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WHEN COMPARED WITH TRADITIONAL AND  
CLINICAL PATH MANAGEMENT

A thesis submitted in partial fulfillment  
of the requirements for the degree of  
Master of Science

By

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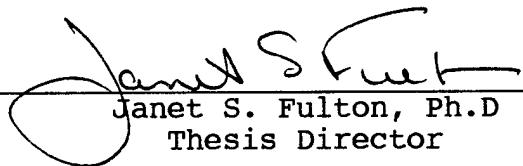
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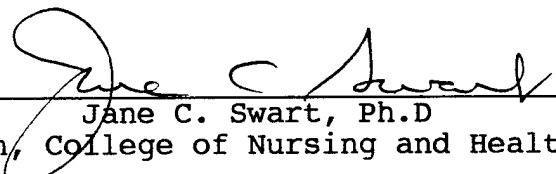
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I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY SUPERVISION BY Vennessa J. Hagan ENTITLED Differences Between Length of Stay and Healthcare Costs When Compared with Traditional and Clinical Path Management BE ACCEPTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF Master of Science.

  
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## ABSTRACT

Hagan, Vennessa J. M.S., College of Nursing and Health, Wright State University, 1997. Differences Between Length of Stay and Healthcare Costs when Compared with Traditional and Clinical Path Management.

Costs of healthcare are increasing at alarming rates. By the year 2000, the General Accounting Office predicts approximately 17 percent of the gross domestic product will be spent on healthcare. Government budget restraints alone will not be able to curtail the increasing trend. To reverse the trend, clinical cost reduction methods must be developed and adopted. Clinical pathways are clinical management instruments. By focusing on interdisciplinary communication and decision making, clinical paths provide guidelines for increasing the efficiency of care, thereby decreasing length of stay and hospital costs. Nurses, as healthcare team members, are interested in the impact of care guidelines on both client outcomes and cost of services. This study compared clinical pathway client management with traditional client management of two medical diagnoses in two different populations--pediatric reactive airway disease/asthma treatment and adult coronary artery bypass grafting. Length of stay for pediatric reactive airway disease/asthma clients was significantly shorter for clients managed with clinical

paths. Both intensive care unit length of stay and total length of stay was significantly shorter for coronary artery bypass graft clients. Hospital costs were significantly less for clients managed with clinical paths when compared to clients managed traditionally. The results of this study demonstrate that clinical paths can impact length of stay and hospital costs, suggesting clinical paths as a viable method for interdisciplinary management of client care. Further research may explore the potential of clinical paths to decrease length of stay and costs healthcare costs throughout Department of Defense healthcare treatment facilities.

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## **I. INTRODUCTION**

Many advances in the healthcare arena take years of research and study before implementation occurs and benefits are realized. Clinical path development may be considered one of those long awaited advances, however, the idea of clinical paths was originally developed in 1958 for manufacturing industries. Originally known as critical paths, they addressed the coordination of time, cost, and resource availability--critical factors in industry (Brandt, 1994). Concepts related to critical paths were examined by healthcare in the early 1970's; the environment at that time was not ready for acceptance and implementation (Coffey et al, 1992). Since hospitals were reimbursed on a retrospective, charge based system, there was little incentive to accept or implement cost control measures such as clinical paths. Physicians resisted formal efforts to restrict or influence their methods of practice. Financial incentive was limited with no need to optimize resource utilization (Coffey et al, 1992). The early 1980's saw the beginning of health related economic changes. Prospective cost based reimbursement and competitive bidding replaced fee for service hospital reimbursement systems (Coffey et al, 1992). As renewed interest in critical paths developed, New England Medical Centers Hospitals became pioneers in

designing clinical paths for healthcare (Rudisill, et al, 1994).

As client management instruments, clinical pathways have a potential positive impact on healthcare by charting a predictable course of treatment thus identifying efficient methods of client care management and decreasing the occurrence of redundant diagnostic procedures and tests. A financial benefit of clinical paths is decreased length of stay and therefore decreased cost. While the relationship between clinical paths and length of stay in civilian settings has been documented (Barnes, Lawton & Briggs, 1994, Corbett & Androwich, 1994, and Boutron, King, Matula & Niznik, 1995), little has been published regarding the same correlation in military settings.

Rather than depending on traditional patient management methods, managing patient care along a clinical path may identify problem areas that can be corrected early. Collaborative interdisciplinary efforts that focus on identifying problems at onset and facilitating early discharge should decrease costs. Financial savings are vital given Department of Defense (DoD) budget cuts and the recent proposal to close or decrease services in 17 more DoD healthcare facilities (Hawkins, 1997). This study explores the potential decrease in healthcare costs and length of stay for a specific military healthcare facility. Further research may determine the applicability of financial savings and

decreased length of stay throughout Department of Defense healthcare treatment facilities.

#### Statement of Research Problem

The cost of healthcare in America is rising. Likewise, the costs of healthcare in military hospitals and clinics are rising. Research revealed clinical paths help decrease cost and improve care in the civilian sector. Studies are needed to determine whether clinical paths will provide similar advantages in military settings.

#### Significance and Justification

The percentage of the United States gross domestic product (GDP) spent on healthcare has increased from five percent in the 1960's to eleven percent today (Edlin and Golanty, 1992). Healthcare costs are at \$650 billion per year and continue to increase (Clark, Steinbinder, & Anderson, 1994). Patients with acute medical problems not resolved within an insurance industry's delineated time frame become a financial drain on acute care institutions and contribute to the United States' spiraling healthcare costs. The upward spiral of healthcare costs must be curbed. No single action will reverse the trend. Various disciplines within the healthcare system need to exercise creative and innovative methods to control increasing costs while concomitantly ensuring quality healthcare. Particularly, the nursing discipline is in a prime position to investigate this issue because of their collaborative capabilities and interaction with other disciplines within the healthcare setting. One

method to explore is the utilization of clinical pathways that decrease costs, reduce length of stay, and improve quality care.

#### Statement of Purpose

The purpose of this study is to describe the relationship of clinical pathways to length of stay (LOS) and healthcare costs in an Air Force Medical Center when compared to traditional care.

#### Research Questions

1a. For traditional client management of RAD/asthma, what is the relationship between LOS and hospital cost?

1b. For traditional client management of CABG, what is the relationship between LOS and hospital cost?

2a. For clinical pathway client management of pediatric RAD/asthma, what is the relationship between LOS and hospital cost?

2b. For clinical pathway client management of CABG, what is the relationship between LOS and hospital cost?

3a. What is the difference between traditionally managed client LOS and clinical path managed client LOS for pediatric RAD/asthma clients?

3b. What is the difference between traditionally managed client LOS and clinical path managed client LOS for CABG clients?

4a. What is the difference between traditionally managed client hospital costs and clinical path managed client hospital costs for the pediatric RAD/asthma client?

4b. What is the difference between traditionally managed client hospital costs and clinical path managed client hospital costs for the CABG client?

#### Definitions

**Clinical pathways** are diagnosis specific, written guidelines which map specific outcome expectations. Clinical paths depict optimal sequencing and timing of interventions by each member of the healthcare team. Paths are designed to improve resource utilization, enhance quality of care, and decrease delays in care (Coffey et al, 1992). For this particular study, clinical paths were developed and used by the healthcare team members of a military medical center in the midwestern United States. For the purpose of this study, the terms critical path, patient care map, and patient care guidelines will be considered synonymous with clinical path.

**Length of stay** (LOS) is defined as the number of days the client remains an inpatient in the acute care setting. LOS will be measured in days including the day of admission but not counting the day of discharge. Intensive Care Unit (ICU) length of stay is defined as the number of hours the client remained in the ICU during the hospital course and will be measured in hours.



**Hospital costs** are defined as the financial charges allocated to each client for the duration of their inpatient stay. Costs will be measured in dollars. Cost data will be retrieved from the Resource Management Office's Medical Expense and Performance Reporting System, Version III Expense Analysis. Number of bed days will be computed and divided into the unit's total marginal cost. This calculation will provide the marginal cost per day for clients, relative to specific patient care units.

#### Limitations

This study is an initial effort to investigate clinical paths in a military healthcare setting. While limited to a single setting, the model can be used for larger studies and the data should provide a basis for expanded research. Clinical paths are relatively new to this facility, thus limiting sample size and generalizability to other military healthcare treatment facilities. There were a limited number of charts available for review which precluded randomization. A power analysis was computed to strengthen the study since the numbers of charts were limited.

#### Summary

Widespread evidence of the lack of financial control of the healthcare market begs for attention and credible solutions to the problem. While clinical pathway utilization will not solve all of the nation's medically related financial woes, tremendous financial savings related to their implementation are promising. The financial significance

referred to can be expanded to include various disciplines, focusing on high cost and high volume procedures. Remaining chapters will discuss the cost savings that result from clinical path utilization in varied disciplines at a military hospital. Given the unique military environment with its emphasis on medical war readiness and the absence of client billing, the study will explore differences between hospital costs and length of stay, when compared with traditional care and clinical path management in a Department of Defense institution.

## II. REVIEW OF LITERATURE

Historically, industry and healthcare functioned at opposite ends of the leadership spectrum. In the early 1900's, Frederick Taylor, the Father of Scientific Management, asserted a philosophy in which the tasks of planning and execution were separated. Leaders, or management did the planning, and workers executed the tasks (Chase & Aquilano Lindsay, 1995). The employees in industry were narrowly focused on task completion with little knowledge or understanding of how individual tasks affected the outcome of a product. Leadership was powerful, directive, authoritarian, and coordinated at high levels. Workers often lacked higher education and were trained to perform a narrow range of tasks.

Conversely, leadership in the healthcare arena has historically been at the opposite extreme. Leadership has been laissez-faire. Providers were highly educated and functioned independently. Medical care was provided in an artisan style; each physician or provider rendered their own method of care. Care was only loosely coordinated, there was little standardization and minimal formal efforts at quality control. Leadership lacked the authority to direct care. The structure failed to coordinate providers, and the healthcare

system evolved in a power vacuum with costs and quality largely unmonitored.

By comparison, industrial leadership was too tight; often employees were prevented from interacting. The assumption, introduced by the Taylor era (Chase & Aquilano, 1995) was that management "knew all the answers." Healthcare leadership was too loose; providers chose not to interact. The assumption was that each provider knew all the answers. Despite the leadership differences between industrial and healthcare markets, the end results were similar. Communication and quality were lacking.

Concepts related to clinical paths were examined by healthcare employees in the 1970's. Since there was limited financial incentive to optimize resource utilization, there was little incentive on the part of leaders or providers to develop clinical paths. Health related economic changes ensued in the 1980's and 1990's, arousing a renewed interest in clinical paths. In September of 1982, the Tax Equity and Fiscal Responsibility Act (TEFRA) became Public Law 97-248 (Brandon, 1985). Prior to TEFRA, hospitals received Medicare reimbursements on a retrospective basis. Retrospective reimbursement encouraged healthcare facilities to spend money to receive reimbursement. TEFRA introduced prospective payments for hospitals (Brandon, 1985). The introduction of Diagnostic Related Groups (DRGs), which accompanied TEFRA, provided strong incentive for hospitals to reduce costs, created external restrictions on providers (particularly

physicians), and was a catalyst for the reintroduction of clinical pathways.

#### Clinical Pathway Development

The 1990's have seen an increase in the development, adaptation, and sharing of clinical paths. Clinical path development is occurring across the nation. Although the paths differ from facility to facility, there are some consistencies in successful development. The predominant consistency in path creation is joint development within an interdisciplinary team context (Rudisill, 1994). Each discipline involved in the client's care should be represented on the team. Since clinical paths are organized around medical diagnoses, physician support is crucial. Without physician support, most clinical pathways are destined for failure (Ferguson, 1993). In addition to physician participation, clinical path development includes as many disciplines of the healthcare team as are appropriate for managing clients in a diagnostic group. The team develops consensus among members about the standards of care for a select diagnostic group of patients (Rudisill, 1994). In addition to defining a path of treatment, clinical path development can facilitate an interdisciplinary process, enhancing communication, facilitating education, clarifying perceptions of various team members, and leading to a better outcome for the patient and the healthcare team. Failure of clinical paths is often related to failure to develop the path in collaboration with multidisciplinary team members

(Anderson, & Finn, 1983, Brown, 1993, Kane, McCabe, Bierly & Miller, 1987). Involvement in the development phase of clinical paths enhances all disciplines acceptance of the path (Ferguson, 1993).

George and Large (1995) studied health related economic changes, examining length of stay for clients undergoing open heart surgery. Clinical paths were used to move client care practices into the managed care arena. Clinical pathways were introduced to a group of physicians who were somewhat conscious of cost effectiveness efforts, but the pathway process highlighted the awareness to the multidisciplinary team. In a non-randomized sample of 246 patients, studied over a 6 month period, intensive care unit (ICU) length of stay decreased 0.81 days and average length of stay decreased 6.37 days. Total costs decreased 32 percent from the baseline. In addition clinical pathway development team members and clinical users were asked to evaluate the clinically ineffective aspects of the pathway. Healthcare provider compliance with the pathway was determined to be essential for successful outcomes of clinical pathways. Following the plan and documenting care were two compliance problem areas noted.

#### Outcome Focus

Clinical paths are geared toward a predetermined destination. The path serves as a day-by-day guide to enable the patient and each team member to know when tests, consults, treatments, and discharge are designed to occur

(Brandt, 1994). Since the clinical path identifies the expected outcome, interventions by interdisciplinary team members are directed at completion of care. Thus, pathways are instruments that expedite the achievement of outcomes while constraining costs (Gartner and Twardon, 1995). Clinical paths also transform passivity often associated with complex clinical and psychosocial situations into expectant activity (Neidig, Megel, & Koehler, 1992), focusing on intended outcome rather than leaving outcome to serendipity, often with associated higher costs. A study on outcomes resulting from use of a pneumonia clinical pathway revealed a decrease in LOS of 1.8 days, a decrease in mean charges of \$3,566 per client, and improved multidisciplinary documentation (Sperry & Birdsall, 1994). Clinical paths provide a clear process for attaining a desired outcome. Outcome focus without regard to process leads to frustration, chaos, suboptimization of the system, and failure. Merging process with outcome is essential.

#### Financial Advantages

The outcome focus of clinical paths leads directly to the financial advantages. The fiscal management of a patient's episode of care is related to a variety of factors. Length of hospital stay, specifically length of stay in an intensive or coronary care unit, as well as the number and type of diagnostic laboratory and radiographic tests, the number and type of consultations, pharmacological needs, and nutritional support are a few of the factors. Clinical paths

combine individual provider practice to promote the most resource efficient, clinically appropriate, and shortest length of stay possible (Rudisill et al, 1994). The path serves as a guide to plan, organize, direct, and control services to eliminate waste, improve efficiency, and thereby reduce costs (Clark, Steinbinder, & Anderson, 1994). The paths effectively reduce costs because they serve as flags to client progress on a particular path by a predetermined time frame. If clients are not progressing as expected, the variance will be noted in a timely manner and interventions can be initiated to get the client back on the path as quickly as possible. Clark et al. (1994) noted that paths also identify and eliminate practices that are excessive or inefficient while maintaining quality care and assisting clients to achieve desired outcomes.

