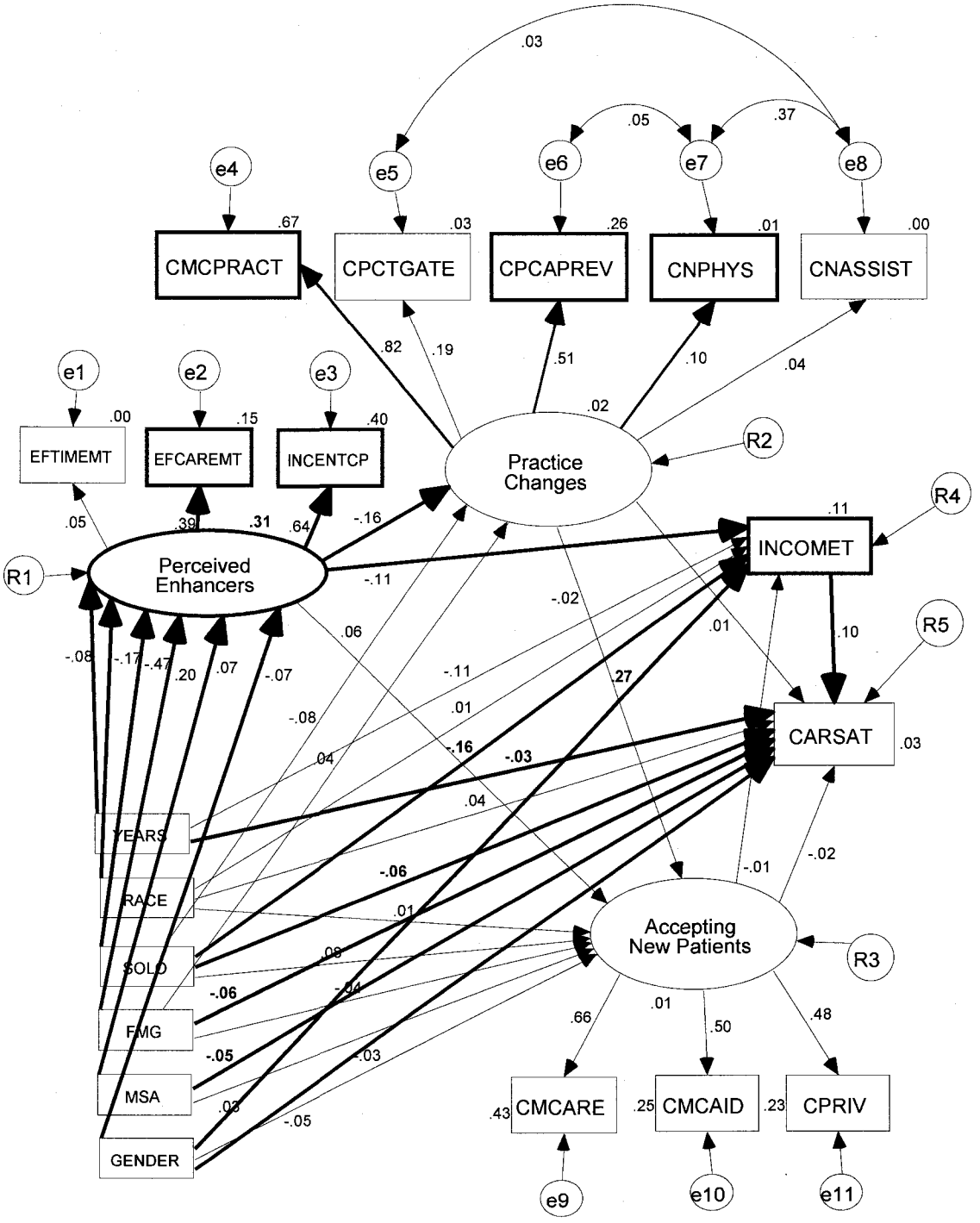


Figure 8: Structural Equation Model of the Effect Environmental Factors have on Adaptive Response and Performance

Table 11 presents the standardized maximum likelihood estimates that are used to examine the causal linkages between the eight exogenous factors and the three endogenous constructs, Perceived Enhancers, Accepting New Patients, and Practice Changes.

The measurement model of physician practice alignment and performance, described in Table 11, reveals that standardized factor loading regression weights for context indicators SOLO, YEARS, GENDER, MSA, FMG, and RACE associated with the latent construct Perceived Enhancer are statistically significant at the 0.001 level. Also, three of the five context variables, SOLO, YEARS, and GENDER, significantly influence income. Career satisfaction (CARSAT) is significantly impacted by a different

Table 11. Standardized Regression Weights: Maximum Likelihood Estimates of Structural Relationships among Exogenous Variables and Performance

Gamma (γ)	Perceived Enhancers	Practice Changes	Accepting New Patients	INCOMET	CARSAT
SOLO	-0.472*	-0.083	0.078	0.162*	-0.064*
YEARS	-0.084*	-	-	-0.112*	-0.027
GENDER	-0.072*	-	-0.026	0.267*	-0.053*
MSA	0.069*	-	0.032	-	-0.046
FMG	0.203*	0.042	-0.039	-	-0.056*
RACE	-0.171*	-	0.007	0.007	0.041
Perceived Enhancers	-	-0.159*	0.058	-0.111*	-
Accepting New Patients	-	-	-	-0.014	-0.016
Practice Changes	-	-0.015	-	-	0.008
INCOMET	-	-	-	-	0.103*
Squared Multiple Correlations (SMC) for Structural Equation	0.311	0.019	0.008	0.109	0.025

* $p < 0.001$ level of significance

combination of context indicators, SOLO, GENDER, and FMG. The latent endogenous variable Perceived Enhancers accounts for 31.1 percent of variation in the model measured by its squared multiple correlation calculation (SMC). Combining the three latent endogenous variable's, SMCs account for 33.8 percent of variation in the model. Whereas, INCOMET and CARSAT account for 13.4 percent of variation in the model.

The overall model fit indices listed in Table 12 show that the structural equation model fits the data reasonably well with an AGFI=0.925 and RMSEA=0.062. A perfectly fit model would have an AGFI=1 and RMSEA=0.05. Future improvements could be made to the model based on CMIN/DF exceeding 5.0, CFI=0.667 where a CFI of 1 equals a perfect fit. The Hoelter Index requires at least 325 cases for the presented Chi Square and degrees of freedom calculated by this model.

Table 12. Goodness-of-Fit Statistics for the Structural Equation Model: Effect of Environmental Factors on Adaptive Response and Performance

Overall Model Fit Indices	Value
Chi-Square	2,446.860
Degrees of Freedom (DF)	126.000
Minimum Discrepancy (CMIN/DF)	19.420
Adjusted Goodness of Fit Index (AGFI)	0.925
Comparative Fit Index (CFI)	0.667
Root Mean Square Error of Approximation (RMSEA)	0.062
Hoelter Index at $p < 0.01$	325.000
Number of Cases Observed (N)	4,784.000

These statistics for fit support the use of this model to interpret relationships described in the structural equation model assessing physician practice alignment and performance.

This chapter has presented empirical results based on exploratory, correlation, confirmatory, and structural equation modeling analysis of panel data related to physician practice alignment and performance. Implications, summary discussion and conclusions of this study are presented in the following chapter.

CHAPTER 6: SUMMARY, DISCUSSION AND CONCLUSION

Summarization of the hypotheses and their support or rejection is presented first. Then this chapter interprets the research results and points out managerial, policy, methodological, and theoretical implications. Study and model design limitations are discussed. The chapter concludes with suggestions for re-specification of the model and suggestions for future research into physician practice alignment and performance measurement.

Summary of Hypotheses Testing

The components and relationships involving physician practice alignment and measurement of performance are many and complex. The alternative hypotheses presented in Chapter 3 reflect that.

