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Resource Utilization

RESOURCE UTILIZATION IN AMBULATORY PRIMARY CARE  
AT DARNALL ARMY COMMUNITY HOSPITAL, FORT HOOD, TEXAS

A Graduate Management Project

Submitted to the Faculty of

Baylor University

In Partial Fullfillment of the

Requirements for the Degree

of

Master of Health Administration

by

Lieutenant Colonel Martha C. Lupo, AN

July 1991

Running Head: RESOURCE UTILIZATION IN AMBULATORY PRIMARY CARE

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ABSTRACT

A cross sectional study was conducted comparing the utilization of medications, laboratory studies, and diagnostic x-ray procedures for the three most frequently seen pediatric acute minor illnesses by three different groups of physicians providing primary care: PRIMUS physicians, CHAMPUS Partnership physicians and military physicians. The sample consisted of approximately 270 children having one of three major acute minor illnesses. The purpose of this study was to determine if differences in resource utilization exist among physician groups who provide care for the pediatric population at Darnall Army Community Hospital, Fort Hood, Texas.

A statistically significant difference in resource utilization was found in the frequency of prescribing medications between PRIMUS and military physicians in the study. Further research will be needed to identify specific factors contributing to the differences.

The findings of this study indicate the need for physicians in the PRIMUS setting to consider establishing practice guidelines for the management of commonly seen pediatric complaints in order to promote cost containment and maintain quality of care. Practice patterns which favor the conservative use of medications appear to already exist in the military physician group.

Resource Utilization in Ambulatory Primary Care  
at Darnall Army Community Hospital, Fort Hood, Texas

INTRODUCTION

The soaring cost of health care during the 1980's contributed to a philosophical shift from the 1960's notion of equal access for all to a contemporary emphasis on cost containment through efficient management of material and personnel resources. Likewise, budgetary constraints and Congressional directives compelled the military medical direct care system to respond, not only to the issue of health care costs, but to quality and access to care. Specific factors forcing the emphasis on cost control, quality and access issues were:

1. Soaring Civilian Health and Medical Programs of the Uniformed Services (CHAMPUS) costs due to increased CHAMPUS use;
2. Heavy CHAMPUS use without measurable improvement in overall health status;
3. Increasing costs per outpatient visit under the cost-plus mode of reimbursement;
4. Intense and growing patient dissatisfaction with the direct care system;
5. Inability of medical treatment facilities (MTFs) to meet beneficiary demand for health care resulting in large backlogs of patients waiting for care; and

6. Strong Congressional criticism and pressure for reforms.

Congress responded by enacting the Department of Defense Authorization Act of 1984 which directed the Department of Defense to conduct demonstration projects and studies to increase access, quality, efficiency, and cost effectiveness for the military health care system. This legislation extended the policy of privatization of governmental services to the health care arena.

With this necessary authorization in place, the attention of military ambulatory health care managers turned to the private sector where innovative methods of providing primary care demonstrated significant gains in efficiency and access. Primary Medical Care for the Uniformed Services (PRIMUS) and the CHAMPUS Partnership Program are two approaches for providing improved access to primary care at or below CHAMPUS cost through contracting with the private health care sector. The term "primary care" generally includes such specialties as pediatrics, OB/GYN, and internal medicine.

In essence, PRIMUS is a for-profit, ambulatory care focused, managed care operation. Managed care is defined as a system that superimposes organizational structure, control, measurement, and accountability upon the health care system to effect a precise balance in the utilization of health care resources, cost containment and quality enhancement (Ottensmeyer & Key, 1988). Classic examples of management controls in a managed care ambulatory care setting are

physician and patient profiling, various financial incentives for conservative use of resources, and retrospective review of the appropriateness of care (Hillman 1990; Lawless, 1990).

The PRIMUS contract requires the contractor to provide an agreed upon range of primary health care and preventive services in its own clinics to the beneficiary population on a per patient clinic visit basis. Necessary lab, x-ray, and pharmacy expenses are included in the fixed charge per patient. Physicians participating in PRIMUS are salaried employees of the contractor. Patients with problems exceeding the defined scope of care are referred to the medical treatment facility (MTF) - in this case, Darnall Army Community Hospital, Fort Hood, Texas - for treatment and follow-up.

The CHAMPUS Partners, on the other hand, are individual physicians or groups of physicians who agree to see beneficiaries in the clinical setting of the MTF for an agreed upon percentage of the CHAMPUS allowable fee. The CHAMPUS copayment from the beneficiary is waived. Necessary lab, x-ray, pharmacy, and most clinic overhead expenses are provided at the expense of the MTF.