Clinical paths can counter cost control problems by decreasing length of stay, decreasing inpatient costs, improving quality of care and enhancing both client and healthcare staff education. An average of \$1,893 per client was saved by clinical path utilization in a cardiac surgery setting (Rudisill, Phillips, & Payne, 1994). In one year, \$1,533,000 was saved in treating 511 clients with coronary artery bypass grafting (CABG) (Barnes, Lawton, & Briggs, 1994). Cohen (1991) revealed a savings of \$940.30 per client case utilizing clinical paths as the primary tool for nurse case management of cesarean section clients. Thoracotomy client costs decreased from approximately \$22,500 to less



than \$10,000 following the implementation of a thoracotomy clinical path (Patton & Schaerf, 1995). In a landmark article, Zander (1988) reported a 29 percent decrease in average LOS and a 47 percent decrease in the number of ICU days for ischemic stroke clients managed with clinical paths. Zander (1988) attributed a reduction in LOS from six to eight weeks down to 32 days for adult leukemia clients to clinical path implementation. Clearly, financial advantages can result from appropriately implemented clinical paths.

Clinical paths provide an economic benefit to the healthcare community, however, they are not without inherent costs. Comried (1996) reported a total cost for developing a tool such as a clinical path at \$36,097 and requiring a total of 1,137.5 hours for development. The costs may be trimmed by \$1000 if the developer does not seek trademark rights. Expenses do not cease when the clinical path is developed. Continuous staff education, particularly in teaching hospitals where professional healthcare staff members rotate through internships, should not be overlooked. Neither is the clinical path a stagnant tool. Clinical paths require continuous evaluation, variance assessment, and revision as healthcare science, technology, the economy, and societal values grow and change.

Time is another valuable commodity that is expended in the creation of clinical paths. The process of developing a clinical path for neuroscience patients took about 3 months, including revisions; the costs of meeting time for staff must

be considered, particularly when multiple providers are involved (Counsell, Guin, & Limbaugh, 1994).

#### Improved Quality of Care

Clinical paths provide an excellent source of data for evaluating quality of care. Clinical paths define the optimal sequencing of a process of care for a given diagnosis. Paths also reduce variations in treatments, leading to the best outcome and providing a means for continuous quality improvements (Barnes, Lawton, & Briggs, 1994).

Counsell, Guin, & Limbaugh (1994) assessed the impact of a coordinated care delivery system for trigeminal neuralgia. Twenty six clients followed a path for six months and demonstrated a non-significant decrease in length of stay of 0.17 days, however, survey results from the clients indicated they felt well informed and consulted during the development of their treatment plans. The healthcare staff all indicated improved communication, excellent discharge planning, and timely management of daily care issues.

Clinical paths can also be used for benchmarking as another step toward continuous improvement. Since the expected outcome is explicitly stated, the clinical path can serve as a benchmarking or quality assurance mechanism. As an ongoing quality assurance mechanism, the clinical path analysis enables comparison of standard outcomes on the clinical path with actual occurrence of events, delivery of care, and the client progress (Neidig et al, 1992). This mechanism allows staff to study paths or care plans in

relation to patient outcomes (Coffey, Richards, Remmert, LeRoy, Schoville, & Baldwin, 1992). If benchmarks are used from clinical paths outside one's facility, care should be taken to evaluate the characteristics associated with the borrowed benchmarks to ensure their appropriateness for the facility planning to utilize them (Aspling & Lagoe, 1996). Use of clinical path benchmarks from institutions dissimilar to the borrowing institution may result in inappropriate outcome goal planning and expectations.

#### Client and Staff Education

Clinical practice guidelines serve as educational tools that enable physicians to (1) get the advice of recognized clinical experts; (2) keep up with the latest clinical research; and (3) evaluate the clinical significance of sometimes conflicting research findings (Brandt, 1994). Given information that clinical practice guidelines can impart, their incorporation into clinical paths can serve to educate staff physicians, residents, nurses, and clients about expected clinical outcomes. When clinical paths are shared with clients and their families, the path helps them comprehend the plan and participate in their own recovery (Brandt, 1994). Delineating specific client education outcomes and specifying their expected completion date on the pathway should lead toward timely client education, preventing the need to delay discharge related to the client being unprepared to assume responsibility for self care.

### Path Adherence

Creation of a clinical path and assignment of a client to that path does not guarantee the client will remain on the path. Strong and Sneed (1991) evaluated clinical paths for coronary artery bypass surgery clients focusing on accuracy in describing client recovery and consequences of variations from the path on postoperative length of stay. A sample of 28 subjects with a total of 195 postoperative days was used to support the notion that closer adherence to the clinical path is associated with shorter length of stay and post-operative LOS can be predicted from the varying percentage of adherence to the critical path. The significant positive relationship between average adherence to the critical path and post-operative LOS supports this clinical path as a valid tool for assessing the post-operative recovery of CABG patients in this setting. The strengths of this study are the statistical correlation between post-operative LOS and the critical path variable identified, and the ability to predict post-operative LOS.

Results of empirical data are somewhat mixed. While much of the literature indicates financial advantages of using clinical paths, the conclusions are not overwhelmingly convincing. Both the theoretical and empirical literature links historical leadership forms to the startling economic realities of healthcare in the 90's. Before economic pressures to control healthcare costs, practice was independent and isolated. The requirement to curb rising

healthcare costs necessitates a change that will obligate the leadership structure to decrease the variance in management of healthcare, provide for quality care, and decrease the proportion of the GDP spent on healthcare. The Path-Goal Theory provides a link to the development of the following conceptual framework.

#### Path-Goal Theory

Some leadership effectiveness theories include a consideration of the situational contingent, or conditions, in which leaders work (Mitchell, Biglan, Oncken, Fiedler, 1970). Contingency leadership theory is a theoretical umbrella that strongly considers the situation, or context, in which leadership occurs. The path-goal theory is a specific contingency theory that recognizes both individual and environmental characteristics as vital components in the development of leadership within organizational systems (Barnett & Arnold 1989). Within organizations, individual marketing channels or product lines exist. Marketing channels can be viewed as interdependent subsystems involved in the process of making a product or service available for use or consumption (Stern & El-Ansary, 1997, p.3). Van de Ven (1976) examined marketing channels within organizations and proposed that the relationship between two or more organizational subsystems linked together to attain joint goals, could be termed a social system. The rationale for proposing that the relationship between subsystems acts as a social system included the belief that:

1. Behavior among members is aimed at attaining collective and self interest goals.

2. Interdependent processes emerge though division of tasks and functions among members.

3. The organizational system can act as a unit with a unique identity separate from its members (Barnett & Arnold, 1989).

Healthcare organizations can be viewed as organizations with multiple market channels or products. Relationships among the channels can be viewed as subsystems that form a social system, behaving as described by Van de Ven (1976). Within the healthcare setting, management of various channels, or medical diagnoses is analogous to managing various contingencies. Multiple providers in healthcare are analogous to the different subsystems. A collaborative relationship links providers--physicians, nurses, physical therapists, pharmacists, nutritionists and laboratory technicians--within a channel to attain goals benefiting the organization and the individual client.

Path-Goal Theory provides an explanation of a power base for leadership. With such a structure the Path-Goal Theory proposes the primary task of a leader is to increase subordinates motivation to meet personal and professional goals (Barnett & Arnold, 1989). Leadership behaviors influence the subordinates task accomplishment by clarifying paths to rewards or increasing rewards valued by subordinates. The leader works with subordinates to identify

and teach behaviors that will lead to task accomplishment (Barnett & Arnold, 1989). The Path-Goal Theory of Leadership predominantly focuses on initiating structure and demonstrating consideration as two distinctive leadership behaviors (House, 1971). Initiating structure means reducing subordinates role ambiguity, thus increasing employee motivation particularly in jobs requiring cognitive versus repetitive routine skills (House, 1971). Consideration means encouraging and motivating employees when they are involved in unsatisfying, repetitive or monotonous tasks.

Largely, the leaders behavior will be governed by or contingent upon the characteristics of the task. As indicated by Figure 1, leaders will provide structure and feedback to employees assigned complicated or ambiguous tasks. An example of client management requiring leadership behavior that provides structure and feedback is weaning a client with chronic obstructive pulmonary disease from a ventilator. This is a difficult task requiring acute assessment skills; structure and feedback are important for healthcare team members performing this task. By contrast, the monotony of repetitive physical therapy for rehabilitation clients, or turning bedridden clients every two hours likely requires consideration behaviors which serve to motivate employees or clients. Leaders incorporating the Path-Goal theory will demonstrate consideration behavior if tasks are repetitious or monotonous.

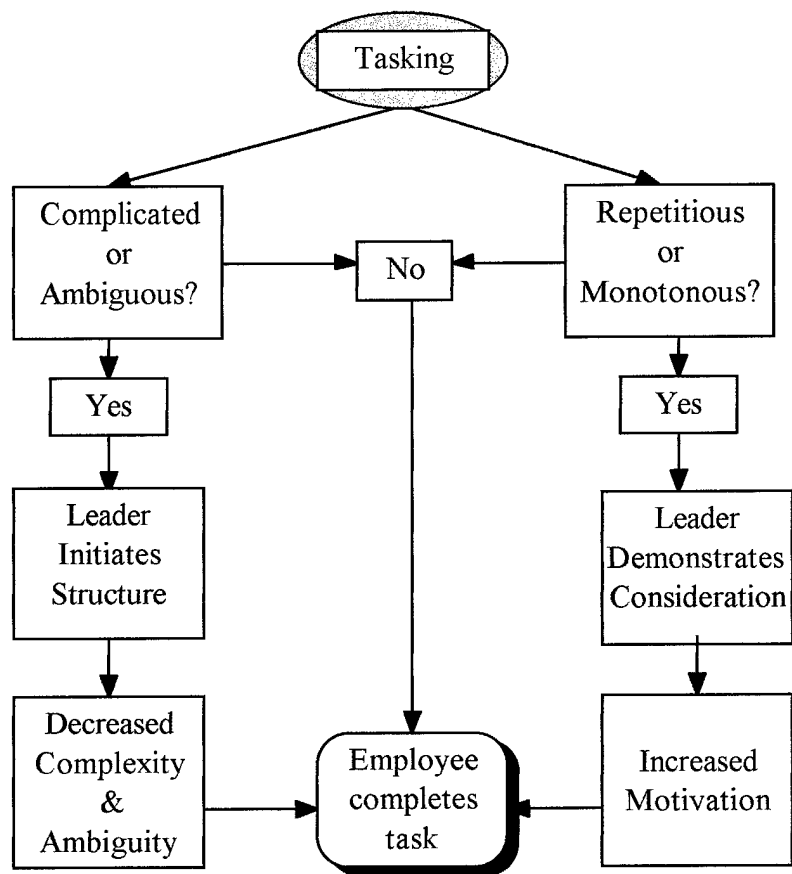


Figure 1. Role of the leader in initiating structure and demonstrating consideration.



The Path-Goal theory of leadership blends well with the concept of clinical paths. The clinical path meshes with the leadership role delineating in a clear manner the methodology for managing complicated or ambiguous and repetitious or monotonous tasks. Examining the historical development of clinical paths clarifies their purpose.

In 1958, critical paths were developed in industry for the purpose of planning and controlling various projects and scheduling maintenance shutdowns (Brandt, 1994). Industrial critical paths addressed use of time and resources and associated costs. The process for critical path development encompassed several steps--identifying required activities, determining and sequencing of activities, estimating time required for each activity, and determining the optimum path which accomplished all the tasks in the minimum time, assuming everything progresses as planned (Brandt, 1994). Critical paths in industry created the structure of multiple subsystems working in a coordinated manner. In such a system, the role of the leader was to initiate structure when procedures were complicated or ambiguous and to demonstrate consideration when tasks were repetitive or monotonous.

#### Conceptual Framework

Collaboration and leadership in development and implementation are important indicators of successful clinical path utilization. The path goal theory provides a link to the conceptual framework for the potential success of managing clients with the aid of clinical pathways. Client

management is complex and arguably ambiguous involving multiple disciplines, each with their own set of objectives. Tasks relate to industry as treatment or management regimes relate to healthcare. In essence, treatment is the task of healthcare. Clinical paths provide the structure of leadership needed to keep the pathway to the client's goal clear and unambiguous. The role of the leader in industry is to facilitate task completion by clarifying complicated tasks and decreasing task ambiguity. In healthcare, the clinical path fulfills the role of the leader by respectively initiating structure and guiding consideration behavior for ambiguous or repetitious treatment regimes. Clinical paths then impact the process by guiding the healthcare team in task completion through enhanced client motivation and healthcare team member motivation. The outcome is reflected in recovery; a more rapid return to health, early discharge, and by association, decreased healthcare costs. If part of the healthcare team is unclear about a client's goal and the projected path to reach those goals, the healthcare team member will feel less fulfilled and in turn, the client will be less likely to attain the goal. The conceptual model (Figure 2) indicates how the Path-Goal Theory enhances outcome through the application of clinical paths as outcome oriented management tools.

Assumptions of this conceptual model are:

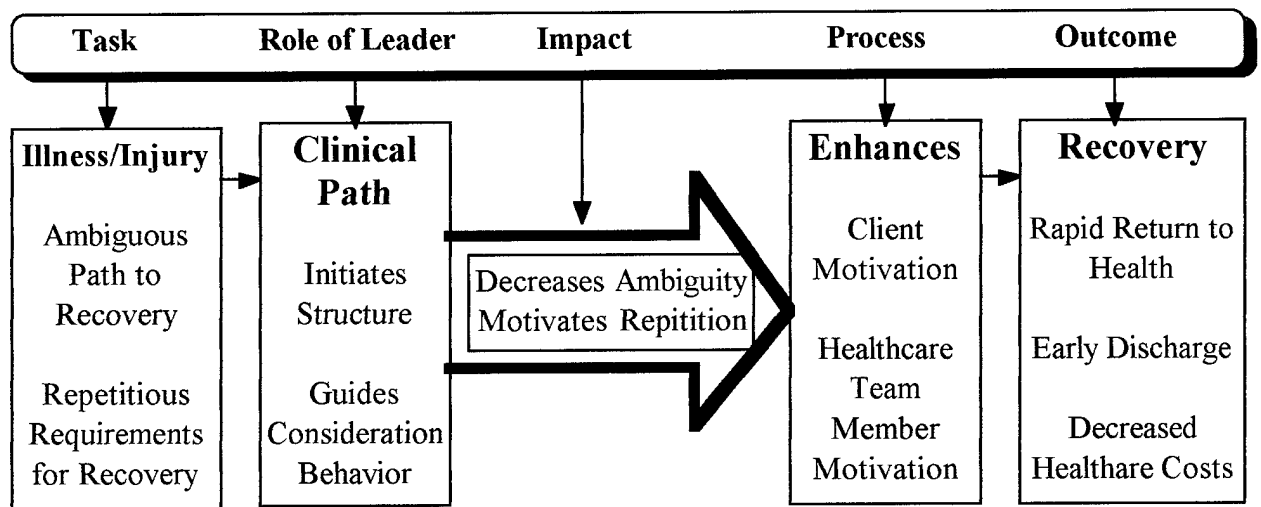
1. People who have job clarity perform better than people who have job ambiguity.