The primary focus of this analysis was to examine the hypotheses that personal characteristics and environmental contextual factors directly influence adaptive response factors. The study found, as described in Figure 8, that these contextual factors do in fact, influence perception of the ability and need to change. In this model, all six factors do have significant impact on perception. Next, significant contextual relationships depicted in Figure 8 relating to endogenous latent constructs as well as income and career satisfaction is discussed. Table 13 summarizes the data analyzed and reflected in the model presented in Figure 8 with respect to previously presented hypotheses.

Table 13. Results of Hypothesis Testing for Personal and Contextual Factors

Exogenous Variables	Perceived Enhancers	Practice Changes	Accepting New Patients	Income	Career Satisfaction
Years	(+)**	N.S.	N.S.	(-)*	(+)**
Race	(+)**	N.S.	(+)*	(+)*	(+)*
Solo	(+)**	(-)*	(+)*	(-)**	(-)**
FMG	(+)**	(+)*	(+)*	(-)**	(-)**
MSA	(+)**	N.S.	(+)*	N.S.	(-)**
Gender	(+)**	N.S.	(-)*	(+)**	(-)**

Notes (+) positive correlation
(-) negative correlation
N.S. no statistical significance
** $p<0.001$ level of significance
* $p<0.05$ level of significance

The model, Figure 8, depicts that the longer physicians practice medicine the less likely they will perceive the ability and need to change and re-align their practice. This observation makes sense, because most people would agree that the longer you have done something the more set in your ways you become.

Hypothesis 1A states:

"Physicians' greater practice experience in years has a negative association with the perceived ability to change and align their professional practice."

This analysis confirms the hypothesis that the longer a physician practices medicine the less likely the practitioner will be able to perceive the need to adapt to a changing practice environment. Warren, Weitz, and Kulis (1998) studied organization attributes in a changing health care environment for physicians. Their study was not designed to examine the specific relationship between the number of physician practice years and the

ability to perceive the need to change and realign their practice organization. Yet their analysis indicated support for this hypothesis. A preponderance of the literature confirms their analysis that states physician practice organization structures can influence physician satisfaction. But, virtually no research is published that examines the precursor to changing a physicians' practice organization structure; namely perceiving the need to change prior to adopting and executing a strategy to change. This is especially apparent when focusing on practice experience in years direct impact on perceiving the need to change an organization. The finding for this hypothesis appears to be unique in the literature.

Hypothesis 1B states:

"Physicians' race, other than white, has a negative association with the perceived ability to change and align their professional practice."

The demographics of the data indicate that the majority of physicians are white. It is stated by the literature reviewed in Chapter Two that being a minority was a disadvantage to getting ahead in a medical organization or solo practice. Price et al. (2005) reported that minority and majority physicians agree that ethnic differences in prior educational opportunities lead to disparities in exposure to career options, and qualifications for and subsequent recruitment to training programs and faculty positions. Minority faculty in this study also described structural barriers (poor retention efforts, lack of mentorship) that hinder their success and professional satisfaction. Review of the literature indicates that white physicians, perhaps, had a more positive ability to perceive the need to change as well as make changes in their practice environment and

organization their based upon their practice experience and past changes in their practice environment. Conversely, nonwhite physicians with less collective medical practice history and fewer experiences in medical practice organization change would be less likely to perceive the need for and actually change their medical practice environment. As stated in Hypothesis 1B, the relationship analyzed between race and perceived need to change physician practice parameters described by the literature shows the opposite. Hypothesis 1B was strongly rejected. White physicians clearly do not see the need for change where as nonwhite physicians do. If changes in medical practice organization are to be made, non-white physicians may be the ones to recognize the need and make those changes.

Hypothesis 1C states:

"Physician's foreign medical school graduation from non-United States or non-Puerto Rico, has a negative association with the perceived ability to change and align their professional practice."

Graduating from a foreign medical school was hypothesized to have a negative impact on perception to change. Hypothesis 1C implies that students graduating from United States medical schools would've been exposed to the latest technology, practice trends, and ways to organize medical practice in the United States. If United States trained physicians have that knowledge, they would be more likely to recognize the need for change or to change in an effort to stay ahead of their peers in their local practice environment. This research shows quite the opposite. Graduating from a foreign medical school appears to correlate positively with recognizing the need to change. Perhaps

graduating from United States medical schools, imparts the notion of maintaining the status quo. The Hypothesis 1C relating to this aspect of the model was clearly not supported. No support for Hypotheses 1B and 1C in this analysis may be indicative of the ethos of striving harder to succeed in a new and challenging medical practice environment by minorities and foreign medical graduates.

Hypothesis 1D states:

"Solo medical practice has a negative association with the perceived ability to change and align professional practice."

Solo medical practices have been declining in United States for some time. The relationship between solo practice and perceived ability to change sheds light on this trend. We cannot say what there is about being in solo practice that causes a negative perception to change. However, just the mere fact of being in solo practice is a strong indicator of resistance to change and align professional practice with current and future trends. In this respect, Hypothesis 1D was supported.

Hypothesis 1E states:

"Non-metropolitan medical practice has a negative association with the perceived ability to change and align professional practice."

The relationship of medical practice location to the perceived ability to change and align the professional practice is important to explore. The literature previously reviewed supports clear differences in resources between rural and urban medical practices. There are also differences between professional and peer support in urban and rural practices. The reviewed literature leads the reader to believe that rural medical

practice had a component of isolation that fed the negative perception of the ability to change. This model supports that relationship stated in Hypothesis 1E. Those physicians practicing in urban areas have a positive perception of the ability to change their medical practice. Those physicians in non-urban areas do not.

This research did not set out to study gender impacts on perception of the ability to change and align medical practice. However, when gender was included in the model some surprising results were observed. Significant relationships, at the 0.001 level were observed between gender and the variables perceived enhancers, income, and career satisfaction. It appears as though female physicians have a greater ability to perceive the need for change. Other literature (Carr, et al, 1998) reports that female physicians are satisfied with their careers. Male physicians, as supported by literature (Hinze, 2000) and data, tend to make more money than female physicians. Female physicians though, are more satisfied than males with their career. This could inform us to the greater question as to whether or not earned income influences career satisfaction. In this model and analysis, female physicians were significantly more satisfied with their career and earned significantly less income than their male counterparts. Future research exploring these differences would require sub-setting the data and analyzing male and female physician groups separately using the model in Figure 8 without the variable GENDER.

Overall, this analysis did show that the components of years of practice, race, solo practice, medical school graduation status, urban versus rural, and the gender play a part in the ability to perceive the need to change and align medical practice.

The next set of questions, grouped under Hypothesis 2, seeks to shed light on physician practice strategies in the practice medicine with respect to earnings and satisfaction. These include contractual obligations, relative distribution of staffing types, and the role of the physician in delivering care in the practice.

The second hypothesis states:

"Optimizing physician practice strategies that are suitable (congruent) for the physician practice environment maximize practice-environment fit via practice alignment and improves earnings and satisfaction."

This hypothesis, detailed in Hypotheses 2A through 2D must show support in their 2A through 2D entirety in order to support the overarching hypothesis number two.

The first component of practice changes analyzed was whether or not changing the number of physicians and nurse practitioners contributed to the latent construct practice changes and had an impact on performance. That is, performance measured by income and career satisfaction. Hypothesis 2A analyzed the change in the number of physicians and nurse assistants in the practice in an attempt to see if that component of practice changes could influence income and satisfaction. It was discovered that the relationship between the number of nurse assistants and physicians favored changes in the number of physicians. That is to say, as pressures to change practice increased, the number of nurse assistants in the practice decreased slightly relative to physicians. The variable, CNPHYS, change in number of physicians in the practice, was a significant component at the $p<0.001$ level for practice changes whereas CNASSIST was only significant at the $p<0.05$ level. One can only surmise at this point the reasons for this

relationship between changes in physician staff level and nurse staff level. It is clear from the analysis that physicians prefer to hire physicians rather than more nurse assistants when trying implementing a practice alignment strategy.