At Darnall Army Community Hospital, two PRIMUS clinics and eleven CHAMPUS Partners augment the primary care resources in the General Outpatient Clinic, OB/GYN clinics, and the Pediatric Clinic. The cost of the PRIMUS contract in FY 1990 was \$5.1 million; the cost of CHAMPUS Partnership services was \$4.3 million (DiMeglio, 1990).

Thanks to these programs, backlogs of patients awaiting appointments for primary care services are virtually nonexistent. However, containing the cost of providing that care remains a multifaceted challenge.

The cost of providing care can be characterized as consisting of fixed costs plus variable costs. The fixed costs of doing business include such expenses as facilities, utilities, telephone, and some labor expenses. Variable costs are the costs which tend to fluctuate in accordance with factors which can be controlled to a certain degree. Examples of variable costs are the number and kind of lab tests, x-ray studies and prescriptions ordered to treat a given illness. In many cases, variable expenses are controlled by the physician. Estimates range from 80% (Hanson and Nicholson, 1989) to 55% (Greene, Goldberg, Beattle, & Russo, 1989; Berndtson, 1986) of the resources consumed to treat a patient are controlled by the physician.

A number of studies suggest that there is considerable variation in how physicians utilize resources and that this variance can have a significant effect on the variable cost of providing primary care services (Dresnick, Roth, Linn & Pratt, 1979; Eisenberg, 1986; Myers & Schroeder, Rovers, 1989; Swick, 1985; Young 1985). A vital management strategy to keep the cost of care low in managed care organizations, such as PRIMUS, is careful resource utilization

management. Utilization management is the application and monitoring of management controls, such as pre-authorization for hospitalization, in order to promote cost containment, access, and quality (Connor, Mack & Handleman, 1983).

Recognizing the key role physicians play in controlling resource utilization, incentives are often put in place to encourage physicians to hold the line on resource consumption. Examples of these incentives include feedback about utilization of resources, peer pressure, and sharing financial risk. Conservative use of resources helps keep the variable cost of care down. In general, incentives such as these are not currently operational in the military primary care settings or in the CHAMPUS Partnership Program.

This study is designed to determine if significant differences in utilization of laboratory tests, prescription medications, and radiological procedures exist among the three primary care provider groups: PRIMUS, CHAMPUS Partners and military physicians. Such a study is an important first step in assessing the need for implementing a utilization management program.

#### Problem Statement

The Army Medical Department is currently experiencing the problem of constantly rising costs for health care in the face of declining fiscal resources. This study is designed to investigate one aspect of this problem. Specifically, are there statistically significant

differences in resource utilization among three different groups of primary care physicians who provide health care at Darnall Army Community Hospital, Fort Hood, Texas.

#### Review of the Literature

The review of the literature is presented in four sections. Section I deals with literature related to developing the concepts of fixed and variable cost, defining a health service in terms of a unit of care, describing the key role of the physician as controller of health services and associated costs, and factors influencing physician utilization of units of care. The focus of this paper is the physician utilization of the units of care component of the total cost equation. Section II describes a model of the clinical process used by physicians to provide care to patients. This is introduced to facilitate understanding of the variability of resource utilization that exists among physicians treating the same illness. The clinical process model described in this section further illustrates how the utilization of ancillary services is a potential target of opportunity for controlling the variable cost of health services.

Section III describes, compares and contrasts the three practice settings examined in this study: PRIMIS, the CHAMPUS Partnership,

and the military clinic. Incentives and constraints regarding utilization of ancillary services within each practice setting will be described.

Section IV presents literature concerned with ancillary services and ancillary service utilization. Recent literature about laboratory, diagnostic radiology and pharmacy utilization will be summarized.

### Section I

A key assumption of this study is that the cost of health care can be controlled to some degree without sacrificing quality (Platt, 1983). It is further assumed that the ability to provide quality health care services at the least possible cost is essential for successful health care organizations in the 1990s (Lewis, 1989).

#### Health Care Services

The product or output of the primary care outpatient clinic is health care services. A given health care service is made up of a variety of subcomponents known as units of care. Units of care are such items as a chest x-ray, urinalysis, blood test, or diagnostic procedure. The cost of a unit of care is the sum of all the fixed and variable direct costs necessary to produce that unit of care. Efficient production of these units of care is the concern of the administrative component of a health care organization (Lewis, 1989). Examples of factors associated with efficient production of units of

care are the control of the cost of labor, raw materials, work methods, and rent (fixed costs).