2. Complicated tasks are more effectively and efficiently accomplished if employees are provided structure for task accomplishment.

3. Monotonous, repetitious tasks are more effectively and efficiently accomplished if employees are motivated by consideration behavior.

The clinical path, developed collaboratively, is a written tool explicitly stating the goal and the steps on the pathway to meet that goal. Specific tasks are outlined in a step by step fashion, and repetitious tasks required by healthcare team members or the client are clearly defined.

Since the ambiguous tasks and repetitious tasks are known and clearly communicated, motivation for the healthcare team member and the client will be enhanced. Clearly communicated paths and goals will lead to more rapid recovery, earlier discharge, and decreased healthcare costs than would be expected with traditional client management (Figure 2).



**Figure 2.** Path-Goal Leadership Theory Applied to Clinical Pathway Management in Healthcare.

## Summary

The United States General Accounting Office 1994 data show that by the year 2000 about 17 percent of the gross domestic product will be spent on healthcare. Clearly, healthcare professionals must become proactive in the management of healthcare costs and healthcare quality. Clinical pathways are a potential tool to aid in the control of healthcare costs. Collaboration in clinical pathway development is a requirement for success. Appropriately utilized, clinical paths may decrease inpatient costs, decrease length of stay, enhance quality of care and improve education for clients and healthcare staff. Empirical data resulting from studies of clinical path utilization are limited. The literature review identifies a weak trend in the decreased length of stay related to clinical pathway use. While some studies fail to show statistically significant decreases in LOS, most found some positive result from pathway implementation. The majority of studies also look at one diagnosis in one institution. The purpose of this study, using two unrelated clinical paths, is to enhance the knowledge base with empirical data establishing the differences between cost and LOS when compared with traditional and clinical path management in a military healthcare facility.

### **III. METHODS**

The purpose of this study was to determine how length of stay and healthcare costs are related to use of clinical pathways in an Air Force medical center. Literature supports the notion that utilization of clinical paths decreases length of stay and costs while simultaneously improving client and healthcare staff satisfaction and quality of care. Clinical path success results from the ability to identify efficient methods of client care management and decrease the occurrence of redundant diagnostic procedures and tests. Empirical literature relating costs and length of stay to clinical path utilization is scarce; the literature reviewed indicates inconsistent trends.

This chapter explains the study methods used to assess differences between traditional client management and clinical path use, using length of stay and hospital costs as outcome measures. A descriptive correlational research design is explained, the setting and population discussed, and the sampling plan is illustrated. Ethical considerations are spelled out. Data collection is carefully explained as are the methods and procedures for collecting the data. Data analysis is introduced to assist the reader in assessing the results of the study.

### Research Design

A descriptive correlational research design explored the relationship between LOS and cost. In addition, the differences between LOS and hospital costs were compared with clients whose care was managed with a clinical path and clients whose care was managed traditionally.

### Setting

The site selected for this study was a 300 bed Air Force medical center located in the midwestern United States. The medical center is one of six Air Force hospitals within the continental United States that provides healthcare in over 70 specialty areas. Outpatient and inpatient care is provided. In 1995, approximately 475,000 outpatient visits occurred and the hospital maintained an average daily inpatient census of approximately 113 inpatients (Insights, 1995). Utilizing a military hospital was key in this study because the research question relates specifically to military settings. While there is a growing body of evidence suggesting economic and clinical benefits of clinical paths in civilian settings, there is an absence of evidence supporting use in military settings. Permission for accessing this agency has been granted as noted in Appendix A.

### Subjects

The subjects for this study consisted of active duty and retired personnel and their dependents who were admitted as inpatients in the study facility. Inclusion criteria were clients admitted with a diagnoses of Reactive Airway Disease

(RAD) or Asthma ages newborn to 17 years, or those undergoing the procedure of coronary artery bypass graft (CABG). Males and females were included in the sample. There were no age restrictions for clients undergoing CABG. The subjects were separated into two groups: those managed with clinical paths and those managed traditionally.

#### Sampling Plan

A stratified random sample was the sampling plan of choice. Stratified random sampling ensures adequate representation for all identified variables (Burns & Grove, 1993). Modifications were employed secondary to limited subject availability. Clinical paths were not in place for greater than one year at this study facility. Since adequate numbers of subjects were not available, a sample of convenience was used for this preliminary study. This study is an initial effort to provide a baseline for further research. Data from all clients that met the inclusion criteria were gathered. Clients with diagnoses of pediatric RAD/asthma and coronary artery bypass graft were included. Equal numbers of clients managed with and without a clinical path for each diagnosis were sought. A limitation of this sampling method is the small sample size. A power analysis using a difference of  $2.25 - 1.76 = 0.49$  days for pediatric RAD/asthma indicates a sample size of 466 pre-path and 466 post path samples is needed for 80% power with a 0.05 level of significance. For CABG clients a sample size of 20 pre-path and 20 post path clients is required to obtain 80



percent power with a 0.05 level of significance. Comparing hospital costs, in order to detect a large effect (0.8 standard deviations) a sample size of 26 pre and post path clients will be needed for each diagnostic group. A retrospective chart audit was conducted. A stratified sample of asthma client charts was selected to provide equivalent representation of clients managed with and without clinical paths. Likewise, charts of CABG clients were selected to provide equal representation of clients managed with and without clinical paths. A computerized list of potential subject charts was obtained by requesting an ad hoc report listing all clients managed during the time frame clinical paths were used for both RAD/asthma clients and CABG clients. Likewise, an ad hoc report listing all clients managed in a traditional manner, before clinical pathways were used was requested. The majority of the traditionally managed asthma clients were treated in 1994 and 1995. Clinical path managed asthma clients were treated in 1996 and 1997. Traditionally managed CABG clients were treated in 1993 and 1994. Clinical path managed CABG clients were treated from July of 1995 to November of 1996. Prior to July 1995 there was inconsistent use of the CABG clinical path and after November 1996 the path was no longer placed in the record. When more clients were listed that this study requires, a random selection was made utilizing a table of random numbers in association with the clients hospital register number.

### Ethical Considerations/Human Subject Protection

Client confidentiality was maintained by utilizing subject numbers rather than names on data collection sheets. Charts were maintained and reviewed in the clinical records department where access is controlled by clinical records personnel. Data collection sheets containing client numbers will be destroyed by shredding after completion of the study. Protection measure approval is documented by IRB forms located in Appendix B.

### Measurement

Diagnosis specific data collection sheets (Appendix C) were developed to collect demographic information and length of stay from each chart reviewed in an organized fashion. The data was then correlated in this study. The CABG data collection sheet had one extra column to enable comparison of length of ICU stay as well as total length of hospital stay. Examining ICU length of stay is deemed significant because the cost for maintaining an ICU bed is substantially higher than the cost for maintaining a medical ward bed. The researcher collected all data. A retrospective chart review was implemented to collect the demographic data (age, rank, gender and marital status for CABG clients), diagnosis and length of stay. Demographic data was collected for the purpose of examining trends related to demographics. Collaboration with the medical center's resource management officer was required to determine the clients' hospital costs.

## Methods/Procedures

The researcher met with the nurse manager of the inpatient pediatric unit and obtained a list of RAD/asthma clients managed with clinical paths. A batch list of clients admitted with a diagnosis of pediatric RAD/asthma was then requested from the clinical records director. The researcher identified clients on the batch list that met the age and diagnosis inclusion requirements for the study. Names were compared to the list of pediatric RAD/asthma clients who were managed utilizing the clinical path and those charts were identified. A random selection table was not used due to the limited number of subjects. All identified RAD/asthma clients managed with a clinical path were listed. A list of needed charts was provided to the clinical records clerk. After the records clerk pulled the charts, the researcher reviewed the charts and collected the data. Charts were directly returned to the records clerk. The researcher then collaborated with the billing specialist in the resource management office to retrieve data regarding costs for each client in the sample. Clients were identified solely by registration number.

A similar process was used to collect the data for CABG clients. The researcher contacted the CABG clinical path project officer to identify the time frame CABG clients were managed with a clinical path. A chart review of clients managed prior to path implementation was completed. A chart review of all available clinical path managed CABG clients was also completed.

Data was collected on and managed with a spreadsheet. The four two-part research questions within this study follow:

1a. For traditional client management of RAD/asthma, what is the relationship between LOS and hospital cost?

1b. For traditional client management of CABG, what is the relationship between LOS and hospital cost?

2a. For clinical pathway client management of pediatric RAD/asthma, what is the relationship between LOS and hospital cost?

2b. For clinical pathway client management of CABG, what is the relationship between LOS and hospital cost?

3a. What is the difference between traditionally managed client length of stay and clinical path managed client length of stay for pediatric RAD/asthma clients?

3b. What is the difference between traditionally managed client length of stay and clinical path managed client length of stay for CABG clients?

4a. What is the difference between traditionally managed client hospital costs and clinical path managed client hospital costs for the pediatric RAD/asthma client?

**4b. What is the difference between traditionally managed client hospital costs and clinical path managed client hospital costs for the CABG client?**

To answer these questions, descriptive statistics were computed. To answer questions related to LOS for the pediatric RAD/asthma subjects, the variable was measured in terms of days. The day of admission was counted; the day of discharge was not counted. Two variables regarding LOS for CABG clients were examined. Total LOS was measured in days; again, the day of admission was counted and the day of discharge was not counted. The ICU length of stay was measured in terms of hours the client was cared for and observed the intensive care unit. To determine cost for pediatric RAD/asthma clients, the established diagnostic related group (DRG) cost per procedure was added to the cost per bed day. To determine cost for the CABG clients, the DRG cost was added to the cost per bed day plus the cost per hour of ICU care. Spearman Rank-Order correlation coefficients were used to answer research questions 1a, 1b, 2a, and 2b. Three Wilcoxon Rank-Sum tests were used to answer research questions 3a and 3b. Two Wilcoxon Rank-Sum tests were used to answer research question 4a and 4b. Level of significance was set at  $p = .05$ .

Summary

A descriptive correlational research design was utilized in a military medical center setting. The population consisted of active duty and retired military personnel and

their dependents. The study was conducted using random samples and convenience samples with a retrospective chart review. Client confidentiality was maintained. Data collection sheets developed by the researcher were used to gather and record data. The study commenced with collaborative meetings with the directors of inpatient records and the resource management office.

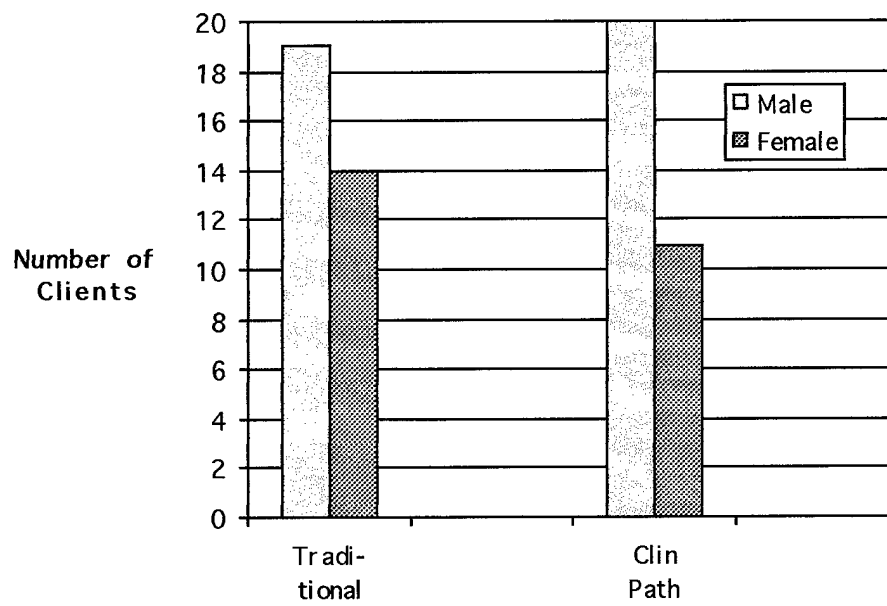
#### IV. ANALYSIS OF DATA

The data collected for this research were obtained through a retrospective chart review from charts of 56 inpatients who had a CABG and 64 pediatric inpatients who had RAD/asthma. Spearman Rank-Order correlation coefficients were used to examine the relationship between length of stay and hospital costs for clients managed traditionally and with clinical paths. Wilcoxon Rank-Sum tests were used to examine the differences in length of stay between traditionally managed clients and clients managed with clinical paths.

Demographic data collected included age, gender, status, and rank. Demographic characteristics were selected to ascertain if any conclusions could be drawn relating age, gender, status or rank to the success or failure of clinical path or traditional management methods.

##### Analysis of the RAD/Asthma Data

The sample of RAD/asthma clients included 39 males, 60.9 percent of the sample, and 25 females, 39.1 percent of the sample. Figure 3 illustrates the similarity between the traditionally managed and clinical path managed samples. The age range was 7 months to 17 years. The mean age was 7 years with a standard deviation of 4.4 years. Traditionally managed clients had a mean age of 7.62 years compared with 6.33 as the mean age of clinical path managed clients (Figure 3).



**Figure 3.** Gender comparison between traditional and clinical path samples.



Grades in the military range from enlisted through officer. The enlisted grades are labeled E-1, E-2, E-3, E-4, E-5, E-6, E-7, E-8, and E-9 as the highest enlisted grade. The 'rank', or title used to address each grade vary with each branch of the service. The officer ranks are labeled O-1, O-2, O-3, O-4, O-5, O-6, O-7, O-8, O-9, O-10 and O-11 as the highest officer grade. Likewise, the 'rank', or title used to address each officer grade varies with the branch of the service. Historically, ranks could be used as a general gauge to assess the level of education attained by a military member. The assumption that officers have college degrees and enlisted members do not is no longer a valid assumption; many senior enlisted members have graduate degrees. Rank is a general gauge to assess economic status, based on published pay scales. Sponsors ranks were E-7 or below for 57.9 percent of the pediatric RAD/asthma sample and E-8 or above for 42.1 percent of the pediatric RAD/asthma sample. The groups were well matched on sponsor rank as a measure of socioeconomic status. Figure 4 illustrates the rank dispersion between the two samples.

Spearman correlation coefficients were used to assess the correlation between cost and LOS for both traditional and clinical pathway management. Wilcoxon Rank-Sum tests were used to examine the differences between traditional and clinical path management.