So, regarding the question of staff level and types, its impact on income and career satisfaction, we can say the following. A changing the level of physician staffing is a significant component of the construct practice changes. Overall, when looking at practices changes with respect to the changing number of physicians and changing number of employees assisting the physician together, as stated in Hypothesis 2A, these combined practice changes had a mixed impact on income and career satisfaction and did not provide uniform support for Hypothesis 2.

Another component of the analysis for hypothesis two asked whether or not increased percentages of revenue from prepaid and capitated plans (CPCAPREV) decreased earnings and satisfaction through the latent construct labeled Practice Changes. Of the five factors that made up the latent construct practice changes, two variables, CMCPRACT and CPCAPREV were the most important and significant components of that construct. The other three variables, CPCTGATE, CNPHYS, and CNASSIST all had positive influences on the latent endogenous variable Practice Changes. But, their significance of association was not strong enough to raise the latent endogenous variable Practice Changes to a level of significance greater than $p<0.05$ on influencing career satisfaction. The model did not look at the direct impact on income or career satisfaction with the five variables mentioned above. Instead, through the concept of practice alignment, shown in Figure 3, which involves the effects of managed-care penetration

and revenue from managed-care plans, channeled through the latent endogenous variables Practice Changes and Accepting New Patients, defined by the construct of Practice Alignment, mixed levels of support with respect to income and career satisfaction as stated in Hypothesis 2B through 2D were found.

The analysis examined the percentage of practice patients enrolled in managed-care plans (CMCPRACT) and its impact through practice alignment on income and career satisfaction. This research found that the variable CMCPRACT had the greatest loading factor on practice changes. It was 20 times larger than the effect changing the number of nurse assistants (CNASSIST) had on practice changes. This is a statistically meaningful distinction based on analysis of standardized data. It was almost 8 times larger than the impact of changing the number of physicians (CNPHYS) had on the construct of practice changes. It is by far, the driving influence on physician practice changes. But, when combined with the physician's role as a gatekeeper (CPCTGATE), staffing levels of professionals, and capitated prepaid revenue in the construct of practice changes; the influence is diluted within the constructs of practice changes and accepting new patients. The strength of the variable CMCPRACT on practice changes suggests that a future model could be re-specified that would allow the percentage of change in managed-care practice to be examined in a direct relationship to income and career satisfaction. Presently, this model does not support Hypothesis 2C associated with the latent variable Practice Changes.

Increasing the numbers professional staff, percentage of prepaid and capitated revenues, and percentage of patients enrolled in managed care plans did not have a

correlation relationship with income. These variables, through the latent endogenous variable, Practice Changes, did support at the $p<0.05$ level, improvement in career satisfaction.

Physician reported income (INCOMET) depends ultimately in some fashion on the number of patients seen by the practice in a given year. Payment formulas associated with classes of patients also determines the amount of income made in a given year. By examining the change of the patient visit load and payer mix, this model hopes to find out whether or not accepting ever-increasing numbers of patients into the physicians' practice increases both income, as well as job satisfaction. What the model reveals is that physicians were willing to increase ever increasing numbers of the three categories of payers for patients. Physicians were willing to accept increasing numbers of Medicare (CMCARE), Medicaid (CMCAID), and private pay (CPRIV) patients at approximately equal proportions. Overall, general increases in patient load did have a significant, at the $p<0.05$ level, direct relationship to income and career satisfaction. Increasing the patient load did reveal a negative impact on income and career satisfaction. This could mean that physicians are willing to work more for less money and less career satisfaction. This is what was hypothesized in 2D and supported in the model specified.

Major components of practice alignment congruence and strategy described in Figure 3 are embodied in the constructs of medical practice organization and accepting more classes of patients by payer types. Both endogenous constructs described in Figure 3 did not significantly associate with physician career satisfaction and income. The current model design specification does support hypotheses 2. In the future, changes to

the construct described as Practice Alignment in Figure 3, comprised of the latent endogenous variables Practice Changes and Accepting New Patients, might be consolidated and the measurement variables grouped in the categories of changes in labor categories, changes in contractual performance roles by providers, and changes in patient payer mix, would specify different correlations. Research conducted among those re-specified relationships in association with personal, community and organization characteristics, and the Perceived Enhancers to delivering effective medical care are proposed.

Table 14 summarizes analysis results describing relationships between the three latent constructs and the directly measured variables that comprise performance, income and career satisfaction. The purpose of this analysis was to determine whether or not the latent endogenous constructs, not their component measures, had significant relationships to the variables indicative of physician performance.

This analysis looked at many components of the model and its impact on income and career satisfaction. In the model, only one of the three latent constructs (Perceived Enhancers) directly impacted income at a significance level of $p<0.001$. By combining community characteristics in conjunction with the three latent constructs, the observed relationship between income (INCOMET) and career satisfaction (CARSAT) can be observed directly. This explores the parsimonious or pure relationship between income and satisfaction. The analysis reveals a significant relationship at the $p<0.001$ level between income and satisfaction. A simple way of describing this relationship is income matters. The more income you make, the more satisfied you are (Shih and Conrad,

Table 14. Results of Hypothesis Testing for the Relationship of Congruence and Strategy and Performance

	Perceived Enhancers	Practice Changes	Accepting New Patients	Income	Career Satisfaction
Perceived Enhancers	N.R.	(-)**	(+)*	(-)**	N.S.
Practice Changes	N.R.	N.R.	(-)*	N.S.	(+)*
Accepting New Patients	N.R.	N.R.	N.R.	(-)*	(-)*
Income	N.R.	N.R.	N.R.	N.R.	(+)**
Career Satisfaction	N.R.	N.R.	N.R.	N.S.	N.R.

Notes (+) positive correlation
(-) negative correlation
N.S. no statistical significance
N.R. no relationship modeled
** $p<0.001$ level of significance
* $p<0.05$ level of significance

2007). In this model, three factors loaded heavily on income. Gender was first with a loading factor of 0.27. Solo and or non-solo practice organization was second in strength with a loading factor of -0.16 and Perceived Enhancers to change was third in loading strength with a factor of -0.11. This research supports hypothesis three that states higher income results in higher satisfaction for physicians. Further research focused on these components could reveal refinements of those significant components that drive income in the context and practice life of a physician.

This may be the basis for designing or modifying physician pay-for-performance programs. Policy implications for organizations that pay physicians by incorporating aspects of pay-for-performance are great. This analysis suggests that improving perceived enhancers to medical practice in the form of practice incentives, aids to clinical care management, and time management could maintain the performance relationship of

income to career satisfaction. In other words, physician career satisfaction may increase in the face of a relative decline in income.

One of the intentions of this research and analysis was to provide an easily identified early-warning group of variables related to physician performance. A managerial application of this would be related to hiring, retention, and employee performance. Analysis of the data revealed that the Metropolitan Statistical Area of the practice had no direct influence on physician earnings but did have a direct and significant influence on career satisfaction. Those physicians practicing in metropolitan areas were less satisfied than those practicing in rural areas. The direct relationship between practicing in an urban area to career satisfaction is significant but negative.

This analysis also confirmed that managed-care penetration into the physicians' practice has no direct influence on physician earnings and satisfaction combined. Interestingly, increasing the percentage change of managed care practice (CMPRACT) has the indirect but positive effect on increasing career satisfaction. This is the opposite of what was hypothesized in 4B. By implication, shielding the physician from the strictures of managed-care practice might strengthen the relationship between the construct of practice changes and career satisfaction, while having little no impact on income. Perhaps the recent rise in the numbers of employed physicians in office practices, as well as in hospitals as a hospitalist is evidence of this activity by healthcare organizations to respond to the motivators of physicians (Shih and Conrad, 2007).

Earlier in the discussion, it was shown that the longer physicians practiced medicine, the less likely they were able to perceive the need for change. Hypothesis 4C states:

"Increased physician experience in practice years has a negative association with physician earnings and satisfaction."