#### Cost of Health Care Services

The manner in which different types of units of care are combined to produce a health care service is largely under the control of the physician. The type and quantity of units of care brought together by the physician to render a health care service is defined as the physician's practice pattern (Lewis, 1989). For example, treating a sore throat may require any or all of the following units of care: an examination, a throat culture or not (with or without sensitivity), symptomatic treatment (to include a wide range of drugs to choose from), and perhaps antibiotics (again, several choices possible). Significant variability exists in how physicians choose and combine the available units of care to treat the same diagnosis (Wennberg, 1984).

The total cost of a health care service is a function of the efficiency with which the health care organization produces units of care and the total number of units used by the physician. Theoretically, the cost of a health care service can be altered by manipulating either the production costs, the number of units of care used to produce a particular service, or both variables. If a health care organization is reasonably efficient in producing units of care, the focus of cost reduction efforts is on the physician and his/her

practice patterns (Lewis, 1989).

The Physician's Role in the Cost of Health Care Services

In 1990, over \$600 billion dollars or 12% of the United States gross national product (GNP) was spent on personal health care services (Fineglass & Salmon, 1990). Estimates of how much of these expenditures are controlled by physicians range from 55% (Hansen & Nicholson, 1989) to 80% (Greene, Goldberg, Beattle & Russo, 1989; Berndtson, 1986). Much of the cost of medical care stems from the manner in which physicians utilize units of care such as labs, diagnostic procedures, and prescription medications (Greene, Goldberg, Beattle & Russo, 1989). Ultimately, the cost of providing a health care service is highly dependent on physician practice patterns.

According to Feinglass (1987), Dr. John Wennberg of Dartmouth Medical School has been the leading researcher of physician practice variations. Dr. Wennberg coined the term "practice style factor" and uses it to describe the variation that exists when different physicians treat the same illness in different ways. He defines the practice style factor as those subjective considerations related to the attitudes of individual physicians which influence how they manage patient care (Wennberg, 1984).

According to Wennberg, the attitudes of physicians are influenced by such factors as the lack of scientific information on outcomes,

concerns about defensive medicine, and a host of patient factors (Wennberg, 1984). Other influences on the practice style factor cited in the literature include medical school training, habit, financial incentives, lack of knowledge about the cost of care, peer pressure, and clinical experience (Greene, Goldberg, Beattie & Russo, 1989). To the extent that physicians control or influence the utilization of most of the units of care, the practice style factor directly effects cost (Feinglass, 1987).

Data collected by Wennberg and others suggest that the variation in resource utilization by physicians treating the same medical condition depends on the decision maker rather than the clinical situation (Lewis, 1989). In some instances, the dollar cost of this variation can be huge such as in the case of deciding to treat coronary artery disease with bypass surgery versus intravascular balloon techniques. Management strategies aimed at influencing the decision maker, such as the financial incentive of capitation payments in HMOs, can have a significant impact on the total cost of health care services (Eisenberg, 1986).

Focusing on the role of financial incentives, Berndtson, a physician, describes three categories of incentives which compete with each other in motivating physician behavior. These include the

incentive to fulfill one's duty to the patient, the incentive to reduce liability risks by practicing defensive medicine, and the economic incentive (Berndtson, 1986).

The economic incentive is further described by Berndtson in terms of three types of payment systems. The first is the retrospective payment system, like fee-for-service in the CHAMPUS Partnership Program, in which the physician earns more by doing more. The second system is the prospective payment system, like Diagnosis Related Groups (DRGs), in which the physician earns more by costing less. The third system is the salary system, such as that found in the military, or a first generation staff model Health Maintenance Organization (HMO), in which the physician earns a set amount and generally does not earn more by doing more. The payment system determines the nature of the economic incentive capable of influencing the physician's diagnostic and therapeutic choices. However, the author stresses that physicians are not purely motivated by any single factor -- duty, liability, or economics. Rather, he suggests that economic incentives are at their best when they also encourage a physician to follow his/her sense of duty, and ease legal liability (Berndtson, 1986).

Although physicians are legally responsible for the correctness of their decisions to use a particular type and number of units of care to treat the patient's illness, they are generally not liable

for the financial consequences of their decisions (Feinglass & Salmon, 1990). As a result, there are few incentives for physicians to ask themselves whether their use of resources is economical (Egdahl, 1985). The major exception to this is large capitated health care organizations which may use economic criteria to implement explicit test use criteria, clinical protocols, and algorithms.

Overall, there is general agreement in the literature that the ultimate cost of providing a health care service depends largely on physician utilization of units of care. The number and type of units of care to produce a health care service represent the variable costs of providing that health care service. The variation in the number and type of units of care used by physicians (i.e., practice pattern) to treat a given diagnosis can be significant, and suggests that opportunities exist to create incentives for conservative use of the units of care. Incentives that encourage conservative use of units of care in turn can result in reduced health care costs.