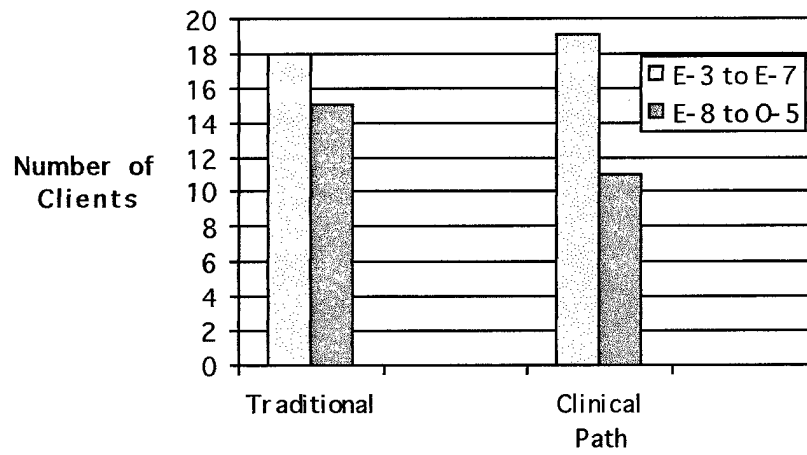


Figure 4. Comparison of rank between traditional and clinical path samples.

Research question 1a. **For traditional client management of RAD/asthma, what is the relationship between LOS and hospital cost?** There is a strong positive correlation ( $\rho=1.00000$ ,  $p=0.0001$ ) between the variables. Cost is significantly correlated with length of stay among traditionally managed pediatric asthma clients ( $\rho=1.00000$ ,  $p=0.0001$ ).

Research question 2a. **For clinical pathway client management of pediatric RAD/asthma, what is the relationship between LOS and hospital cost?** There is a strong positive correlation between the variables. Cost is significantly correlated with length of stay among clinical path managed pediatric asthma clients ( $\rho=1.00000$ ,  $p=0.0001$ ). Refer to Figure 5.

Research question 3a. **What is the difference between traditionally managed client length of stay and clinical path managed client length of stay for pediatric RAD/asthma clients?** Traditionally managed RAD/asthma clients had a mean LOS of 2.70 days with a standard deviation of 1.79 days. Clinical path managed RAD/asthma clients had a mean LOS of 1.87 days with a standard deviation of 1.26 days. The change amounted to a decrease of 0.82 days. A significant difference exists between the management types ( $Z=-2.30$ ,  $p=0.0215$ ) in asthma clients. Length of stay for traditionally managed asthma clients is significantly longer than the length of stay for clinical path managed asthma clients (Figure 6).

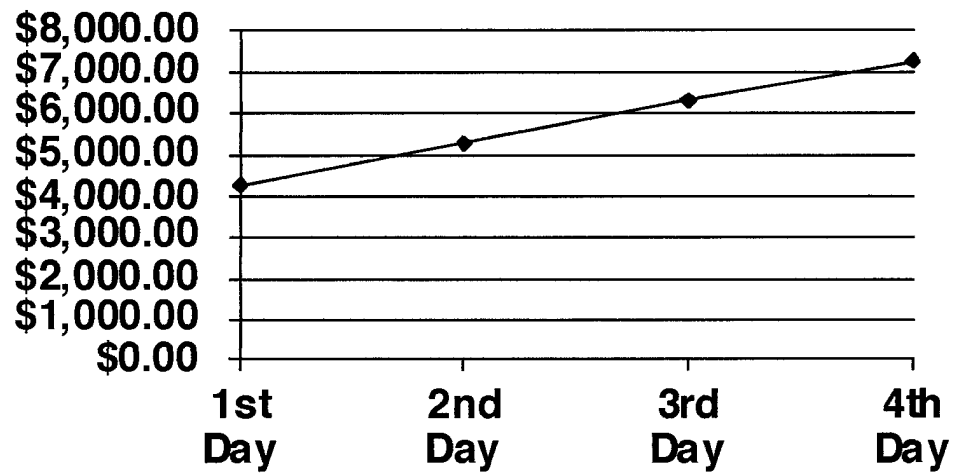


Figure 5. Regression line indicating the correlation between cost and length of stay for pediatric RAD/asthma clients ( $\rho=1.00$ ,  $p=0.001$ ).

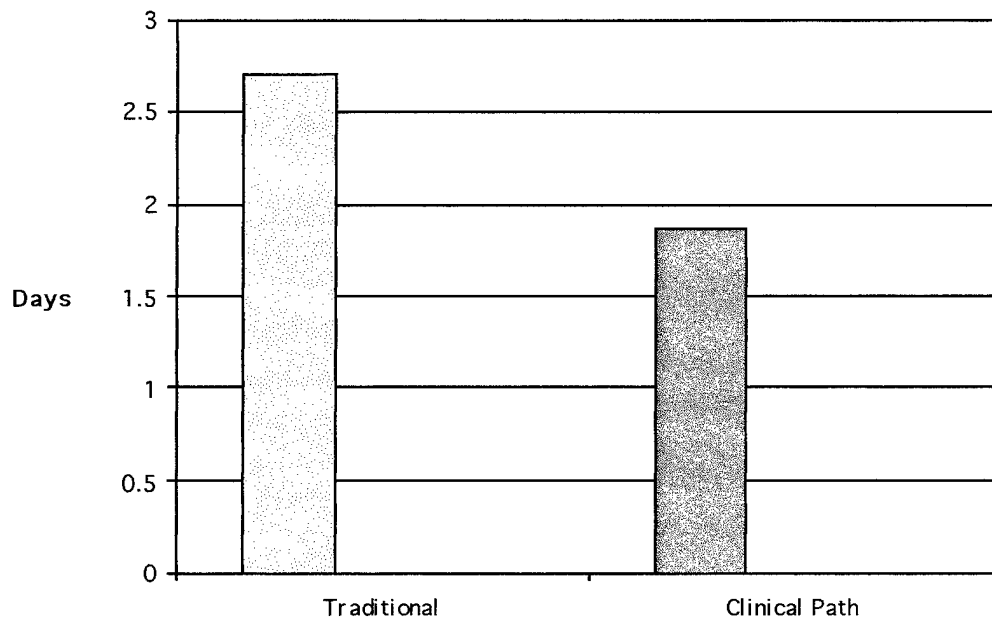


Figure 6. Comparison of mean length of stay for the traditional and clinical path pediatric RAD/asthma sample ( $z=-2.30$ ,  $p=0.0215$ ).

Research question 4a. **What is the difference between traditionally managed client hospital costs and clinical path managed client hospital costs for the pediatric RAD/asthma client?** The mean cost per client for the pediatric RAD/asthma sample was \$5564.03 with a standard deviation of \$1618.08. Costs ranged from \$9308.07 to \$4252.82. Traditionally managed RAD/asthma clients had a mean cost per client of \$5968.54 with a standard deviation of \$1813.65. Clinical path managed RAD/asthma had a mean cost of \$5133.41 with a standard deviation of \$1271.99. There was a decrease in cost of \$835.00 for each client managed with a clinical path. A significant difference in cost exists between traditionally managed and clinical path managed RAD/asthma clients ( $z=-2.30$ ,  $p=0.0215$ ). Cost for traditionally managed asthma clients is significantly higher than the cost for clinical path managed RAD/asthma clients (Figure 7). Table 1 also illustrates differences in cost between traditional and clinical path management.

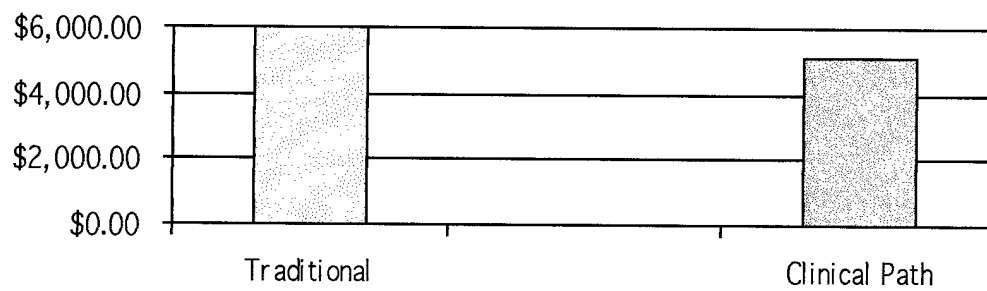


Figure 7. A comparison between the traditionally managed mean hospital cost and clinical path managed mean hospital cost for pediatric RAD/Asthma clients.

Table 1.

Differences in LOS & Cost Between Traditional & Clinical Path  
RAD/Asthma Management

<b>Asthma</b>	<b>Sample Size</b>	<b>Mean LOS Days</b>	<b>Mean Cost per Client</b>
Traditional			
Management	33	2.69	\$5968.41
Clinical Path			
Management	31	1.87	\$5133.41
Change		.82	\$ 835.00
		z=-2.30 p=0.0215	z=-2.30 p=0.0215

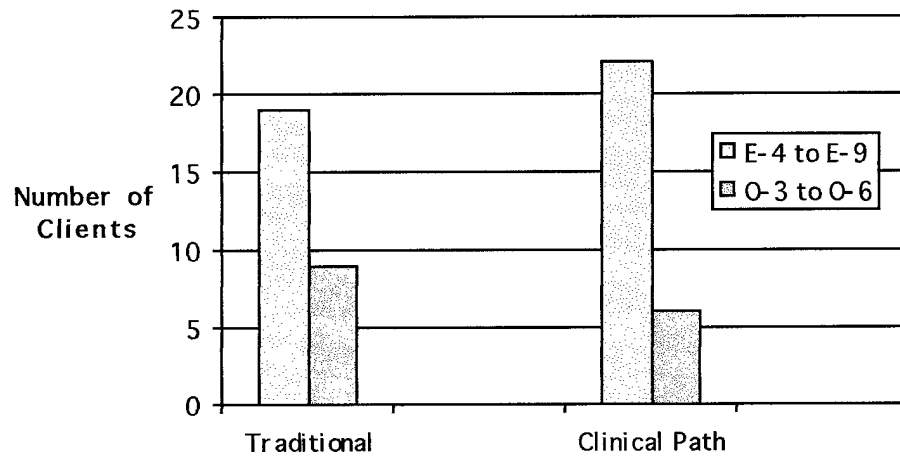


### Analysis of the CABG Data

The sample of CABG clients included 56 clients undergoing a CABG procedure. The sample included 51 males and 5 females. Active duty members comprised 9.2 percent of the sample; the majority were retired. Ranks of the clients or their sponsors were E-9 and below for 73.2 percent of the sample and O-1 through O-6 for 26.8 percent of the sample. This is not an unusual dispersion given the fact that there are generally more enlisted personnel than officers assigned to a base (Figure 8). Married clients comprised 89.3 percent of the sample where 5.4 percent were widowed, 3.6 percent were single, and 1.8 percent were divorced.

The mean age of traditionally managed CABG clients was 61.96 years with a standard deviation of 10.34 years. The mean age of clinical path managed CABG clients was 61.39 years with a standard deviation of 9.56 years. The groups were well matched with no significant differences in demographics between the two groups (Figure 9).

Research question 1b. **For traditional client management of CABG, what is the relationship between LOS and hospital cost?** Cost is significantly correlated with both the total length of stay ( $\rho=0.83662$ ,  $p=0.0001$ ) and the ICU length of stay ( $\rho=0.73471$ ,  $p=0.0001$ ) among traditionally managed CABG clients. Both correlation coefficients indicate strong positive correlation (Figure 10).



**Figure 8.** Comparison of rank dispersion between traditionally managed CABG clients and clinical path managed CABG clients.



Figure 9. Comparison of mean age between traditionally managed CABG clients and clinical path managed CABG clients.

**Scatterplot of Cost and Length of Stay in CABG Patients  
Management=Traditional**

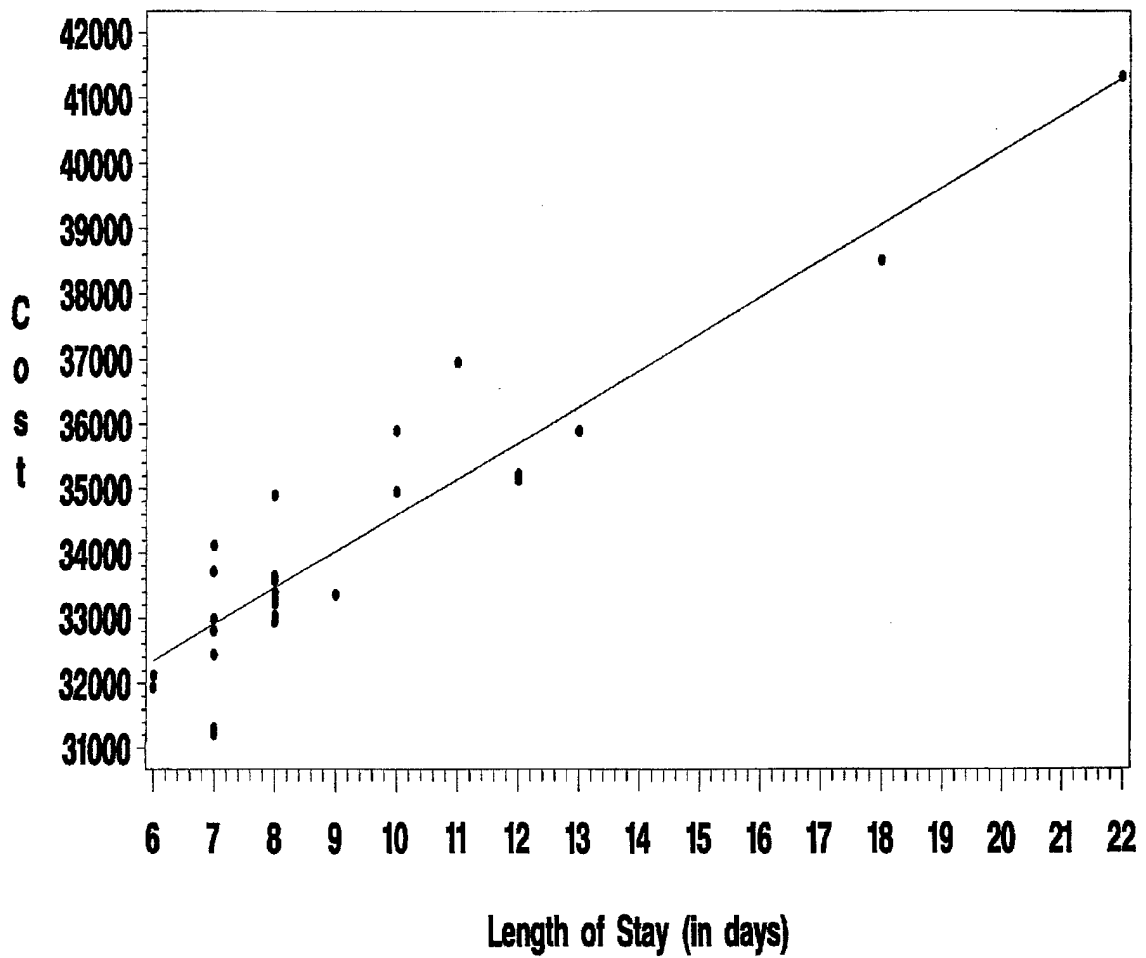


Figure 10. Correlation between cost and total LOS for traditionally managed CABG clients.