Results of the analysis support this negative relationship to career satisfaction as well income when related to years of practice. It is significant to note that the longer a physician has practiced the less likely the physician is satisfied with their career. This is significant at the $p<0.001$ level. Regarding years of practice impacting negatively on income, further investigation may be warranted on the implications of pro bono *locum tenens* practice by older and retired physicians responding to the survey. For managers and policymakers this is something noteworthy. Physicians at different stages of their career would require different approaches with respect to their perception of the need increasing income in order to maintain or improve career satisfaction. This finding is contrasts with Warren, Weitz, and Kulis (1998) who did not establish a relationship between satisfaction and physician age, year of beginning practice, or gender.

Previously, observations were made on the fact that race does play a role in the ability to perceive the need for change and that nonwhite physicians seem to be better equipped to perceive the need for change in order to align their medical practice with the intention to improve performance measured by earnings and job satisfaction. However, this analysis does reveal relationships, described in Hypothesis 4D, significant at the $p<0.05$ level, that directly influence income and career satisfaction based on race alone.

The data revealed that white physicians, though not mildly significant, enjoy a slight edge in income and career satisfaction over nonwhite physicians.

Another question that was investigated was whether being in a group practice, versus a solo practice had a direct impact on earnings and satisfaction. Hypothesis 4E states:

"Solo physician practice type has a negative association with physician earnings and satisfaction."

Analysis using this model reveals in fact, practicing in a group setting relates significantly to improved income and improved career satisfaction. This highlights the plight of the sole practitioner irrespective of whether or not the sole practitioner is in an urban or rural area. Hypothesis 4E is supported and states that solo practice lowers performance measured by physician income and career satisfaction. This model suggests a possible prescription for attracting physicians to or retaining physicians in rural practice. Non-solo practice organization in a rural MSA could correlate with higher physician income and career satisfaction. Combining practice organization characteristics associated with urban practice and the rural environment could be what physicians seek.

Lastly, a direct assessment was made regarding the question of whether or not foreign graduation from medical school directly influenced earnings and career satisfaction. Hypothesis 4F states:

"Graduating from a foreign medical school has a negative association with physician earnings and satisfaction."

No direct relationship was found between foreign graduation and income. There was a significant link between foreign graduation and career satisfaction. This model reveals a significantly negative direct relationship with respect to foreign graduation status and career satisfaction. That is, foreign graduates are less satisfied with their careers than their graduate counterparts from the United States.

The model used in this assessment cannot say why certain hypotheses are supported or rejected. The model supports or rejects statistical correlations not causation. However, physician practice groups and managers of individual physicians should be aware of this model and limitations when evaluating performance, especially career satisfaction indicators. This approach to evaluating physician income and career satisfaction is relatively new. Reflection upon the results of this model in conjunction with the literature may shed light on ways to refocus the model to improve upon this initial design.

An important observation made based on the model but not identified by hypothesis is the impact effective clinical care management and medical practice incentives have on income, clinical practice change, and indirectly on career satisfaction. Future model respecification should highlight this revelation and form hypotheses aimed at examining these relationships.

Implications of the Study

This section presents several unique and important implications, based on the findings, for health care policy makers, health care researchers, physicians, and managers from theoretical, methodological, managerial, and policy aspects.

Theoretical Implications

Ginsberg and Venkatraman (1985) pioneered work on the development and understanding of the contingency-based strategic adaptation model. This was built upon earlier contributions by Gailbraith (1973) that recognized complexity and interdependence as components affecting appropriate strategies for modeling and executing change strategies in an organization. This research builds and reinforces prior bodies of work and expands strategic adaptation theory for health professionals published by Begun (1993).

This empirical study demonstrates that measures of congruency and strategy for change can be separated into measurable constructs. In addition, this study begins to describe components of strategic adaptive factors that can be prioritized and emphasized in order to achieve improved physician performance, as measured by income and career satisfaction. Also, this study begins the process in which the relationship of numbers of health care providers within an organization, nurses and physicians, are reduced or increased as a means to maintain or increase physician income and career satisfaction.

Results of this study and the modeling method used for analysis invite further use of the contingency perspective in the examination of physician performance by the use of longitudinal data. Additionally, this theoretical approach may be applied to examine other health care providers' adaptation to improve performance in the health care marketplace. Using similar data from the professions of pharmacy and nursing could shed light upon the nature of substituting these professionals for certain types of work currently performed by physicians on their individual measures of income and career

satisfaction. This would expand the modeling and analysis capability beyond single provider class status to entire systems of health care delivery.

Methodological Implications

This study adds a unique method of measurement and modeling of the antecedents and effects of: a) incentive programs, b) care management programs, including disease management and technology enhancement programs, c) managed care, d) labor and patient mix, and e) payer classification such as Medicare and Medicaid, on physician performance. Several improvements on performance measurement are noted. Previous studies (Stamps and Cruz, 1994) measured performance of physicians by a series of Likert scale based questionnaires. This study incorporates ordinal data into a comprehensive model that links and expands the assessment of performance in include contextual factors in addition to survey responses.

Previous research (Landon, 2003) relied on regression techniques to assess levels of physician satisfaction. Williams (1999) demonstrated performance measurement was complex and not necessarily able to be analyzed by linear regression alone. This study, using structural equation modeling addresses the complex, non-linear relationship of data involved in measuring physician performance. Theoretical constructs associated with modeling, measurement, and analysis of physician performance, in the arena of health services research are complex and multi-dimensional. This method of investigation mirrors the complex work world of physicians. The modeling technique using a structural equation model with measurement models is appropriate as a multivariate statistical tool for studying these complex relationships. This methodology allows

research questions pertaining to assessment of adaptation and performance relating to physicians to be conducted simultaneously. This method allows for incorporation of additional measures or removing them and re-specifying the measurement model in order to get a clearer picture of the strength and nature of the relationships described by the model.

Managerial Implications

The findings have several implications for managers. First, it implies that some attempts to improve the physician's work place environment by hiring more nursing staff may not improve greatly, satisfaction levels of physicians. The nature of the total practice environment should be considered before instituting managerial and operational changes in the physician work place. This model does give the manager ability to take the 'temperature' of the organization and observe whether external changes imposed by insurance companies, government payers like Medicare, or community and organizational characteristics have altered physician performance in any way. Likewise, it allows factors and characteristics within the organization to be considered when assessing likely impact on physician income and satisfaction.

Next, physician managers can use this model and approach to assess proposed contracts and requirements submitted for consideration of acceptance. If proposed contracts require activities, labor mix, or interfere with clinical care and incorporate physician practice changes that run counter to results and relationships shown in the model, it is likely to have an unintended consequence if incorporated into medical practice operations. It is very useful for managers to see in this model that technological

and clinical practice care improvements in clinical care management have a significant impact on physician income and satisfaction.

In addition to the considerations mentioned above, both managers of physicians and managers responsible for designing clinical care systems as well as methods of reimbursement for services should note the strong influence incentive programs have on prodding physician perception of the need for change and implementing practice changes as a result. Since practices changes are made with no measurable increase in physician income and improved perceived enhancers to change lead to lower physician income and improvements in satisfaction, it could be stated that pay-for-performance programs have fulfilled their intended purposes of changing practice behavior while lowering reimbursement cost to physicians.

Policy Implications

Public as well as health plan policy makers should consider expanding pay-for-performance programs that incorporate components of; a) patient satisfaction, b) quality of care measures, and c) physician practice profiling. In conjunction with those incentives, improvements in the physician's ability to provide effective care should be implemented. These programs would include; a) increase the use of formal practice guidelines, b) institute computer generated, automatic reminders for physicians and patients alerting them of specific preventative and clinical care services needed, and c) improve the use of computers to obtain, record and use clinical data in the practice of medicine.

Next, policy makers should use analysis tools described in this study to carefully assess and understand what is happening in the physician practice market. The results of this study show significant relationships in the physician practice market that can inform changes to policy related to governance of managed care, regulated activities of licensed health care professionals, the substitution effect of nurses for physicians, and what changes physicians are willing to make in their practice environment.