## Section II

The Clinical Process Model (Figure 1) proposed by Lewis (1989) provides a means to understand how physician utilization of units of care can affect the cost of health care services and how practice variations are likely to occur.

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As shown in Figure 1, the health care utilization process begins when the patient decides to seek services from the physician for a health problem or concern, and the doctor agrees to accept the patient (Griffith, 1972). The physician alone has the legal authorization to diagnose and treat an illness. The decision making or diagnostic part of the process begins when the physician begins to determine the etiology of the problem, orders diagnostic tests, and makes a probable diagnosis (Griffith, 1972).

At this stage of the process, there are three categories of medical decision making: (1) determining what is wrong with the patient, (2) deciding what diagnostic tests should be done to confirm or rule out the diagnosis, and (3) deciding what to do, if anything, after the cause is identified. As the model (Figure 1) suggests, there is more than one way to proceed through the diagnostic phase and arrive at a clinical diagnosis. Lewis states that where there are variations in approach, there are also likely to be wasted resources in one approach versus another (Lewis, 1989).

As noted by the research of Wennberg (1984) and Lewis (1989), there is often remarkable variation in individual physician practice patterns, among physicians dealing with the same clinical situations.

As previously mentioned, there are many factors influencing the physicians' selection of units of care to provide a given health care service. There are many choices about which units of care will provide adequate information at this phase of the clinical process.

Returning to Figure 1, after the diagnostic phase results in a working diagnosis, the therapeutic process begins. The fundamental courses of action are to do nothing or to intervene therapeutically in some way. Seldom is there clear, specific, scientific information concerning when or how to intervene in a given clinical situation (Lewis, 1989). Again, practice style factors come into play to determine a course of action for therapeutic intervention.

If a therapeutic service is ordered, certain results or outcomes are expected. The final part of the clinical process is an evaluation of the effectiveness of the therapeutic service in producing the desired outcome (Griffith, 1972). Not featured in this model are the effects of feedback from diagnostic tests and therapeutic interventions and how this feedback influences the utilization of units of care.

### Section III

For the military, the 1980's were a time of searching for creative solutions to remedy serious problems with out-of-control CHAMPUS costs, health care manpower shortages, rampant patient dissatisfaction, severe access problems and Congressional pressure

for change. Doing business the way it had always been done in the military was clearly an inadequate solution to these problems.

Innovative approaches for efficiently managing the delivery of health care, such as managed care, were being successfully implemented in the private sector. The Department of Defense (DoD) Authorization Act of 1984 facilitated implementation of these approaches by directing the Department of Defense to conduct demonstration projects and studies to increase access, quality, efficiency and cost effectiveness for the military health care system. This Act articulates the Federal government's policy to privatize governmental services, such as health care, when possible (Hudak, 1988). The development and implementation of PRIMUS clinics and the CHAMPUS Partnership Program were two of these demonstration projects.

#### PRIMUS

PRIMUS is the acronym for "Primary Medical Care for the Uniformed Services" (a similar program in the Navy is called NAVCARE, an acronym for Navy Cares). The PRIMUS program consists of civilian run primary care outpatient clinics which operate under contract to provide services to eligible beneficiaries at a fixed rate per visit. At Fort Hood, eligible beneficiaries are defined as family members of active duty and deceased service members, and retirees and their family members. Primary care for active duty military is provided in

the six Troop Medical Clinics and in the General Outpatient Clinic at Darnall Army Community Hospital. Unless unusual circumstances exist, active duty military at Fort Hood are not to use PRIMUS clinics for care.

The purpose of PRIMUS is to expand the direct care capability of the medical treatment facility in order to provide a wide range of primary care and preventive services to the beneficiary population. The main objective of PRIMUS is to provide improved and timely access to quality health care at a cost that is at or below the government's portion of the CHAMPUS cost for the same service. To facilitate this objective, the Fort Hood MEDDAC has two PRIMUS clinics located in nearby communities where the majority of Fort Hood families reside: Killeen and Copperas Cove.

PRIMUS is an example of a for-profit, managed care organization. Managed care organizations are characterized by utilization management strategies such as practice protocols, utilization feedback to physicians, and risk sharing. The PRIMUS physicians are salaried employees. To enable the contractor to make a profit, physicians are encouraged to see as many patients as possible and to use resources such as lab, pharmacy, and x-ray as conservatively as possible. In fact, the pharmacy, lab, and x-ray capabilities are limited to basic drugs and procedures by the terms of the contract. The contract also limits the scope of care of PRIMUS physicians.