Research question 2b. **For clinical pathway client management of CABG, what is the relationship between LOS and hospital cost?** Cost is significantly correlated with both the total length of stay ( $\rho=0.92606$ ,  $p=0.0001$ ) and the ICU length of stay ( $\rho=0.52136$ ,  $p=0.0044$ ) among clinical path managed CABG clients. The correlation between cost and total length of stay is positive and moderately strong (Figure 10). The correlation between cost and ICU length of stay is positive and very strong; however, one client had an ICU length of stay of 137 hours. This client appears to be an outlier and suggests the need to re-compute the statistics with this client removed from the data. However, the 137 hour data point lies very close to the regression line correlating cost with ICU length of stay in hours for CABG clients. Recomputing the statistics indicated the outlier did influence the mean length of stay. Originally, the mean ICU length of stay was 34.5 hours for clients managed with the clinical path. Re-computing the mean reveals a mean ICU length of stay of 30.70 hours with the outlier removed. The outlier is discussed further in chapter five.

Research question 3b. **What is the difference between traditionally managed client length of stay and clinical path managed client length of stay for**

**Scatterplot of Cost and ICU Length of Stay in CABG Patients**  
**Management=Clinical Path**

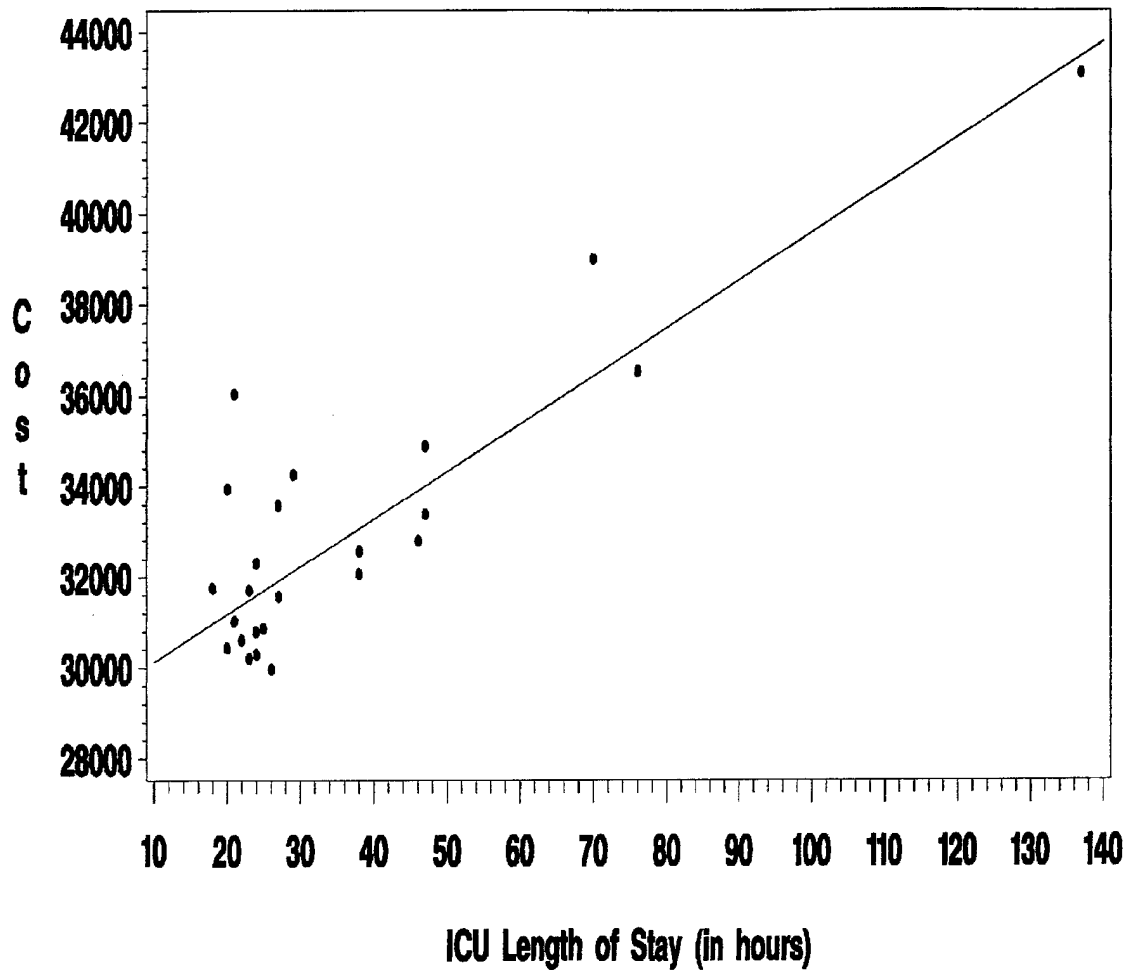


Figure 11. Correlation between cost and ICU LOS for clinical path managed CABG clients.

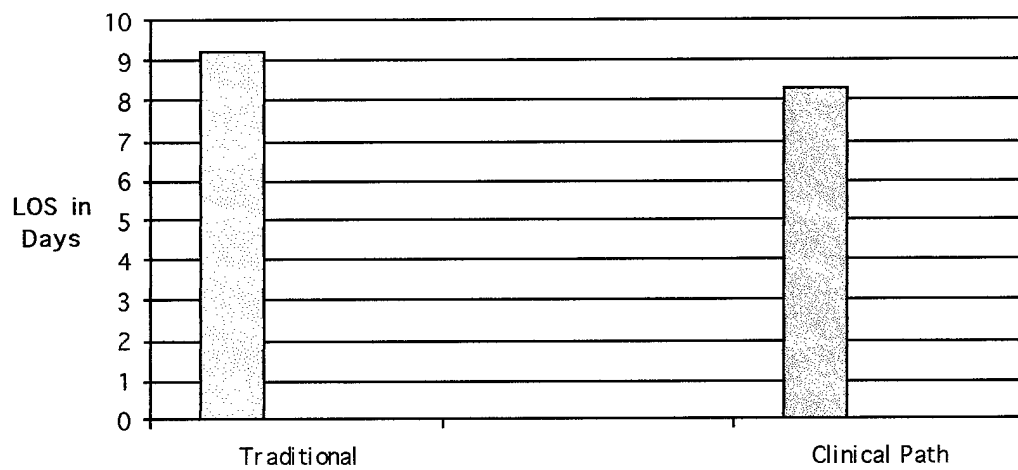
**CABG clients?** The mean total LOS for all CABG clients was 8.75 days with a standard deviation of 3.57 days.

Traditionally managed CABG clients had a mean total LOS of 9.21 days with a standard deviation of 3.57 days. Clinical path managed CABG clients had a total mean LOS of 8.29 days with a standard deviation of 3.57 days (Figure 12).

No statistically significant difference existed in total length of stay between traditionally managed and clinical path managed CABG clients ( $Z=1.76$ ,  $p=0.0776$ ). Recomputation of the statistics with the outlier removed resulted in a reduction in the mean total LOS from 8.28 days to 8.03 days indicating there is a statistically significant difference in total LOS between traditionally managed and clinical path managed CABG clients.

The entire CABG sample had a mean ICU LOS of 42.02 hours per client with a standard deviation of 20.89 hours. The mean ICU LOS for traditionally managed CABG clients was 49.54 hours with a standard deviation of 12.55 hours. The mean ICU LOS for clinical path managed CABG clients was 34.5 hours with a standard deviation of 24.78 hours (Figure 13).

Recomputation of the statistics with the outlier removed resulted in a reduction in mean ICU LOS from 34.50 hours per client to 30.70 hours.



**Figure 12.** Representation of mean total length of stay for CABG clients measured in days for the traditional sample, and clinical path sample.



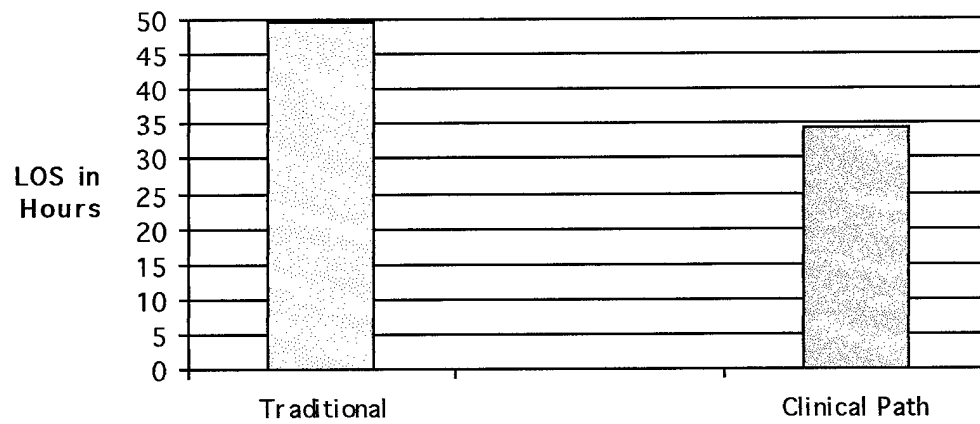


Figure 13. Representation of mean ICU length of stay for CABG clients measured in hours for the traditional sample and clinical path sample.

A statistically significant difference does exist in ICU length of stay between traditionally managed and clinical path managed CABG clients ( $Z=3.99$ ,  $p=0.0001$ ). Traditionally managed CABG clients have significantly longer ICU lengths of stay than clinical path managed CABG clients.

Research question 4b. **What is the difference between traditionally managed client hospital costs and clinical path managed client hospital costs for the CABG client?** The mean cost for CABG clients was \$33,430.50 per client with a standard deviation of \$2704.85. The mean cost for traditionally managed CABG clients was \$34,150.72 per client with a standard deviation of \$2170.37. The mean cost for clinical path managed CABG clients was \$32,710.29 with a standard deviation of \$3019.44 (Figure 14).

There is a significant difference in cost between traditionally managed and clinical path managed CABG clients ( $Z=2.94$ ,  $p=0.0033$ ). Traditionally managed CABG clients have significantly higher costs than clinical path managed CABG clients (see Table 2). Recomputation of the statistics with the outlier removed results in an increased savings of \$1,825.25 per client, a reduction in the mean total LOS from 8.28 days to 8.03 days, and a reduction in mean ICU LOS from 34.50 hours to 30.70 hours.

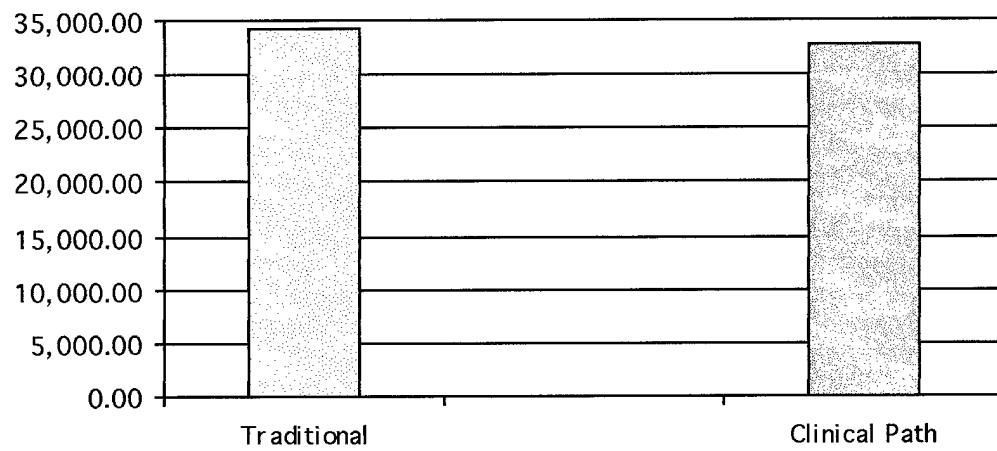


Figure 14. A comparison of traditional sample, and clinical path sample mean cost in dollars for CABG treatment.

Table 2.

Differences in LOS & Cost Between Traditional and Clinical  
Path Managed CABG Clients

CABG	Sample Size	Mean ICU LOS Hours	Mean LOS Days	Mean Cost per Client
Traditional				
Management	28	49.54	9.21	\$34,150.72
Clinical Path				
Management	28	34.50	8.28	\$32,710.29
Change		15.04	.93	\$1440.43
		z=3.99 p=0.0001	z=1.76 p=0.0776	z=2.94 p=0.0033

## Summary

A retrospective chart review was completed on 120 clients. The samples consisted of 64 pediatric inpatients who were diagnosed with RAD/asthma, and 56 clients who had a CABG. The relationship between length of stay and hospital costs were examined. Differences between traditional management and clinical path management were also studied in relation to LOS and costs. A significant difference in LOS and cost exists between management types for RAD/asthma. A significant difference in total LOS exists between management types for CABG and there is a significant difference in ICU LOS and costs for CABG clients. The following chapter includes discussion of conclusions, implications, and recommendations related to the research findings.

## V. DISCUSSION

Costs of healthcare are increasing at alarming rates. Clinical paths claim the benefit of decreasing LOS and costs of healthcare while simultaneously improving quality and controlling variance. Leadership in business has changed as economies have transformed throughout history. Leadership within the healthcare sector is lagging behind leadership in the business sector. The use of clinical paths correspond with advances made in the business sector. Clinical paths are widely studied and used in the civilian healthcare sector. This research studied effects of clinical paths in a Department of Defense healthcare setting.

### Decreased Costs

A reduction of costs when clinical paths were used in lieu of traditional management for pediatric RAD/asthma clients was revealed by this research. Specifically there was an \$835.00 reduction per client managed with a pediatric RAD/asthma clinical pathway, and an \$1825.25 reduction per client managed with a CABG pathway. These results are congruent with research in civilian facilities in which a reduction of cost was noted when clinical paths were used (Clark, Steinbinder, & Anderson, 1994, Cohen, 1991, and Rudisill, Phillips, & Payne, 1994).

The difference in mean cost between traditionally managed RAD/asthma clients and clinical path managed RAD/asthma clients, multiplied by the number of RAD/asthma clients admitted per year can result in substantial financial savings for the medical facility. The savings could be invested in RAD/asthma health maintenance and education programs or designated for the purchase and maintenance of nebulizers for home use. Developing, fostering and improving self maintenance programs can potentially further reduce costs by decreasing the need for inpatient management of RAD/asthma exacerbation episodes.

Demonstrated fiscal advantages of CABG clinical paths in the study setting are congruent with results of studies in two civilian settings (Barnes, Lawton, & Briggs, 1994 and Rudisill, Phillips, & Payne, 1994). The cost reduction of \$1,825.25 draws attention to the financial benefits of clinical path management. The difference may increase even more if paths are used throughout the clients' hospital course. Increasing the collaboration and including medical ward nurses in the development and implementation of the path would likely heighten the financial savings. The cost reduction associated with CABG clinical paths in this study could be reinvested in the cardiac rehabilitation program. Allocating financial savings made by a particular department back into that department may motivate continued improvements within the department and in turn, benefit the facility.