The landscape of medical practice has changed over time with respect to influence the insurance industry has on the practice of medicine. By using this approach to model physician practice activity response to changes in the practice environment, policy makers can map out different possible end results when making changes to contracts, rules or regulations regarding the coverage and payment for health care services. By creating these 'virtual markets' of health care service delivery pitfalls in proposed changes may be exposed before implementation. Also, unexpected possibilities for change may be revealed, as in this study, highlighting the importance of medical care management improvement (EFCAREMT) and practice incentives (INCENTCP) relationship to measuring and improving physician performance.

Lastly, increasing the numbers of patients physicians see in their practice is not necessarily enriching physicians. It may be a harbinger of change in how physicians, in a health care market short of physicians, organize and relate to their overall medical practice environment. This model satisfies an objective of the study by providing a method policy makers can use to delineate key factors mediating the relationships between contextual (ecological) factors and physicians' earnings and satisfaction. This

analytic approach provides a novel way to study and model changes in physician behavioral systems in a complex, turbulent medical practice landscape.

Limitations of the Study

This study was undertaken to understand factors correlated with physician performance. Panel data were used in the analysis. The major advantage of using panel data to study physician performance is that multiple hypotheses and relationships can be tested at the same time. This advantage is also a reminder that correlation studies using panel data are not to be considered studies of causation. This is limitation of the study design. The research preference is to identify solid causal inferences and relationships. Structural equation modeling cannot identify causation.

Panel data has inherent limitations based on data collection methods. If, in the survey from time one to time two, great care is not taken to repeat the interview process in an identical manner, use identical questions, question the same respondent both times, and retrieve the same level of completeness of response, the threat to internal validity becomes great. Data collected for this analysis addressed each of these issues. Because of care taken by the Center for Studying Health Systems Change to address these threats to internal validity, the results of this analysis can withstand most questions regarding the validity of the data. Briefly, physicians can be identified that answer the same questions administered the same way over different time periods. Refinement of the model and incorporation of longitudinal approach would improve the strength of relationships observed over time but still would not be considered causal for interpretation.

A third limitation to consider relates to sampling. To be eligible for sampling physicians had to have completed their formal medical training. That is, residents, interns, and fellows were excluded. The sample was limited to those physicians providing direct patient care in the contiguous United States. Therefore, military physicians practicing overseas and physicians practicing in Hawaii, Alaska, or the U.S. Territories and Trusts are not addressed with the data. The sampling method used further narrows the ability to generalize by the exclusion of; 1) specialists in fields where direct patient care is not a primary focus, 2) graduates of foreign medical schools temporarily licensed to practice in the United States, and 3) Federal employees. Also, the data authors stated that some physicians thought to be eligible based on the sample frame information were later classified as ineligible because of certain survey responses. Lastly, physicians who specifically requested that their names not be released to outsiders by the American Medical Association and those physicians previously sampled for the AMA Sociometric Monitoring System survey were excluded.

A fourth limitation associated with the precision and accuracy of the survey response variable values is noted. A consideration must be made regarding how truthful respondents answered questions. For example, the variable INCOMET, representing personal income of the physician, is stated as net income after expenses but before taxes. This value may or may not be accurately stated by the respondents. Also, response choices were offered in increments of $50,000 from $0 to $300,000. All physicians earning $300,000 or more were in one group. A question could be asked whether or not these increments have any relationship to self reported career satisfaction scores. For

example, physicians with identical characteristics and incomes of $101,000 and $149,999 may very well have different career satisfaction scores yet are members of the same income block. One physician may be very dissatisfied and the other very satisfied with their career and the net effect for the variable CARSAT in this analysis would be represented as neutral. Several improvements are suggested to reduce the limitations of this reported variable. Comparison of these reported figures to other data sources of physician income controlling for possibly physician age, years of practice, and MSA location of practice could reduce the limitations associated with identifying physician income and validate the data. Another limitation associated with the study variables in general is the possibility that responses may be intentionally reported in error by the physician. This phenomenon is most often revealed in the world of politics when pre-election survey data does not compare similarly to post-election results. An additional possible data limitation is; while technically no change in actual data value could have occurred from time one to time two, the respondent recalls and reports the value differently. Surveys administered within a short time period seeking the same answer for a data value that is known to be constant will have a higher correlation than similar surveys administered at a longer time interval.

Other individual measures used in this study are subject to limitations. Individual measures may not be stable and can possibly inflate standard error estimates. Standard error estimates are incorporated in the statistical method used in this analysis. An alternative to using individual data points is aggregation by groups. Group mean scores would be more stable but this would be offset by a reduction in the number of degrees of

freedom contained in the analysis. For this analysis, the large number of standardized individual responses (4,784) tilts the preference in favor of using individual response measures.

Other measures used in this study are subject to other limitations as well. This structural equation modeling method uses latent variables and indices composed of multiple indicators. These are variables constructed to represent something that is not directly measured by the sample data. The question then becomes; do these variables really represent the measures you are trying to express? This study has limitations in this area because the latent variables used do not have a long history in the literature and in structural equation modeling of physician performance or behavior. Likewise, the three indices related to the construct of Perceived Enhancers, EFTIMEMT, EFCAREMT, and INCENTCP are not found in past research literature. Additional future research aimed at refining these latent constructs and indices will reduce this limitation in measurement validity.

The time of data collection might be considered a limitation of the study. The data were collected from the first and second round CTS studies from 1996-97 and 1998/99. While some researchers might think aged data is liability, this SEM analytic approach can turn it into an asset. The CTS physician survey questions are maintained and administered every year. This means the most recent CTS 2004-05 survey data will contain responses to identical questions surveyed in 1996-97. By proposing to acquire 2004-05 CTS data and 2005 ARF data for future study, limitations of aged data can be

eliminated and results of applying this model would shed light on temporal differences and compare evolutionary trends in physician practice alignment and performance.

Lastly, a limitation is considered based on the unit of analysis, the physician. There is a recognized inherent tension between physicians practicing in an organization and the organization enveloping the practicing physician. The current model uses physician income and career satisfaction as the proxy for physician performance from the physicians' perspective. However, physician performance from a managerial or organizations' perspective may not place as much importance on physician career satisfaction. There may be other variables representing health system goals in addition to physician income and career satisfaction that are important from this perspective. In an extreme perspective, it is conceivable that physician income and career satisfaction are not components of a physician performance measurement system. Respecification of the model in addition to refocusing the analytical perspective would be desired before this modeling approach is used to assist implementation of changes to the physician practice environment in an attempt to modify an organizational assessment of physician performance from a non-physician perspective.

The results of this study are only generalizable to the national panel of physicians responding in full to the survey questions. Additional study would be required to understand how partial responders would affect the results. It would be possible to follow and look for specific responses over time from specific physicians. Past or future responses for current survey questions left blank may be imputed for post hoc analysis of

the group of partial physician responders. Subsequent analysis would further inform these results.

This study only looks at physicians in the context of congruence and strategies used in alignment with the medical market environment. There are legal and regulatory factors associated with the practice of medicine which is not incorporated in this study. Adding that as a construct to consider would develop the model further. However, the survey questions posed by CTS did not ask about legal and regulatory factors that impact the practice of medicine.

Conclusion and Directions for Future Research

Several suggestions for future studies have been hinted at previously. These involve study design, respecification of measurement models, and generalizability. The first direction for future research would be to incorporate waves of longitudinal data into the design. This would reveal the strength and stability of relationships over time and hint at some causal relationships. Next, a differently specified model would incorporate additional variables related to physician manpower demographics with regard to substitution effects based on alternative providers to physician care. In conjunction with that, examining the impact of independent nurse practitioner clinics placed in malls, free-standing sites, and alongside pharmacies would prove useful in not only studying the substitution effect of labor but also the substitution effect of practice location.