Specifically, it protects PRIMUS from being required to see the very sick or chronically ill patients, since management of these patients generally demands higher resource utilization. Quality assurance programs, peer review and outside oversight by the contractor ensure that patient care is provided at a satisfactory level of quality.

#### The CHAMPUS Partnership Program

The CHAMPUS Partners are local civilian physicians who maintain their private practices while agreeing to spend specified time in the military treatment facility seeing eligible beneficiaries at negotiated rates. Generally, these physicians see patients on a fee-for-service basis at 60% to 70% (in some cases, as low as 45% to 50%) of the CHAMPUS allowable rate per visit. The usual CHAMPUS copayment to the patient is waived, so the patient pays nothing for the visit. The greater the volume of visits, the more the Partnership physician makes.

Like PRIMUS, the purpose of using CHAMPUS Partners is to expand the direct care capability of the military treatment facility to provide care to the beneficiary population. A major difference between PRIMUS and CHAMPUS Partners is that both primary care providers and specialty care CHAMPUS Partners are utilized. Partners are contracted in specialties needed to capture workload which would ordinarily have to be provided at the full CHAMPUS rate with copayment. There are presently over thirty CHAMPUS Partners in a wide-

variety of specialties who have agreed to treat patients in the Partnership Program at the Fort Hood MEDDAC.

Partnership physicians use office space, some ancillary support, the patient appointment system, utilities, pharmacy, laboratory, x-ray and consultation within the facility with essentially no formal utilization management controls in place. The Partnership physicians fall under the umbrella of the hospital Quality Assurance Plan. Monitoring the productivity and utilization of the CHAMPUS Partners a function of the Patient Administration Division and the Utilization Management Committee.

#### Military Physicians

Funding and staffing of military hospitals is a function of the number of clinic visits, occupied bed days, and admissions. Even with 25% of supply dollars being reimbursed on the basis of Diagnosis Related Groups (DRGs), there is little incentive to seek out and eliminate excessive resource utilization in the inpatient setting. In spite of this, the Fort Hood MEDDAC medical staff, as a function of the Utilization Management Committee, monitors inpatient utilization using the Texas Medical Foundation criteria. To date, the same degree of scrutiny using agreed upon criteria has not been uniformly applied to the use of resources in the outpatient setting.

Since military physicians are salaried, they have no real incentive to restrict or to overutilize resources (Braendel, 1990).

Despite this lack of incentive, at the Fort Hood MEDDAC, there are some examples of individual departments and services developing constraints or criteria for utilization of certain resources which do have an impact on outpatient utilization. For instance, the Pharmacy, through the Therapeutics and Drug Review Committee, specifies that only physicians in designated specialties may prescribe certain high cost or high risk drug items. The hospital formulary itself, because it is limited in the number and variety of drugs it contains, is a constraint in some instances. Similarly, in order to reduce costs, the Radiology Department has developed criteria which patients must meet to receive barium enemas. And finally, the Respiratory Therapy Department has established criteria for ordering home oxygen therapy which limits its use.

These three practice groups, PRIMUS, the CHAMBERS Partners, and military physicians, are the independent variables in the current study. Based on the factors just described, it is hypothesized that resource utilization will vary among these three physician groups.

#### Section IV

Whereas the focus of utilization management literature in the early 1980s was on controlling the cost of "big ticket" items, such as the decision to hospitalize or to admit to the intensive care unit, the focus of current literature is beginning to focus on controlling the cost of high volume little ticket items such as

laboratory tests and prescriptions. This change in focus corresponds with the shift from inpatient care to ambulatory care resulting largely from the implementation of prospective payment in the mid-eighties.

There is growing evidence that the aggregate expense of little ticket technologies, such as clinical laboratory tests and procedures, account for far more of the annual growth rate in health care expenditures than does the capital outlay for major medical technologies such as computerized tomography scanning, fetal monitoring or coronary artery bypass (Grossman, 1983).

It is estimated that laboratory tests alone account for 10% of all health care expenditures (Statland, 1985). As cited by Kreig, Abendroth, & Bongiovanni (1986), the total cost of medical testing in the United States includes \$30 billion for laboratory tests, \$20 billion for diagnostic radiology, and \$50 billion for other testing such as audiology, vision testing, endoscopy, ultrasound and electrocardiogram. Compared to European physicians, the frequency of laboratory tests is from two to four times as great in the United States (Statland, 1985).

Johnson, Azevedo, & Kieburtz (1986) estimate that 10% of total medical care expenditures in the United States are prescription

drugs. The Fort Hood MEDDAC spends roughly 17% of its total budget on dispensed pharmaceuticals. A large proportion of this cost is attributable to outpatient prescriptions.