### Decreased Length of Stay

Mean length of stay in this study was reduced by 0.82 days and 1.18 days respectively for pediatric RAD/asthma clients and CABG clients. Mean ICU length of stay in hours was reduced by 18.84 hours. Reducing length of stay has several nursing implications. The shorter LOS may be attributed to increased collaboration between clients, family members, nurses, physicians, respiratory therapy technicians, and other members of the healthcare team. Collaborative development of the path promotes open communication between healthcare team members, enhancing understanding and coordination of various interactions and aspects of care. Discussion of the path with parents and/or clients likewise enhances open communication. Reduced LOS may enhance well-being and a sense of independence for clients. Proactive interventions of healthcare team members can further enhance well being and independence through client and family member education, training and support efforts.

Reduction of iatrogenic complications and nosocomial infections is another nursing implication associated with the utilization of clinical paths. Reduction of exposure to a hospital environment by decreasing LOS will curtail the clients exposure to iatrogenic complications and decrease risk of acquiring nosocomial infections.

### Cost Correlation

Initially, the positive correlation between cost and LOS may seem obvious, but it is not necessarily a logical



conclusion. It is possible that shorter LOS may have a proportionately higher cost. Consider the following scenario. A client managed with a clinical path may have multiple consults (i.e., physical therapy, respiratory therapy, dietary counseling) early in their course of care. These consults may be initiated in attempt to identify problems early in an episode of care and to prevent delays in discharge related to problem identification later in the episode of care. Clients may be discharged more rapidly with clinical path management, but have a higher cost per day ratio secondary to costs of early multidisciplinary interventions.

Potential skewing of cost information within this study results from the tool (MEPRS form) used to compute costs associated with designated cost centers. MEPRS forms are time sheets filled out by the hospital's employees. The time sheets have codes identifying individual cost centers. Diverse areas such as war readiness, administrative time, infection control, quality assurance, training and education, clinical care, and committee work may all be included on the form. The cost per bed day is computed by dividing the number of client bed days by the costs tabulated through the MEPRS system. The quotient is identified as the marginal cost of one additional bed day (Peterson, Sergeant, personal communication March, 1997).

A second factor attributing to the strong positive correlation is the method utilized for costing in the study

facility. Individual client costs are not tracked and billed. Cost analysis is performed by obtaining the DRG allotment, \$3241.77 in the pediatric RAD/asthma case, and adding the marginal cost per bed day, \$1011.05, for each day the client is an inpatient.

Review of LOS and cost correlation data indicates there is a positive correlation between LOS and cost. The cost was \$3241.77 plus \$1011.05 per day for each RAD/asthma client, whether managed with a clinical path or traditionally. The cost differences between traditionally and clinical path managed clients was a function of length of stay. Segmentation of the RAD/asthma population may explain the similarity of cost between the two groups. Children treated as inpatients in the study facility are transferred to a civilian institution if their condition becomes critical and they require critical care or ventilatory support with it's associated higher costs. This segmentation increases the homogeneity within the study groups and may cloud measurements of differences in cost for an entire episode of care.

Cost data for CABG clients indicates cost is significantly correlated with both total length of stay and ICU length of stay. The correlation between cost and total LOS is positive and moderately strong (Figure 10). The correlation between cost and ICU LOS is positive and very strong (Figure 11). Examination of the clinical path sample revealed one client identified as an outlier with an ICU LOS

of 137 hours. This client had a co-morbidity of chronic obstructive pulmonary disease, extending his ICU length of stay due to the prolonged ventilator weaning process. The 137 hour prolonged LOS data point increased the mean ICU length of stay, but remained close to the linear regression line indicating alignment with the correlational analysis. The mean ICU LOS without the outlier was 30.70 hours, a decrease of 3.8 hours.

The positive strong correlation between cost and LOS in ICU suggests that decreasing LOS in ICU would lead to a significant reduction in costs. An ICU bed day costs \$2134.96. A ward bed day costs \$501.76. The nearly three-fold cost increase highlights a potential area to focus improvement processes and efforts.

There was also a significant positive correlation with both total LOS and ICU LOS for clinical path managed clients. The cost for a traditionally managed CABG client was \$34,150.72 compared with \$32,710.29 for a clinical path managed client (Figure 14). A projected savings of \$1,440.43 per client can be assumed for CABG clients managed with clinical paths in the study facility.

### Leadership

Clinical paths focus leadership in a manner that benefits clients and healthcare team members. The Path-Goal theory provides structure while it clarifies and communicates goals. Drawing on the conceptual framework, the clinical path serves as a tool to initiate structure for the often

ambiguous path toward recovery. Since client management is complex, and involves multiple disciplines, leadership is needed to help identify the goal and keep the pathway to the goal clear and unambiguous. Clinical paths are defined tools that leaders may implement to keep providers on the path toward a predetermined outcome. Reduction of ambiguity enhances client and healthcare team member motivation. The clinical path also guides consideration behavior of staff members to support parents and clients with repetitious requirements for recovery. Supportive actions by staff members encourage or motivate participation in required repetitious tasks leading to recovery. Enhanced client and healthcare team member motivation lead to a more rapid return to health, earlier discharge, and by correlation, decreased healthcare costs.

Given the potential for financial savings, why are some physicians and healthcare facilities hesitant to use clinical paths? Recall the historical leadership practices mentioned in Chapter Two. There may be reluctance to use clinical paths secondary to the belief professional practice is controlled by the path. On the contrary, the path and associated leadership provides a means to decrease the variability of care, while leaving control and judgment with the provider. A clinical path written collaboratively, serves as a tool. The path guides the client and healthcare team members through the often confusing maze of tests, procedures, therapies, nutritional restrictions, rehabilitation steps, education

milestones, and discharge plans that are part of a hospitalization episode. Path-Goal theory identifies the task or treatment and clarifies the role of the leader. The clinical path provides structure and clarifies and communicates goals. The leader's actions can then impact the process facilitating the healthcare team member and/or client work through the process and complete the task, leading to an improved outcome with rapid return to health, early discharge, and decreased healthcare costs.

A road-map with a highlighted pre-planned route does not lock a driver into the specific highlighted route on the map. If drivers face some obstacle such as a traffic jam, road block, or construction, drivers can use their judgment to circumnavigate the problem, and later get back on the highlighted route to reach their planned destination. Similarly, the clinical path serves as a map. Applying the Path-Goal theory, leadership associated with the clinical path guides healthcare team members and clients for complicated or ambiguous tasks and for repetitive, monotonous tasks. If complications arise, such as poor arterial blood gas values in a CABG client, delayed extubation may be a detour on the map. There are certainly going to be instances when clients have medical, developmental, or social setbacks that delay their progress on the clinical path. The clinical judgment, expertise and leadership of healthcare providers is essential in removing a client from a "planned route" on the path if variances in the client's condition warrant an

alternative plan of care. Professional medical practice is in no way "controlled" by a clinical path. Rather, it is enhanced; the clinical path guides healthcare team members through complicated diagnoses and procedures to ensure the appropriate process is implemented and the desired outcome is reached. The clinical path is a leadership tool; it's development opens doors to communication and stimulates collaborative practice. Developed collaboratively, clinical paths have the potential to decrease variance, improve quality, decrease length of stay, and decrease healthcare costs. The path is in no way a substitute or controller of professional medical practice or professional nursing practice. Rather the path is a leadership tool facilitating improved processes and outcomes.

Other reasons for opposition to clinical paths refer to the litigious tendency of the population. Some physicians have verbalized fear of litigation if a client varies from the predicted path. Physicians may fear accusation of failing to follow standard of care if their clients deviate from the path. In reality, following a collaboratively developed clinical path is a measure of assurance that standard of care is more likely being followed. Variances will occur. When clinical paths are appropriately utilized, the variances that cause a client to come off the path will be documented and once the problem is resolved, the client can be placed back on the path.

Meanwhile, the variances serve a very useful purpose. Managed appropriately, variance data can be extremely beneficial in improving the quality of care, and enhancing clinical pathways. In effect, clinical pathways follow the PDSA (plan, do, study, act) cycle well known in quality management. The 'plan' phase is the collaborative process in which the clinical path is developed or tailored if adopted from another source. The 'do' phase involves the implementation of the pathway. The 'study' phase includes evaluation of progress and variances. The 'act' phase incorporates therapies or actions to reduce or eliminate the variance, and then cycles back to the collaborative planning phase. The path is not stagnant, but rather a fluid tool with the potential for facilitating continuous improvement. Clinical paths will not prove beneficial unless they are accompanied by and implemented with professional practice.

#### Implications for Healthcare Team Members

Results of this study indicate advantages for pursuing collaborative development and implementation of clinical paths. Contrasts were clear in comparisons of the pediatric RAD/asthma path and the CABG path. The pediatric clinical path was developed collaboratively and evidence existed of continuous improvements. A second generation of the path was developed to include variance tracking measures. The CABG path, in contrast, was not developed collaboratively. It was imported from another facility and was no longer in use by March, 1997.

As the development of clinical paths are pursued, variance assessment measures should be considered. The mean LOS was higher for traditionally managed CABG clients, but the mean LOS for clinical path managed clients had a wider standard deviation, hence, there was more variation with the clinical path. Perhaps more variation occurred because there was less "groupthink" which may be prevalent with traditional forms of management. Groupthink phenomena may occur when group members strive for group harmony in deference to making carefully reasoned decisions (Shortell & Kaluzny, 1994). A more subtle form of groupthink may be seen following traditional methods of task accomplishment rather than testing limits and exploring new methods. The wide standard deviation associated with the clinical path may be related to the fact that multidisciplinary groups are less likely to succumb to groupthink, than are groups whose members are more homogeneous.

The wide standard deviation in LOS for clinical path managed CABG clients prompts the question, 'Is variance good?' Certainly in business, there is an attempt to decrease variance in order to improve quality and productivity. Healthcare leaders should look beyond strict parameters of variance. Even though clinical path management has wider variation, the mean costs are significantly lower than with traditional management. Systems can appear in statistical control, and still be producing a poor quality service or product. Other systems may appear out of statistical control



because of wider variation, but still be closer to the product or service goal.

A vital question to keep in the forefront during clinical path development is, 'What is the goal?' Clinical paths should not be developed to get a client discharged in an arbitrary number of days. Rather, clinical paths should be developed to promote the best quality care available, given the constraints of the healthcare facility. Constraints, resources, key assets and skills will vary between facilities, and within facilities over time. This is why it is important for clinical paths to be developed collaboratively and continuously evaluated and improved. A clinical path brought into a facility from an outside source and implemented without collaboration has a higher probability of failing than a clinical path developed collaboratively within the facility where the path will be implemented. The course of the CABG path in the study reinforces this notion. Only the healthcare team members within a facility know their own strengths, weaknesses, constraints, opportunities, and threats. Interdisciplinary communication with combined knowledge and understanding of systems are much more likely to develop clinical paths that are capable of guiding the provision of quality care while judiciously decreasing LOS and improving the cost effectiveness of care.

As collaborative development and implementation of clinical paths are pursued, the focus should be on diagnoses

with potential for the best impact. High cost DRGs and high volume DRGs are two categories with the highest payback potential for the resources used in path development.

Beyond financial benefits, clinical paths may play an additional role particularly well suited to a military environment. Part of the uniqueness of the military environment includes frequent or prolonged separations between family members. When the primary breadwinner is deployed or assigned to a distant geographic area, the remaining custodial parent assumes increased stress and responsibilities. Clinical paths can help improve and structure communication and an understanding of health care plans for family members admitted to the hospital. Hospitalizations can be stressful for any family; that stress is exacerbated when a spouse is absent during an illness. Clarity and consistency of communication is especially important during times of increased stress. The clinical path is a simple tool capable of facilitating the needed clarity and consistency of communication. The added clinical path benefit of a more rapid return to health and home can also help decrease the stress of parents trying to manage a household when a spouse is absent because of military duties.

Clinical paths may also fulfill a vital role in military medical treatment facilities located in remote areas or war and conflict zones. In battle zones, human resources may be stretched very thin. Structured clinical paths developed for expected battle zone injuries or illnesses may provide the

leadership structure necessary to guide care and progress toward the goal while minimizing time required by healthcare team members to plan and document care.

### Limitations

This study was an initial attempt to explore the effects of clinical path utilization in a military healthcare setting. Limitations in this study included the restricted number of charts that were available for review. Since clinical paths are a relatively new phenomenon at the facility in which the study was conducted, the number of charts available was limited, preventing stratified random sampling.

Other limitations include the lack of standardization regarding the implementation of clinical paths. High staff turnover affect standard implementation. The study facility includes a physician residency program. Hence, there is a high yearly turnover rate among the residents. The remainder of the healthcare team members turn over at a rate of approximately one third per year. The high turnover rate is inherent within most military healthcare facilities since the normal rotation and reassignment occurs approximately every three years. Turnover occurs within civilian settings too as physicians and medical students rotate. The turnover in the military system however, is more pervasive since it includes all support functions in addition to physicians and medical students. An estimated one third of the entire medical treatment facility's personnel cadre rotate each year. The

turnover rate is even higher in isolated overseas locations where personnel rotate every 12 to 24 months. The high turnover rate can have a negative impact on continuity unless communication and collaboration are priority issues, supported by the healthcare facility's leadership.

The CABG data from this study should be considered understanding the limitations of this sample. The facility in which the study was conducted was in the process of developing new clinical paths. The collaboration in the development of the imported CABG path studied was primarily limited to two physicians and one nurse. The nurse involved was an advocate of the path and routinely briefed fellow ICU staff members on documentation and utilization of the clinical path.

The CABG path was initiated in the cardiology clinic when pre-operative teaching was started with the client. The path was utilized while the client was in ICU, but then placed in the back of the client's chart and no longer utilized once the client was transferred out of ICU. This practice may account for the fact that there was not a statistically significant difference ( $Z=1.76$ ,  $p=0.0776$ ) in total LOS between traditionally and clinical path managed clients in the inclusive sample. Excluding the outlier resulted in a significant difference ( $z=-2.02$ ,  $p=0.0435$ ) in total length of stay between traditionally and clinical path managed CABG clients.

Another limitation was the inability to account for changes in practice that occurred as senior cardiologists rotated. The decrease in LOS for CABG clients may be related to differing cardiac surgeons with various approaches to client management. There was no control mechanism for differing surgeons in this study.

This initial study provides a baseline for future clinical path studies, despite the limitations discussed.

#### Recommendations

Assessing the two clinical paths use in this study, the pediatric RAD/asthma clinic path is further along in development and implementation than the CABG clinical path. Recommendations for the RAD/asthma clinical path are to continue with its use and to examine the possibility of developing specialized paths for various segments of the population. Focus on RAD/asthma management of outpatients, adolescents, or steroid dependent clients, for example, may further decrease variance in care, improve quality of client education and enhance client functional status. Further studies in the pediatric RAD/asthma population with tailored paths may amplify the value of clinical paths.