Future models would incorporate expansions on the variable SOLO. Examining physician practice size beyond this binary variable would shed light on the impact the

evolution of physician practice organization by size has on physician performance and career fulfillment.

Next, to increase the generalizability and validity of the results to specific physician specialty types, repeating the study with data subset by practice specialty, from the same time periods would test the stability of the current model and inform questions based on practice specialty. Also, using the current model but using data from a different and more current time period would be helpful in assessing the viability of the model. This would test the stability of the current model as well as suggest ways to re-specify the model in order to be current with today's environment.

This study supports many of the ideas involving how, what, and why physicians do what they do to achieve better earnings and job satisfaction. Specifically, the new finding that stood out was the large impact perception of the need for change has in the model. The components of effective medical care management and medical practice incentive programs clearly are important factors to consider when attempting influencing physicians to change old habits. Managed care and capitated revenues occupied a large component of the Practice Changes construct yet failed to drive improving satisfaction and income. This too, may be a forecast of the demise of traditional managed care. The substitution effect of improving medical care management (EFCAREMT) and practice incentives (INCENTCP) in place of revenue (CPCAPREV) generated by managed care practice (CMCPRACT) should be explored further.

Finally, if the data used for this analysis could be combined with physician specific patient outcome data through the use of medical insurance claims then the

triumvirate of physician, patient, and payer could use the expanded model to assess several items important to participants in the health care industry. Tangible and intangible inputs to the difficult to grasp product called health care may be evaluated sensibly. Physicians could assess what really works to produce the best outcomes from the medical perspective. Patients and payers might begin to be able to assess what set of circumstances leads to the likelihood and receipt of better health care. And, all participants may begin to assess and demand improvements in value within the healthcare market. Physicians could perform their art and science and be satisfied with their delivery and remuneration. Patients could be satisfied that the best provider and circumstances for receiving care were utilized. Lastly, the payers for care could be satisfied that money was well spent on health care.

This research has contributed insight to the non-linear dynamic relationships that exist between physician practitioners and the medical practice environment. Knowledge has been gained concerning factors important to strategic adaptations made by physicians contingent upon their practice environment. The constructs of evaluating physicians with the guidance of contingency theory are supported by this research. They are; 1) components of a complex environment can be incorporated in an analysis, 2) patterns of strategic adaptation can be identified, 3) congruency, or patterns of alignment or fit can be identified and measured, and 4) performance or physician fulfillment can be objectively measured in relationship to congruency. The evidence-based structural model approach, informed by contingency theory, used for this research highlights mechanisms that may be used to improve physicians' income, job satisfaction, and ultimately

performance from perspectives of both individual physicians' and those attempting to influence physicians.

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APPENDIX A

Model Specification

Model specification follows the theoretical framework outlined in Figure 3. The first set of relationships explored involves relationships between physician personal, community, and organizational characteristics and the latent constructs exemplifying congruence and strategy. The following diagram, Figure 9, displays specifications related to the first major linkages identified.

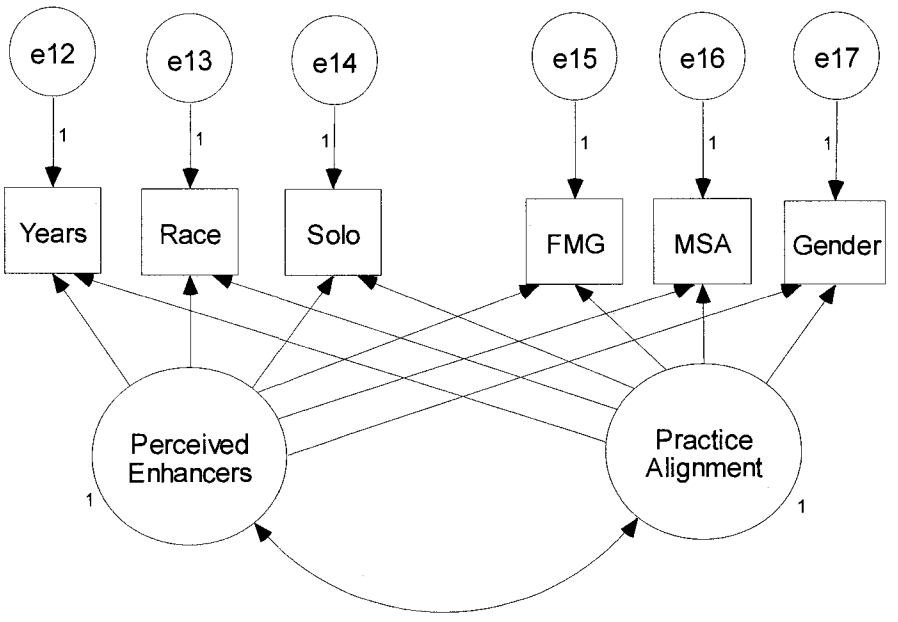

Figure 9: Factor Analysis for Linkage One

Factor analysis confirmed these structural linkages between personal and contextual factors and the endogenous latent constructs Perceived Enhancers and Practice Alignment.

The latent construct of Practice Alignment encompasses both sides of the patient care equation. That is, providers of health care and patients are necessary components in the equation of providing and receiving health care. Additionally, providers' care delivery component of the equation is affected by the gate keeping role (CPCTGATE) of providers, the managed care environment (CMCPRACT), payment methods (CPCAPREV), and staff levels (CNPHYS, CNASSIST). Classification of patients by Medicare (CMCARE), Medicaid (CMCAID), and private pay (CPRIV) fills the other side of the provision and exchange for services equation. Because of this perspective, the latent construct, Practice Alignment, is decomposed into two endogenous latent variables named Practice Changes and Accepting New Patients. Figure 10 describes these relations associated with the second major linkage identified in Figure 3.

Factor analysis confirmed that Practice Alignment should be bisected into two separate endogenous latent variables called Practice Changes and Accepting New Patients. The variables CMCARE, CMCAID, and CPRIV are associated with Accepting New Patients while the provider and environment variables are strictly associated with the endogenous latent variable Practice Changes.

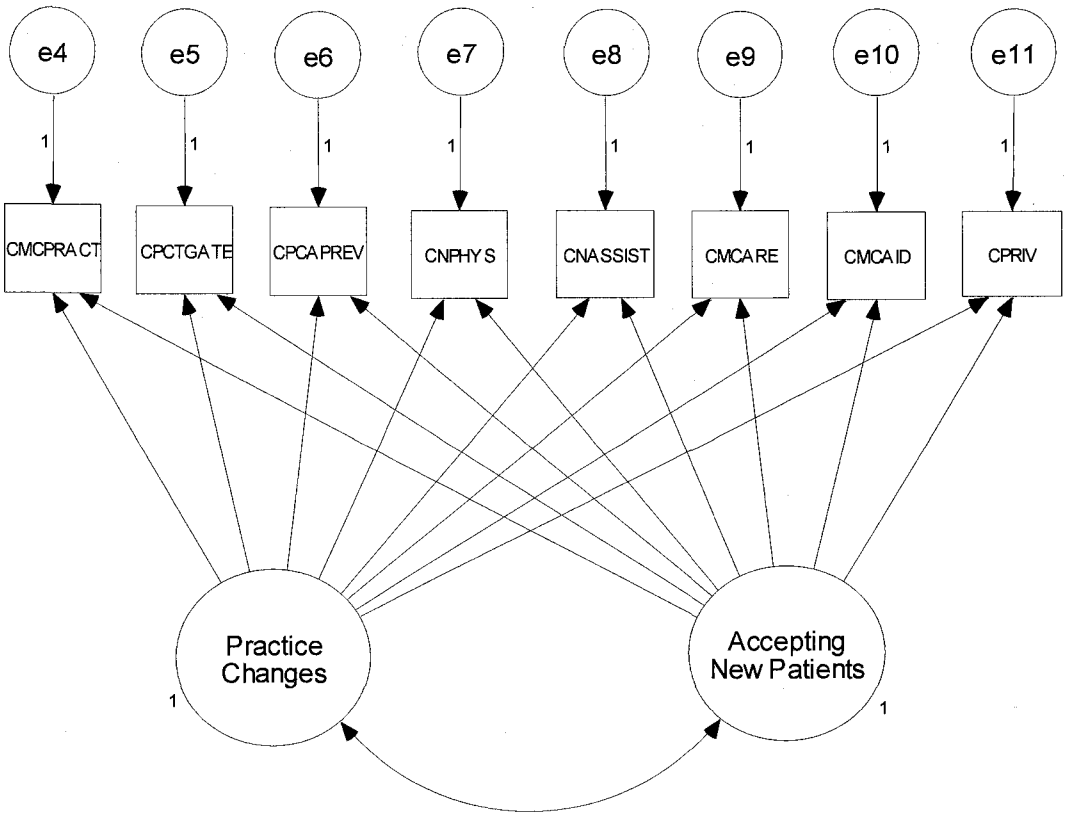

Figure 10: Factor Analysis of Linkage Two

The third and fourth linkages were specified for analysis and Figure 11 describes the model.