The frequency with which laboratory, x-ray and pharmacy units of care are used is subject to the practice variations of the physicians. As previously stated, variations can be influenced by incentives existing in various practice settings. Laboratory tests, diagnostic x-ray procedures, and the number of prescriptions will be the dependent variables of this study.

#### Summary

Health care services are composed of combinations of units of care such as laboratory tests, x-ray studies or prescription medications. Considerable variation in the utilization of these units of care to treat the same type illness can exist among physicians. Since cost is directly proportional to the volume of the units of care used, differences in practice patterns can have an effect on the cost of a health care service.

The economic incentive is one of several factors which influence physician practice patterns. Economic incentives can be retrospective (fee-for-service), prospective (as with DRGs) or salary-type. Economic incentives within a given practice setting can have an impact on utilization of units of care.

The independent variables of this study consist of three groups of primary care physicians: PRIMUS physicians, CHAMPUS Partners, and military physicians. The dependent variables of the study include laboratory studies, prescription drugs and radiological procedures used to treat a given set of diagnoses.

#### Purpose

The purpose of this study is to determine if there are statistically significant variations among three groups of primary care providers with regard to the utilization of specified units of care to provide primary care health services to beneficiaries with the same diagnoses at Fort Hood.

#### METHOD AND PROCEDURE

The research design is a cross sectional survey comparing resource utilization by three types of primary care provider groups: PRIMUS (for-profit, managed care), CHAMPUS Partners (solo practice, discounted fee-for-service), and military physicians. All three groups provide pediatric primary care to the beneficiary population of the Darnall Army Community Hospital catchment area. All physicians in the study are board certified or are board eligible pediatricians. The three types of provider groups are the independent variables in the study.

For purposes of this study, resource utilization will be defined as the laboratory studies, x-ray procedures, and prescriptions

ordered during a single patient visit for each of three of the most frequently seen, annually occurring pediatric acute minor illnesses in the beneficiary population: gastroenteritis (GI), otitis media (OM), and upper respiratory infection (URI). These resources will be the dependent variables of the study.

The age and development of the child, pre-existing chronic medical conditions, and more than one illness occurring at the same visit could influence the type and quantity of resources used to treat the diagnosed illness. To control for this, only children in the preschool age group - ages 3 through 5 - will be considered in the sample. Children with pre-existing medical conditions or more than one illness at the time of the visit will be excluded from the study sample. Children with birthdates from 1 January 1986 to 31 December 1988 who were diagnosed with URI, GI or OM will be randomly selected from outpatient clinic logs.

A potential source of error in the military physician group will be the effect of the practice patterns of reservist physicians called to active duty during Operation Desert Storm/Desert Shield. Reservist physicians will be eliminated from the study sample.

Sample size for each diagnosis group and for each provider group will consist of at least 30 subjects. Data will be collected during the months of January through March, 1991. The anonymity of individual physicians and patients will be strictly protected.

The primary hypotheses to be tested in this study are as follows:

1.  $H_0$  = Utilization of lab studies does not vary with provider group.

$$Y \nmid (f)X$$

$H_A$  = Utilization of lab studies varies with provider group.

$$Y = (f)X$$

The null hypothesis states that utilization of lab studies does not vary with provider group. The alternate hypothesis states that the utilization of lab studies varies with provider group.

2.  $H_0$  = Utilization of x-ray procedures does not vary with provider group.

$$Y \nmid (f)X$$

$H_A$  = Utilization of x-ray procedures varies with provider group.

$$Y = (f)X$$

The null hypothesis states that the utilization of x-ray procedures does not vary with provider group. The alternate hypothesis states that the utilization of x-ray procedures does vary with provider group.

3.  $H_0$  = Utilization of prescriptions does not vary with provider group.

$$Y \nmid (f)X$$

HA = Utilization of prescriptions varies with provider group.

$$Y = (f)X$$

The null hypothesis states that the utilization of prescriptions does not vary with provider group. The alternate hypothesis states that the utilization of prescriptions does vary with provider group.

Data will be analyzed and the hypotheses will be tested using analysis of variance procedures. The alpha probability level of the study will be 0.05.

The major threat to reliability and validity is the possible lack of representation of the physicians in the three groups, the lack of randomness with the selection of the three diagnoses used for this study, or selection of the site of the study. Since the test period will be two months out of a calendar year, there may be seasonal effects which could influence the results. However, the months of January and February are traditionally the months of the year with the highest incidence of the common pediatric diseases examined in this study. These threats are not fatal to the study since the sample size is large and results will not be generalized beyond Fort Hood.

A major limitation of the study includes limited generalization beyond the Fort Hood catchment area. Regional differences in patient mix, mission of the MTF, and age of the population may limit generalization beyond Fort Hood. Nevertheless, this study should

enable researchers to suspect that variation in practice patterns might affect the utilization of resources, and therefore the variable cost, of providing care in their own primary care settings.