Provider commitment to support and value clinical paths remains a problem particularly during the initial development of clinical paths. Further research looking beyond LOS and hospital costs may provide convincing evidence of clinical path value. Subsequent studies should include assessments of client functional status before and after CABG procedures for

clients managed traditionally and with clinical paths. Comparisons of functional improvement and length of time required to regain functional status would be useful to evaluate clinical path value. Mortality rates may also provide stronger influences regarding the decision to support clinical paths. Controlling for provider rotations with associated changes in practice is important for future studies. The strength of future studies may also be enhanced by ensuring the data collection is performed in a facility designated with a Specialized Treatment Service (STS) in the area studied. Utilizing an STS would also increase the sample size and improve the opportunity to obtain a stratified random sample.

Development of sub-specialized clinical paths, or elimination of clinical path use for clients with multiple or severe co-morbidities should be considered. Notably, removing the outlier resulted in a statistically significant difference in total LOS between traditionally managed and clinical path managed CABG clients ( $z=-2.02$ ,  $p=0.0435$ ). These statistics in combination with the Wilcoxon Rank-Sum test results indicate that traditionally managed CABG clients have significantly longer total lengths of stay than clinical path managed CABG clients.

The remarkable difference in ICU LOS and moderate difference in total LOS when this particular outlier is removed may indicate a better 'fit' between homogeneous clients and clinical paths than between clients with multiple

or significant co-morbid diseases and clinical paths. Clinical paths are most effective with a homogenous clientele set. Clients with severe or multiple co-morbidities may skew study results. The clinical path managed CABG client with the 137 hour ICU LOS had a respiratory co-morbidity. The client's chronic obstructive pulmonary lung disease prevented weaning from the ventilator within the expected time frame. This single client's increased LOS was significant enough to change study results from statistical insignificance to statistical significance when the outlying data point was removed. This indicates that clinical paths succeed and are beneficial with homogenous groups.

#### Conclusion

The cost of healthcare in the United States of America is at a crisis level. Technology for the diagnosis and treatment of diseases has become so sophisticated that it has stripped society's ability to pay for it (Healthy People 2000, 1992). Healthcare providers must learn to practice their science and art with financial constraints not dreamed of 20 years ago. The Path-Goal Theory provides a framework for leading the development of clinical paths. The process of development and utilization of pathways stimulates collaborative practice and improves interdisciplinary communication. Clients enter healthcare facilities as a whole person, but they are routed through complex medical facilities system by system. Clients do not have a clear understanding of how one department affects another or how

all the departments come together to provide uniform service. Lamentably, healthcare team members are also at a loss to explain or understand how various departments and disciplines interact to provide uniform service to the whole person.

Clinical pathways can help solve some of our healthcare system's problems. This study demonstrates the reduction in cost when clinical paths are used for two separate diagnostic sample groups. Reduced length of stay was evident for pediatric RAD/asthma clients and ICU LOS was reduced for CABG clients. Total LOS was reduced for CABG clients once the outlier was removed. Clinical paths open communication between interdisciplinary healthcare providers. Skillfully employed, the paths can also serve to educate and clarify how various departments within a healthcare facility work for the common goal of efficiently returning customers to health.



Appendix A

Wright State University-Miami Valley

College of Nursing and Health

**AGENCY PERMISSION FOR CONDUCTING STUDY**

THE Wright Patterson Air Force Base Medical Center

GRANTS TO Vennessa J. Hagan

a student enrolled in a program of nursing leading to a Master's degree at Wright State University, the privilege of using its facilities in order to study the following problem: Relationship Between Clinical Pathway Utilization, Length of Stay and Health Care Costs

The conditions mutually agreed upon are as follows:

1. The agency (may) (may not) be identified in the final report.
2. The names of consultative or administrative personnel in the agency (may) (may not) be identified in the final report.
3. The agency (wants) (does not want) a conference with the student when the report is completed.
4. Other: We will need progress reports yearly + final report when completed

Date: 1-15-97

Vennessa J. Hagan  
Vennessa J. Hagan

Thomas Koroscil  
Dr. Thomas Koroscil  
Director, Clinical Investigations

Donna Miles Curry  
Dr. Donna Miles-Curry Director

## **Appendix B**

### **IRB Forms**



**Wright State  
University**

Research and  
Sponsored Programs  
3640 Colonel Glenn Hwy.  
Dayton, OH 45435-0001  
(937) 775-2425  
FAX (937) 775-3781

e-mail: rsp@wright.edu

**DATE:** February 27, 1997

**TO:** Vennessa J. Hagan, P.I., Student  
Donna Miles-Curry, Ph.D., Faculty Advisor  
College Of Nursing & Health

**FROM:** Robyn Simmons, Sponsored Programs Assistant  
Secretary, WSU Institutional Review Board

**SUBJECT:** SC# 1815

*Relationship Between Clinical Pathway Utilization, Length Of  
Stay And Healthcare Costs*

This memo is to verify the receipt and acceptance of your response to the conditions placed on the above referenced human subjects protocol/amendment.

These conditions were lifted on: February 27, 1997

This study/amendment now has full approval and you are free to begin the research project. This implies the following:

1. That this approval is for one year from the approval date shown on the Action Form and if it extends beyond this period a request for an extension is required. (Also see expiration date on the Action Form)
2. That a progress report must be submitted before an extension of the approved one-year period can be granted.
3. That any change in the protocol must be approved by the IRB; otherwise approval is terminated.

If you have any questions concerning the condition(s), please contact me at 775-2425.

Thank you!

/rds

Enclosure

RESEARCH INVOLVING HUMAN SUBJECTS

SC# 1815

Original Review X

Continuing Review \_\_\_\_\_

ACTION OF THE WRIGHT STATE UNIVERSITY  
SCREENING COMMITTEE  
Assurance Number: M-1021-01

Title: *Relationship Between Clinical Pathway Utilization, Length Of Stay And Healthcare Costs*

Contract No.

Principal Investigator: Vennessa J. Hagan, P.I., Student  
Donna Miles-Curry, Ph.D., Faculty Advisor  
Department: College Of Nursing & Health

The Institutional Review Board named above has taken the following action with regard to the use of human subjects on this proposed project:

\_\_\_\_\_ Approved

\*\*SEE ATTACHED X Approved pending receipt of the items listed \*\*

The conditions, if any, are attached and are signed by the Committee Chairer. If disapproved, the reasons are attached and are signed by the Committee Chairer and by other consultants, if any.

REMINDER: FDA regulations require prompt reporting to the IRB of any changes in research activity, changes in approved research during the approval period may not be initiated without IRB review (submission of an amendment), and prompt reporting of any unanticipated problems (adverse events).

Eugene P. Hagan  
Signed \_\_\_\_\_ Coordinator, WSU-IRB  
Date: January 24, 1997

**This approval is effective only through: January 24, 1998**

This activity may be initiated only after any restrictions that may have been placed on this study by the Board have been addressed and removed. To continue the activities approved under this protocol you should receive the appropriate form(s) from Research and Sponsored Programs (RSP) two to three months prior to the required due date. If you do not receive this notification, please contact RSP at 873-2425.

SC#1815  
January 24, 1997

Vennessa J. Hagan, P.I. (Student)  
Donna Miles-Curry, Ph.D. (Faculty Advisor)

**PLEASE RESPOND:**

**\*NOTE:** *When responding, please Hi-lite the requested changes made to your revised document(s) . Unless otherwise noted, only one (1) copy of the requested item(s) need be submitted for your response.*

**Please be aware that the activities covered by this action may not be initiated until all conditions have been removed and subsequent final approval has been recommended.**

\*Recommended for Expedited Review provided the following conditions are met:

- a. In your response memo, clarify that Donna Curry is your faculty advisor and should be included on the Petition cover page.
- b. Research Summary: Clarify and expand upon the purpose of the study. Clarify what financial data will be obtained.
- c. To be anonymous, there can be no personal identifiers linked to subjects. If names and social security numbers are to be omitted from the data collection sheet, clarify what the "ID Number" column is for (Appendix C).

**\*\*The above conditions have been lifted upon receipt of the items, as requested above, from PI noting that she has conformed to the Conditions the Screening committee placed on this research study. This study now has final approval and the Principal Investigator may proceed with this research protocol.**

74TH MEDICAL GROUP  
WRIGHT-PATTERSON AFB OH

NURSING RESEARCH GROUP

**ROUTING SLIP for Internal Review**

**TITLE:** /Relationship Between Clinical Pathway Utilization, Length of Stay and Health Care Costs

**PRINCIPAL INVESTIGATOR:** Major Vennessa J. Hagan

**NURSING RESEARCH GROUP:**

The Nursing Research Group has reviewed this proposal for scientific merit and risk to human subjects and recommends:

	<u>INITIALS</u>	<u>DATE</u>
<u>APPROVED</u> - May proceed with study.	<u>TLC</u>	<u>14 Jan 97</u>
Approval for forwarding to the Medical Center Institutional Review Board	<u>TLC</u>	<u>14 Jan 97</u>
Approval for routing through appropriate Flight Chiefs and Flight Nurse Executives	<u>N/A</u>	<u>                    </u>

CONDITIONAL APPROVAL - Areas of concern have been identified by this group and may affect the conduct of this study. These issues must be addressed and presented to the nursing research group prior to proceeding with the study.

DISAPPROVAL - This proposal did not meet the standards established by this group as follows:

Substantive human risk involved	<u>                    </u>	<u>                    </u>
Technical human risk involved	<u>                    </u>	<u>                    </u>

SIGNED:

Theresa G. Collins

THERESA COLLINS, Maj, USAF, NC  
Chair, Nursing Research Group

15 January 1997

MEMORANDUM FOR MAJOR VENNESSA HAGAN

FROM: SGOI-C/Major Collins

SUBJECT: Approval of Research Proposal

1. This is to inform you that your research study, "Relationship Between Clinical Pathway Utilization, Length of Stay, and Health Care Costs" has been approved by the Nursing Research Function. You are free to conduct your study as requested.
2. Dr. Thomas Koroscil, the Director of Clinical Investigations, has granted permission for you to continue with your study at the 74th MG.



THERESA L. COLLINS, Maj, USAF, NC  
Chair, Nursing Research Function



DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS AIR FORCE MATERIEL COMMAND  
WRIGHT-PATTERSON AIR FORCE BASE OHIO

21 January 1997

MEMORANDUM FOR 74 MDG/SGN  
ATTN: VENNESSA J. HAGAN

FROM: 74th Medical Group/SGHT  
Clinical Investigations  
4881 Sugar Maple Drive  
Wright-Patterson AFB OH 45433-5300

SUBJECT: Proposed Clinical Investigation Protocol

1. The Clinical Investigation protocol you submitted, "Relationship Between Clinical Pathway Utilization, Length of Stay and Health Care Costs," was reviewed via expedited review by the Chair of the Institutional Review Board (IRB) of Wright-Patterson Medical Center on 15 January 1997 and has been assigned file number #97-X01. Your protocol was determined to be exempt and has been approved.
2. Progress reports will be due annually. The first one will be due in January 1998. You will receive a reminder 30 days in advance when your report is due. If you complete your study prior to this date you may request a final report form from this office upon completion.
3. Any unanticipated major adverse reactions or other medical misadventures must be reported immediately to the department chairperson, the Chief of Medical Staff, the Clinical Investigations Coordinator and ultimately the commander IAW AFI 40-403. Such events will also need to be summarized in the subsequent progress report.
4. If you anticipate separating from the Air Force or changing assignments before the protocol is completed, you must notify the Clinical Investigations Office as soon as this is known. You will be required to either formally close the protocol, or to have another investigator take over the study. The latter process requires nomination by the department chairperson, submission of a curriculum vitae, and approval by the Institutional Review Board.
5. Please indorse below and return to Clinical Investigations (SGHT). I hope that your study will prove to be a worthwhile experience for you. Let us know if there is any way we can assist you.

*Debbie Bachman*  
DEBBIE BACHMAN  
Clinical Investigations Coordinator

1st IND

TO: SGHT/Clinical Investigations

Noted/Acknowledged

*Vennessa J. Hagan*  
\_\_\_\_\_  
Principle Investigator

85

*23 Jan 97*  
\_\_\_\_\_  
Date





**Wright State  
University**

Research and  
Sponsored Programs  
3640 Colonel Glenn Hwy.  
Dayton, OH 45435-0001  
(937) 775-2425  
FAX (937) 775-3781  
e-mail: rsp@wright.edu

**DATE:** February 10, 1997

**TO:** Vennessa J. Hagan, P.I., Student  
Donna Miles-Curry, Ph.D., Faculty Advisor  
College Of Nursing & Health

**FROM:** Robyn Simmons, Sponsored Programs Assistant  
Secretary, WSU Institutional Review Board

**SUBJECT:** SC# 1815  
*Relationship Between Clinical Pathway Utilization, Length Of Stay And  
Healthcare Costs*

The above human subjects study was approved by the Screening Committee on the condition that you respond to the Committee's comments. **Please note that the activities covered by this action may not be initiated until your responses to these conditions have been received and accepted.**

In order for us to remove the conditions, would you please respond by sending a cover letter explaining the additions or changes along with a copy of any revised pages and/or consent document (with changes highlighted) as indicated.

Send your response to Robyn Simmons, Secretary to the Institutional Review Board, 122 Allyn Hall.

If you have any questions concerning the condition(s), please contact me at 775-2425.

Thank you!

/rds

Enclosures

RE ARCH INVOLVING HUMAN SUBJECTS

SC# 1815

Original Review X

Continuing Review

ACTION OF THE WRIGHT STATE UNIVERSITY  
SCREENING COMMITTEE  
Assurance Number: M-1021-01

Title: *Relationship Between Clinical Pathway Utilization, Length Of Stay And Healthcare Costs*

Contract No.

Principal Investigator: Vennessa J. Hagan, P.I., Student  
Donna Miles-Curry, Ph.D., Faculty Advisor  
Department: College Of Nursing & Health

The Institutional Review Board named above has taken the following action with regard to the use of human subjects on this proposed project:

\_\_\_\_\_ Approved  
X Approved pending receipt of the items listed \*\*

The conditions, if any, are attached and are signed by the Committee Chairer. If disapproved, the reasons are attached and are signed by the Committee Chairer and by other consultants, if any.  
REMINDER: FDA regulations require prompt reporting to the IRB of any changes in research activity, changes in approved research during the approval period may not be initiated without IRB review (submission of an amendment), and prompt reporting of any unanticipated problems (adverse events).

Eugene P. Hagan  
Signed \_\_\_\_\_ Coordinator, WSU-IRB

Date: January 24, 1997

**This approval is effective only through: January 24, 1998**

This activity may be initiated only after any restrictions that may have been placed on this study by the Board have been addressed and removed. To continue the activities approved under this protocol you should receive the appropriate form(s) from Research and Sponsored Programs (RSP) two to three months prior to the required due date. If you do not receive this notification, please contact RSP at 873-2425.