Analysis of this model revealed that the variables INCOMET and CARSAT do not have a reciprocal relationship. The variable income (INCOMET) loads unidirectionally onto the variable for career satisfaction (CARSAT) in the final analysis. All six context variables associated with CARSAT. All context variables except FMG and MSA associated with INCOMET in the final analysis. Additionally, the contextual variables revealed a reasonable degree of independence from each other.

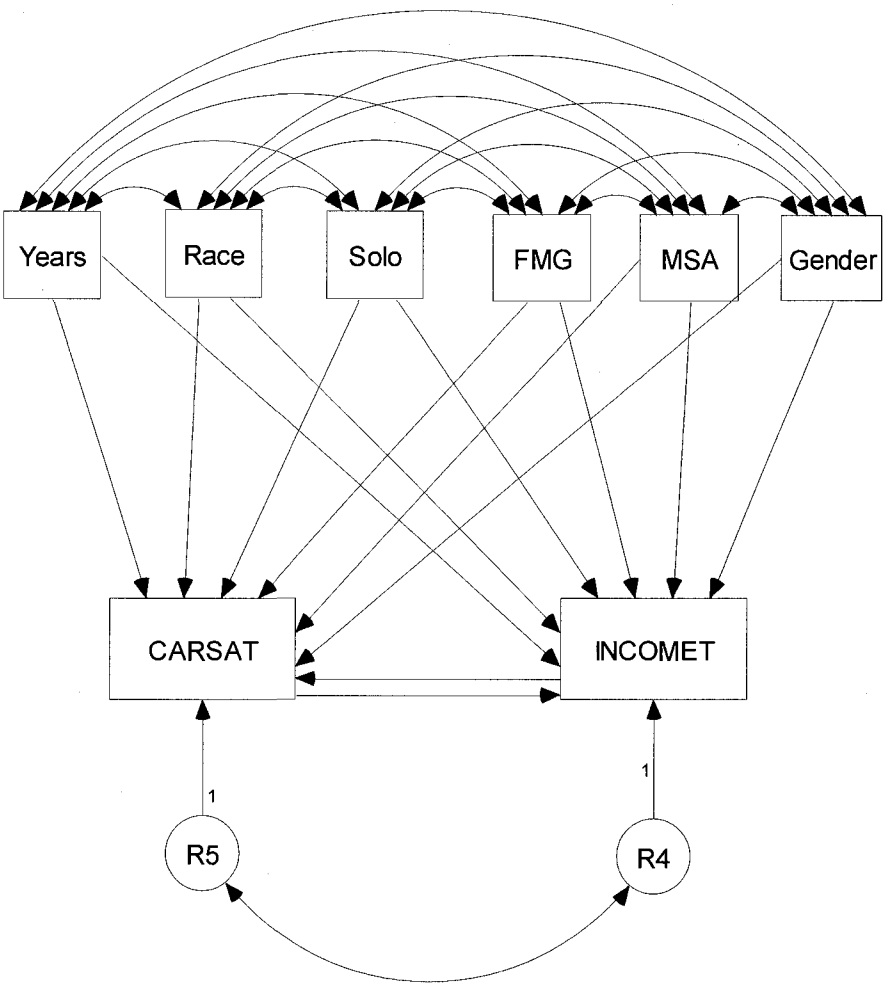

Figure 11: Factor Analysis for Linkages Three and Four

The full research structural equation model was built by combining the three specification models describing the four linkages outlined by the theoretical framework in Figure 3. Any changes to the full research model will require respecification of the linkages and variables associated with the latent constructs.

APPENDIX B

Study Variables

Study Variables

Grouping	Type	Definition	Data Source
Control Variables		**Environment: Personal and Contextual Factors**	
YEARS	Co	Practice experience in years.	RUF
RACE	Ca	Race (1 = White 0 = Other).	RUF
SOLO	Ca	Type of Practice (1=solo 0=multiple MD).	
FMG	Ca	Foreign Medical Graduate (0 = US, Puerto Rico, 1 = Foreign Medical Graduate). Year 2.	RUF
MSA	Ca	Constructed variable which uses MSA/PMSA boundaries and population counts to define large, small, and non-metropolitan areas. 1 = non-metropolitan, 2 = small metropolitan, 3 = large metropolitan.	RUF
GENDER	Ca	Female = 0, Male = 1	PUF
Congruence and Strategy		**Adaptive Response Factors: Practice Alignment through Accepting New Patients**	
Accepting New Patients		An endogenous latent variable describing changes in practice congruence and an adaptive response strategy of changing the mix of Medicare, Medicaid, and Private Pay patients seen in the practice.	
NWMCARE	In	Whether the practice accept new patients who are insured through Medicare, including Medicare managed care patient (1: none; 2: some; 3: most; 4:all). Time 2.	RUF
NWMCARE0	In	Whether the practice accept new patients who are insured through Medicare, including Medicare managed care patient (1: none; 2: some; 3: most; 4:all). Time 1.	RUF

Study Variables

Grouping	Type	Definition	Data Source
NWMCAID	In	Whether the practice accept new patients who are insured through Medicaid, including Medicaid managed care patient (1: none; 2: some; 3: most; 4:all). Time 2.	RUF
NWMCAID0	In	Whether the practice accept new patients who are insured through Medicaid, including Medicaid managed care patient (1: none; 2: some; 3: most; 4:all). Time 1.	RUF
NWPRIV	In	Whether the practice accept new patients who are insured through private or commercial insurance plans including managed care plans and HMOs with whom the practice has contracts (1: none; 2: some; 3: most; 4:all). Time 2.	RUF
NWPRIV0	In	Whether the practice accept new patients who are insured through private or commercial insurance plans including managed care plans and HMOs with whom the practice has contracts (1: none; 2: some; 3: most; 4:all). Time 1.	RUF
CMCARE	In	Change in the practice accepting new patients who are insured through Medicare, including Medicare managed care patient from time 1 to time 2 (Calculated by; NWMCARE – NWMCARE0) (Value Range -3, -2, -1, 0, 1, 2, 3).	
CMCAID	In	Change in the practice accepting new patients who are insured through Medicaid, including Medicaid managed care patient from time 1 to time 2 (Calculated by; NWMCAID – NWMCAID0) (Value Range -3, -2, -1, 0, 1, 2, 3).	
CPRIV	In	Change in the practice accept new patients who are insured through private or commercial insurance plans including managed care plans and HMOs with whom the practice has contracts from time 1 to time 2 (Calculated by; NWPRIV – NWPRIV0) (Value Range -3, -2, -1, 0, 1, 2, 3).	
Congruence and Strategy		**Adaptive Response Factors: Practice Alignment through Practice Changes**	