### RESULTS

The study sample consisted of observations of the frequency of use of x-ray, laboratory tests and prescription medication documented in the outpatient medical records of 270 children seen at PRIMUS and Darnall Army Community Hospital pediatric clinic from January to February 1991. The children ranged in age from 3 to 5 years old and were diagnosed with otitis media, upper respiratory tract infection, and gastroenteritis. A total of 296 x-rays, laboratory tests and prescription medications, which were the dependent variables of this study, were documented in the records.

The independent variables consisted of three provider groups: military physicians, CHAMPUS Partnership physicians, and PRIMUS physicians. Thirty cases of each diagnosis seen by each provider group were randomly selected for the study. The combined frequencies of prescription medications are arrayed by diagnosis group and provider group in Table 1.

Table 1 revealed that for all diagnoses, the military physicians wrote 85 prescriptions, which were the lowest number of prescriptions written. The highest prescriber group was the PRIMUS physicians, who wrote 110 prescriptions. More prescriptions were written for

children with otitis media than the other two diagnoses. The least prescriptions were written for children with gastroenteritis.

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Insert Table 1 about here

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An unanticipated discovery found during the course of the data collection was that laboratory tests and x-rays were rarely ordered to confirm the diagnoses of otitis media, gastroenteritis, and upper respiratory tract infection. Only eight laboratory tests and one x-ray procedure were ordered in the entire sample. Because of the low utilization of these dependent variables, they were considered too insignificant a number to test hypothesis 1 and 2, and these hypotheses were deleted from the study.

Figure 2 graphically represents the direction and magnitude of the effects of the type of physician group and diagnosis on the number of prescription medications ordered. The highest utilizing group appears to be the PRIMUS physicians, and the lowest is the military physicians.

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Insert Figure 2 about here

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The frequency of prescription medication utilization within the sample is not consistent with the expectation that the PRIMUS

physicians would be the most conservative with writing prescription medications, that the CHAMPUS partners would be the highest utilizers and that military physicians would be somewhere in between the PRIMUS and CHAMPUS physician groups.

Table 2 presents the source table and F ratios of the analysis of variance procedure as calculated using SAS software. The results indicate that there is no statistically significant interaction between the type of diagnosis and the provider group, and the utilization of prescription medication since  $F(4,261) = 1.96$  which does not exceed the critical value of  $F(4,261)$  which is 2.37 at .05.

However, significant main effects among the groups of providers and types of diagnoses emerged with  $F(2,261) = 6.01$ ,  $p < .05$  and  $F(2,261) = 81.46$ ,  $p < .05$  respectively. The critical value for  $F(2,261) = 3.00$ . These findings provide evidence that the number of medications prescribed is effected by both the diagnosis and the provider group. Based on these findings, the null hypothesis of hypothesis number three - that there is no difference among provider groups with respect to number of prescriptions written - can be rejected. The probability that all the provider groups prescribe medications at the same rate for the three diagnoses selected for study is less than five chances in one hundred.

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Insert Table 2 about here.

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The significant main effects, the effects of physician group and the effects of the type of diagnosis, were studied further using the Bonferroni (Dunn) T test to determine if significant mean differences exist among the three groups of physicians and the three types of illness and the utilization of prescription medication.

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Insert Table 3 about here.

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The mean rate of utilization of prescriptions between CHAMPUS Partnership physicians and both PRIMUS and military physicians was not significant. However, there is a significant difference in the utilization rate between PRIMUS physicians and military physicians with T(261) value exceeding the critical value of 2.41 at  $\alpha$  0.05. The mean difference between the number of prescriptions written for gastroenteritis was significantly different from the means of the other diagnosis groups with the T(261) value also exceeding the critical value of 2.41 at  $\alpha$  0.05.

#### DISCUSSION

The purpose of this study was to determine if there are statistically significant variations among three groups of primary care providers with regard to the utilization of specified units of

care to provide primary health care services to beneficiaries with the same diagnosis at Fort Hood. The results of the study suggest that a statistically significant difference in prescription medication utilization exists between military physicians and PRIMUS physician. The study shows that military physicians are the most conservative with resources, PRIMUS the most liberal and CHAMPUS Partners occupying the middle ground.

This result is unexpected since military physicians had no compelling economic incentives to conserve or be liberal with resources, while PRIMUS as a capitated system has a strong economic incentive to be conservative. However, these results support the assertion noted in the literature (Berndtson, 1986) that economic incentives are not the only factors influencing physician behavior.