SC#1815  
January 24, 1997

Vennessa J. Hagan, P.I. (Student)  
Donna Miles-Curry, Ph.D. (Faculty Advisor)

**PLEASE RESPOND:**

**\*NOTE:** *When responding, please Hi-lite the requested changes made to your revised document(s) . Unless otherwise noted, only one (1) copy of the requested item(s) need be submitted for your response.*

**Please be aware that the activities covered by this action may not be initiated until all conditions have been removed and subsequent final approval has been recommended.**

\*Recommended for Expedited Review provided the following conditions are met:

- a. In your response memo, clarify that Donna Curry is your faculty advisor and should be included on the Petition cover page.
- b. Research Summary: Clarify and expand upon the purpose of the study. Clarify what financial data will be obtained.
- c. To be anonymous, there can be no personal identifiers linked to subjects. If names and social security numbers are to be omitted from the data collection sheet, clarify what the "ID Number" column is for (Appendix C).

## Appendix C

### Sample Data Collection Sheet

	ID Number	LOS	Hosp Costs	Age	Gender	Status	Rank
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

## APPENDIX D

### Pediatric RAD/Asthma Clinical Pathway

Patient Care	STAGE I *ADVANCE WITHIN 72 HOURS	STAGE II	STAGE III
1. Assessment	*Nursing assessment including asthma HX <sup>1</sup> <b>A</b> *Dr's HX & Phy <b>B</b> *Baseline Ht, Wt & VS w/BPC	-Respiratory Tx for aerosol &/or MDI teaching if indicated <b>D</b>	
2. Activity	-As Tol/appropriate for age <b>A</b>	-Same	
3. Diagnostics	*Pulse Oximetry values <b>A</b> -Electrolytes if Hx indicates dehydration <b>B</b> -CBC if febrile <b>C</b> -Blood Cultures if indicated <b>D</b> -ABG or CBG if indicated <b>E</b> -Theophylline lvl if indicated <sup>2,3</sup> <b>F</b> -Chest x-ray first time or asymmetrical wheezes &/or febrile <sup>4,6</sup> <b>G</b>	-Theophylline level if indicated <sup>2,3</sup> <b>F</b>	
4. Treatments	*Bronchodilator aerosols q4 hrs/q2 (pm) <sup>7-9</sup> <b>A</b> -Optional: q2 hrs X 3 *O2 to maintain sats greater than or equal to 94% <b>B</b>	*Aerosols to q6 hrs/q4 (pm) <sup>4</sup> <b>C</b> *Off O2 <b>D</b>	
5. Hydration/ Nurition/Elimination	-Heplock or IV fluids <b>A</b> *Regular diet for age as tol <b>B</b>	*IV fluids to Heplock <b>A</b> Regular diet for age as tol <b>B</b>	Regular diet for age <b>B</b>
6. Consults	*Notification of primary asthma physician <b>A</b> -Consider allergy consult <b>B</b> -Social Svs if indicated <b>C</b>		
7. Medications	Bronchodilators (see Tx) <b>A</b> *IV/PO steroids q6 hrs <b>B</b> -Optional: IV aminophylline <b>C</b>	*Solumedrol to PO steroids <b>D</b> Bronchodilators (see Tx) -If on IV aminophylline change to PO form <b>E</b>	*Discharge prescriptions written <b>F</b>
8. Education/Teaching (Patient & Family)	*Unit orientation to pt (appropriate for age) & family (incl. bedside equip.) <b>A</b> *Knowledge assessment of meds, disease, peak flow meters (5y & above)-See "Check your asthma IQ" -See asthma teaching flow sheet (ATFS) <sup>1</sup> <b>B</b>	*Disease process (see ATFS) <b>C</b> *Equipment needed at home (primary done by RT see ATFS and equipment flowchart) <b>D</b> *Medications (see ATFS) <b>E</b> *Peak flow meter (see ATFS) <b>F</b>	Ensure teaching done on: -Disease process -Equipment -Medications -Peak Flow (include zones) <b>G</b> *Follow up appt scheduled <sup>10</sup> <b>H</b>
Pain Management	Not addressed in path	-----	-----
9. Monitoring	*Cardio-respiratory monitoring via CRM <b>A</b> *Pulse Ox q4 hrs while on O2 or if condition deteriorates <b>B</b> *VS q4hrs (or more freq) <b>C</b>	*D/C CRM if indicated <b>D</b> *Peak flow pre & post treatment <b>E</b> *VS q4 hrs <b>C</b>	-CRM as needed until discharge <b>D</b> -VS q8 hrs <b>F</b> -PEFR <b>G</b>
10. Discharge Planning	*Initial evaluation:begin any discharge planning necessary (see Nsg Admission Hx and Phy) <sup>1,10</sup> <b>A</b>		-As needed -Consider assignment to asthma team <b>B</b>
11. Psycho-social	Patient/family support -Recr. activity approp. for age <b>A</b>	-Same	Pt/family support
12. Outcomes	-Pt &/or family understands the reason for hospitalization & Tx <b>A</b> -Physiological measures improve (maintained &/or improved O2 sat, decreased wheezes, decreased HR, improved PEFR) <sup>1</sup> <b>B</b>	-Reinforce reasons for continued hospitalization w/pt & family <b>C</b> -Pt/family will respond positively to teaching <b>D</b> -Continued improvement of physiologic measures <b>E</b>	-Acute episode resolved, care manageable at home <b>F</b> -Pt/family verbalizes understanding of home health care needs <b>G</b>

\*Necessary step. Patients unable to comply represent a Variance

## variance, linking Sheet

Addressograph Information	
<p>are Unit to complete)</p> <p>Admit Date _____ Discharge Date _____</p> <p>Diagnosis _____</p> <p>Attending MD _____</p>	<p>Medical records to complete)</p> <p>ICD9 _____</p> <p>Series: _____</p> <p>Boundary _____</p> <p>Diagnoses: _____</p>

**BE SURE TO STAMP THIS SHEET WITH PATIENT INFORMATION**

[illegible]

DRG = Diagnostic Related Group (Code #)  
ICD9 = International Classification of Diseases

APPENDIX E  
CABG Clinical Pathway



# PRIMARY ISOLATED CORONARY REVASCULARIZATION (CABG)

(This form is subject to the Privacy Act of 1994 - Use Blanket PAS - 2005)

Selection: Patients undergoing isolated coronary artery bypass grafting (CABG).

Time: From preop consultation until hospital discharge.

DAY	PREOP	INIT	VAR	POD 0 DATE CT ICU	INIT	VAR	POD 1 DATE CT ICU	INIT	VAR	POD 1 WARD 3A	INIT	VAR
Clinical Assessment	History & Physical Nsg History & Physical MD preop note Anesthesia preop Consent Ht & Wt, bilat arm BP & pulses on chart	---	---	VS q 15" x 4, q 30" x 2. q 1Hr Hemodynamic monitoring. Assess: CNS, lung, heart, wound, peripheral perfusion I & O q 1Hr Stable on drip AV sync	---	101 102	VS q 2 Hr Hemodynamic monitoring. Assess: CNS, lung, heart, wound, peripheral perfusion I & O q 2 Hr Stable on drip Stable rhythm off pacemaker	---	111 112	VS q 4 Hr Assess: CNS, lung, heart, wound, peripheral perfusion I & O Telemetry Weight on arrival to floor	---	---
Tests/Diagnostics	T & C x 4u PRBC's ECG CXR PA & LAT CBC, Pts, PT/PTT, SMA-10, LFT's UA	---	---	Confirm T & C x 4u PRBC's STAT: ECG & CXR Admit: ABG & q 4 Hr PRN CBC, Pts, PT/PTT, SMA-7, Ca <sup>++</sup> , PO4, Mg <sup>++</sup>	---	---	ABG PRN STAT lytes q 4 Hr PRN AM: ECG, CXR CBC, Pts, PT/PTT, SMA-7, Ca <sup>++</sup> , PO4, Mg <sup>++</sup> CPK, amylase, (drug levels as indicated) CXR post CT out	---	---	(as indicated)	---	---
Treatment/Procedures	Hibiclens shower in pm & am of surgery	---	---	ET suction PRN, ace wraps, wound care, CT, foley, NGT Pacemaker as ordered Extubated and fasted No return to OR	---	303 304	Arterial peripheral, femoral SG, CVP, JP's, CT's q 1 DC foley, IV hep lock Pacing wires capped O <sub>2</sub> , 4L N/C IS & CDB q 1 Hr Wound care	---	313	O <sub>2</sub> , 4L N/C IS q 1Hr while awake Hep flush q shift Pacing wires capped TED's reapply qD and PRN Wound care	---	---
Teaching/Education	Preop teaching ICU tour Patient pathway	---	411	Family teaching: care plan and expected progress Pt orientation	---	---	Pt & family eval re: care plan Introduce cardiac rehab plan	---	---	Orient to unit Discuss care plan Explain fall risks	---	---
Discharge Planning	DC assessment (see consults as indicated) Advance directive & personal affairs addressed	---	---	DC planning tool: - living arrangements - support systems - discharge location - transportation	---	---	Validate discharge needs Evaluate, reassess a need for intermediate care Write transfer orders TRANSFER TO WARD 3A	---	514	---	---	---
Psycho-social	---	---	---	Physician to talk to family Emotional suport to pt & family	---	---	Emotional support to pt & family, eval coping mech Pt & family prepare for transfer	---	---	Increased independence Emotional support Encourage & reinforce self-responsibility	---	---
Medications	Preop cardiac meds with sips in am Sleeper qHS PRN Premed by anesthesia Continue NTG, Heparin (if ordered) IV antibiotics ordered	---	---	Vaso-active drips as ordered NTG, Nipride, Neo titrated as ordered IV antibiotics, analgesics Zantac	---	---	IV antibiotics ASA IV Lasix, KCl Lopressor Analgesics, stool softeners Vasoactive drips as ordered	---	715	PO meds: ASA Lasix, PO KCl Lopressor analgesics, stool softeners Zantac	---	---
Hydration/Nutrition/ Elimination	Regular diet NPO post 2400 night of surgery	---	---	NPO, IVF TKO Fluid bolus & blood products as indicated Sips and chips when extubated	---	---	Clear liquid then advance as tolerated IVF TKO	---	---	Cardiac light diet IV hep lock	---	---
Activity	Up ad lib	---	---	Bed rest Turn q 2 Hr if stable	---	---	Up in chair for meals (after SG out)	---	916	BRP with assist Walks from stretcher to bed	---	917
Consults	Case Manager, Social Work (as indicated) Other (as indicated)	---	---	DC Planning OT, Cardiac Rehab, (PT if indicated)	---	---	Dietary (as indicated)	---	---	Telemetry	---	---

## ••SIGNATURES••

NURSE _____ NURSE _____ CASE MANAGER _____  PHYSICIAN _____	NURSE _____ NURSE _____ CASE MANAGER _____  PHYSICIAN _____	NURSE _____ NURSE _____ CASE MANAGER _____  PHYSICIAN _____	NURSE _____ NURSE _____ CASE MANAGER _____  PHYSICIAN _____
---	---	---	---

Patient's identification:

☐ Preop initiated as outpatient  
☐ Preop initiated as inpatient  
☐ Preop not initiated

DAY	POD 2 DATE WARD 3A	INIT	VAR	POD 3 DATE WARD 3A	INIT	VAR	POD 4 DATE WARD 3A	INIT	VAR	POD 5 DATE WARD 3A	INIT	VAR
Clinical Assessment	VS q 4 Hr Assess: CNS, lung, heart, wound, peripheral perfusion I & O Weight Telemetry	—	—	VS q 4 Hr Assess: CNS, lungs, heart, wound, peripheral perfusion I & O Weight Telemetry	—	—	VS q 8 Hr Assess: CNS, lung, heart, wound, peripheral perfusion I & O T: 101.5, P: 141, R: 142, W: 143, SpO2: 144 Pre: 101.5, P: 141, R: 142, W: 143, SpO2: 144	—	—	VS q 8 Hr Assess: CNS, lung, heart, wound, peripheral perfusion Weight	—	—
Tests/Diagnostics	CBC, SMA-7 (drug levels as indicated)	—	—	SMA-7 (drug levels as indicated) Room air pulse oximetry	—	—	SMA-7 (if on Lasix) CXR PA & LAT after pacing wires out Room air pulse oximetry	—	—		—	—
Treatments/Procedures	O, PRN Hep flush q shift TED's reapply q D and PRN IS q 1Hr while awake Wound care	—	—	O, PRN Hep flush q shift TED's reapply q D and PRN IS q 1Hr while awake Wound care	—	—	DC pre-ictal DC G DC telemetry, hep lock	—	345 346		—	—
Teaching/Education	Cardiac Education class	—	—	Cardiac Education class	—	—	Completed Cardiac Education classes	—	—	Reinforce teaching DC activity instructions DC medication instructions	—	—
Discharge Planning	DC summary for Air- evac. Contact Air- evac Confirm: - home support - transportation - assess ambulation, ADL - arrange HHC, rehab, Nsg	—	—	Completed DC Contact referring MD Manifest Air- evac	—	531	Write DC pre-ictal Update DC summary	—	547	DISCHARGE Discharge before 1200	—	551 552
Psycho-social	Emotional support, Encourage and reinforce self-responsibility	—	—		—	—	Prepare pt & family for discharge, encourage self-responsibility	—	—	Reinforce progress	—	—
Medications	PO meds: ASA Lasix, KCI Lopressor Analgesics, stool softeners Zantac	—	—	PO meds: ASA Lasix, KCI Lopressor Analgesics, stool softeners Zantac	—	—	PO meds: ASA Lopressor Analgesics Zantac DC Lasix & KCI (if at preop wt) LOC (if no BM)	—	—	PO meds: ASA Lopressor Analgesics, stool softeners	—	—
Hydration/Nutrition/ Elimination	Regular diet (preop) Nutritional supplement @ 1400 & 1800	—	—	Regular diet (preop) Nutritional supplement @ 1400 & 1800	—	832	Regular diet (preop) Bowel management	—	848	Regular diet (preop)	—	—
Activity	Walk A lap BID Up for all meals	—	921	Walk A lap TID Up for all meals	—	—	Walk A lap Up for all meals May shower Up for meals	—	949 940	Make follow up appt on 38	—	—
Consults		—	—		—	—		—	—	Cardiology/Internal Medicine followup consult	—	—

\*\*SIGNATURES\*\*

NURSE _____	NURSE _____	NURSE _____	NURSE _____
NURSE _____	NURSE _____	NURSE _____	NURSE _____
CASE MANAGER _____	CASE MANAGER _____	CASE MANAGER _____	CASE MANAGER _____
PHYSICIAN _____	PHYSICIAN _____	PHYSICIAN _____	PHYSICIAN _____

_____ Pathway completed; on POD _____  _____ Pathway completed/ but stay extended _____ day(s)  Reason(s) for Delays:  _____ Pathway not completed; withdrawn on POD _____	
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