Study Variables

Grouping	Type	Definition	Data Source
Practice Changes		An endogenous latent variable describing changes in practice congruence and an adaptive response strategy through changing the mix of practitioners and their roles in the practice.	
CMCPRACT	Co	Percent of change in managed care practice. Calculated by PMC – PMC0.	
CPCTGATE	Co	Change in the percent of patients where physician serves as primary care gatekeeper from time 1 to time 2. Calculated by PCTGATE – PCTGATE0.	
CPCAPREV	Co	Change in percent of practice revenue prepaid, capitated. (Calculated by PCAPREV – PCAPREV0).	
CNPHYS	Co	Change in number of physicians at practice time 1 to time 2. (Calculated by NPHYS – NPHYS0).	
CNASSIST	Co	Change in number of physician assistants, nurse practitioners, nurse midwives, and clinical nurse specialists employed by the practice including all locations time 1 to time 2. (Calculated by NASSIST – NASSIST0)	
PMC	Co	Percent of practice's patient care revenue from all managed care. Constructed variable based on responses to questions G6-G11. Constraints: If PCAPREV > PMC, then PMC was set to equal PCAPREV. Time 2	RUF
PMC0	Co	Percent of practice's patient care revenue from all managed care. Constructed variable based on responses to questions G6-G11. Constraints: If PCAPREV > PMC, then PMC was set to equal PCAPREV. Time 1	RUF
PCTGATE	Co	Some insurance plans or medical groups REQUIRE their enrollees to obtain permission from a primary care physician before seeing a specialist. For roughly what percent of your patients do you serve in this role? Time 2.	RUF
PCTGATE0	Co	Some insurance plans or medical groups REQUIRE their enrollees to obtain permission from a primary care physician before seeing a specialist. For roughly what percent of your patients do you serve in this role? Time 1.	RUF

Study Variables

Grouping	Type	Definition	Data Source
PCAPREV	Co	Percent of practice's patient care revenue paid on capitated or other prepaid basis. Constructed variable based on responses to questions G6-G11. Some edits were performed on this variable to insure that percent capitated revenue is not greater than percent managed care (PMC) after imputation. Time 2.	RUF
PCAPREV0	Co	Percent of practice's patient care revenue paid on capitated or other prepaid basis. Constructed variable based on responses to questions G6-G11. Some edits were performed on this variable to insure that percent capitated revenue is not greater than percent managed care (PMC) after imputation. Time 1.	RUF
NPHYS	Co	Number of physicians, including self, at the site. Time 2.	RUF
NPHYS0	Co	Number of physicians, including self, at the site. Time 1.	RUF
NASSIST	Co	Number of physician assistants, nurse practitioners, nurse midwives, and clinical nurse specialists employed by the practice including all locations. Time 2.	RUF
NASSIST0	Co	Number of physician assistants, nurse practitioners, nurse midwives, and clinical nurse specialists employed by the practice including all locations. Time 1.	RUF
Congruence and Strategy		**Adaptive Response Factors: Perceived Enhancers**	
Perceived Enhancers		An endogenous latent variable describing the use of time, medical care practice management, and compensation factors involved in prompting practice change.	
EFCAREMT	Co	Effective Care Management Index (EFCAREMT); a Care Management Effectiveness Index: An index comprised of the following: ((0.173*efprofl0) + (0.146*efguide0) + (0.061*efrmndr0) + (0.102*eftreat0) + (0.063*efdata0)	

Study Variables

Grouping	Type	Definition	Data Source
EFPROFL0	In	Effect of the results of practice profiles comparing your pattern of using medical resources to treat patients with that of other physicians in the practice of medicine (5: very large to 0: no effect; 6 scales).	RUF
EFGUIDE0	In	Effect of use of formal written practice guidelines such as generated by physician organizations, insurance companies or HMOs, or government agencies) in the practice of medicine (5: very large to 0: no effect; 6 scales).	PUF
EFRMNDR0	In	How large an effect do reminders that you receive from either a medical group, insurance company or HMO alerting you about specific preventive services that may be due for your individual patients have on your practice of medicine? (0 = No Effect through 5 = Very Large; 6 scales).	PUF
EFTREAT0	In	Effect of use of computer to obtain information about treatment alternative or recommended guidelines in the practice of medicine (0 = No Effect through 5 = Very Large; 6 scales)	PUF
EFDATA0	In	Effect of use of computer to obtain or record clinical data such as medical records and lab results in the practice of medicine. (0 = No Effect through 5 = Very Large; 6 scales).	PUF
INCENTCP	Co	Incentive Compensation Index (INCENTCP); An index comprised of the following: (0.045*sprod0) + (0.135*ssat0) + (0.295*squal0) + (0.126*sprof0)	
SPROD0	Ca	Whether physician compensation is affected by own productivity. (0: Productivity doesn't affect comp, 1: Productivity affects comp).	PUF
SSAT0	Ca	Whether physician compensation is affected by patient satisfaction. (0: Satisfaction doesn't affect comp, 1: Satisfaction affects comp)	PUF
SQUAL0	Ca	Whether physician compensation is affected by specific measurement of quality of care. (0: Quality measure doesn't affect comp, 1: Quality measure affects comp)	PUF

Study Variables

Grouping	Type	Definition	Data Source
SPROF0	Ca	Whether physician compensation is affected by practice profiling. (0: Profile not affected comp, 1: Profile affected comp).	PUF
EFTIMEMT	Co	Effective Use of Time Index (EFTIMEMT); An index comprised of the following: (1.166*WKSWRK) + (1.073*HRSMED) + (1.004*HRFREE) + (0.756*PPTMNRE)	
WKSWRK	Co	Weeks practicing medicine in a year.	RUF
HRSMED	Co	Hours in a week performing medically related acts.	RUF
HRFREE	Co	Hours in previous month spent on charity care.	RUF
PPTMNRE	Co	Percent of patient care time spent in main practice.	RUF
Performance: Observed Indicator Variables			
CARSAT	In	General satisfaction with overall medical career in 1998. (5: very satisfied; 4: satisfied; 3: neither satisfied or dissatisfied; 2: dissatisfied; 1: very dissatisfied).	RUF
INCOMET	Co	1997 Net income of physicians (after expenses but before tax)	RUF
Descriptive Variables			
Physician Characteristics			RUF
AGE	Co	Age of physicians.	RUF
BDCERT	Ca	Board certification status of physician. (1: board certified; 2: board eligible only; 3: neither).	RUF
Community Characteristics			
FIPS	Ca	FIPS code for county and state of physician practice location. Time 2.	RUF
FIPS0	Ca	FIPS code for county and state of physician practice location. Time 1.	RUF

Note: Ca - Category variable; Co - Continuous variable; In – Interval variable; PUF – Public Use File; RUF – Restricted Use File; ARF: Area Resource File; PCSAP: Primary Care Services Area Project

VITA

Charles Shasky was born in Fargo, North Dakota on August 24, 1954. He received his elementary education in Fergus Falls, and Breckenridge, Minnesota. He attended Junior and Senior High School in Breckenridge, Minnesota and graduated in 1972. He entered the College of Pharmacy at North Dakota State University in Fargo, North Dakota in the Fall of 1972 and graduated with a Bachelor of Science in Pharmacy, B.Sci.,Pharm., in the Spring of 1977. He was the first student of the College of Pharmacy to be awarded the honor of excellence in clinical pharmacy. Following this, he completed an American Society of Hospital Pharmacy Residency, specializing in oncology, infectious disease, and pharmacy administration in 1979. His mentor and preceptor was Paul Pierpaoli, M.S. Subsequently, he built a pharmacy practice in Richmond, Virginia serving institutionalized geriatrics, ambulatory care, and precepting pharmacy students. Concurrent with this practice he completed a Master of Business Administration with an emphasis on finance and marketing from Virginia Commonwealth University in 1985. As a doctoral student, he was the project manager and researcher for the nation's first primary care case management provider based disease management program, Virginia Health Outcomes Partnership (VHOP). Its primary sponsors were the Virginia Department of Medical Assistance Services Medicaid program and the National Pharmaceutical Council. Afterwards, he became the program

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