The findings of the study support Wennberg's (1984) observation that significant variability can exist in how physicians choose and combine the available units of care to treat the same diagnosis. Wennberg's (1984) research focused primarily on regional differences in physician practice. This study demonstrates that variations can exist among physician groups treating similar diagnosis within the same patient population.

Clearly, the outcome of this study is good news for military hospital administrators at Fort Hood. Military pediatricians at Darnall Army Community Hospital appear to be disposed to the

conservative use of prescriptions when treating the most frequently seen pediatric diagnoses.

The finding that CHAMPUS Partners are not the most liberal group of prescribers is reassuring since they have the least economic incentive to be conservative. Only in the case of gastroenteritis did their medication utilization exceed the other two groups which was due to the predisposition to prescribe antiemetic and antidiarrheal medication more often.

The finding that PRIMUS is the highest utilizer of prescription medication in this study has no effect on the military treatment facility bottom line. Darnall pays one price if the patient receives one or fifty prescriptions. However, there needs to be concern about the long term effect of having to pay a higher capitated rate in the future. Further study should be done to see if the rate of medication utilization is higher over time and across a larger variety of diagnoses.

On the surface, it is unfortunate that not enough laboratory tests and x-rays were generated to do statistical analysis in this study. However, empirical treatment of common pediatric illnesses is accepted and appropriate practice unless the individual child shows signs of severe illness or complication. Patients in this sample do not appear to be subjected to unnecessary, risky and painful tests unless clinically indicated.

Caution should be used when interpreting and applying the results of retrospective studies such as this. By nature, the study describes a point in time and that time is in the past. Periodic sampling over time shows trends which can give much more useful information, and provides a basis for forecasting the future. An administrator cannot undo the past, but can act to alter future outcomes.

#### RECOMMENDATIONS

The issue of practice pattern variations in ambulatory care and the impact on resource utilization is important and should be of concern to hospital administrators. The importance is magnified by the ever increasing trend toward shifting workload from the inpatient to the ambulatory setting. Studies similar to this one looking at both the frequency of resource utilization and cost should yield interesting and useful results.

Physicians who are conservative utilizers within the system should be recognized and rewarded. Although our means are limited within the military direct care system, positive reinforcement of conservative utilization should be provided.

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LIST OF TABLES

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- Table 2. Analysis of Variance Source Table and F Ratios for Hypothesis Tests Regarding Utilization of Prescription Medications by Diagnosis and by Physician Group.
- Table 3. Bonferroni (Dunn) T Test Results for Differences in Medication Utilization Rate Among Types of Illness and Physician Groups.

Table 1. Means and Standard Deviations of Numbers of Prescriptions by Physician Group and by Diagnosis

Physician	Observations	Prescriptions	Mean	$\sigma$	$\sigma^2$
a. Military					
- GI	30	7	0.2333	0.5040	0.2540
- OM	30	39	1.3000	0.4660	0.2172
-URI	30	39	1.3000	0.5960	0.3552
b. Partner					
- GI	30	21	0.7000	0.7022	0.4931
- OM	30	41	1.3667	0.6149	0.3781
-URI	30	39	1.3000	0.7022	0.4931
c. PRIMUS					
- GI	30	17	0.5667	0.5040	0.2540
- OM	30	49	1.6333	0.6149	0.3781
-URI	30	44	1.4667	0.5074	0.2575

Table 2. Analysis of Variance Source Table and F Ratios for Hypothesis Tests Regarding Utilization of Prescription Medications by Diagnosis and by Physician Group

SOURCE	df	SS	MS	F-Ratio
TREATMENTS	8	54.16	6.77	
Factor A: Physician Group	2	3.56	1.78	6.01*
Factor B: Diagnosis Group	2	48.27	24.14	81.46*
AB Interaction	4	2.33	.58	1.96 ns
Error	261	77.33	.30	
Total	269	131.50		

\* $p < .05$

ns = not significant

Table 3. Bonferroni (Dunn) T Test Results for Difference In Medication Utilization Rate Among Types of Illness and Physician Groups.

a. Illness Groups

Bon Grouping	Mean	Number	Illness
A	1.4333	90	OM
A			
A	1.3556	90	URI
B	0.5000	90	GI

b. Physician Groups

Bon Grouping	Mean	Number	Physician
A	1.2222	90	PRIMUS
A			
B A	1.2222	90	Partners
B			
B	0.9444	90	Military

Alpha = 0.05 df = 261 MSE = 0.3423 CV = 2.41 Minimum Significant Difference = 0.2101

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Figure 1. The Clinical Process Model.

Figure 2. The Frequency of Prescriptions by Diagnosis Group and By Provider Group.

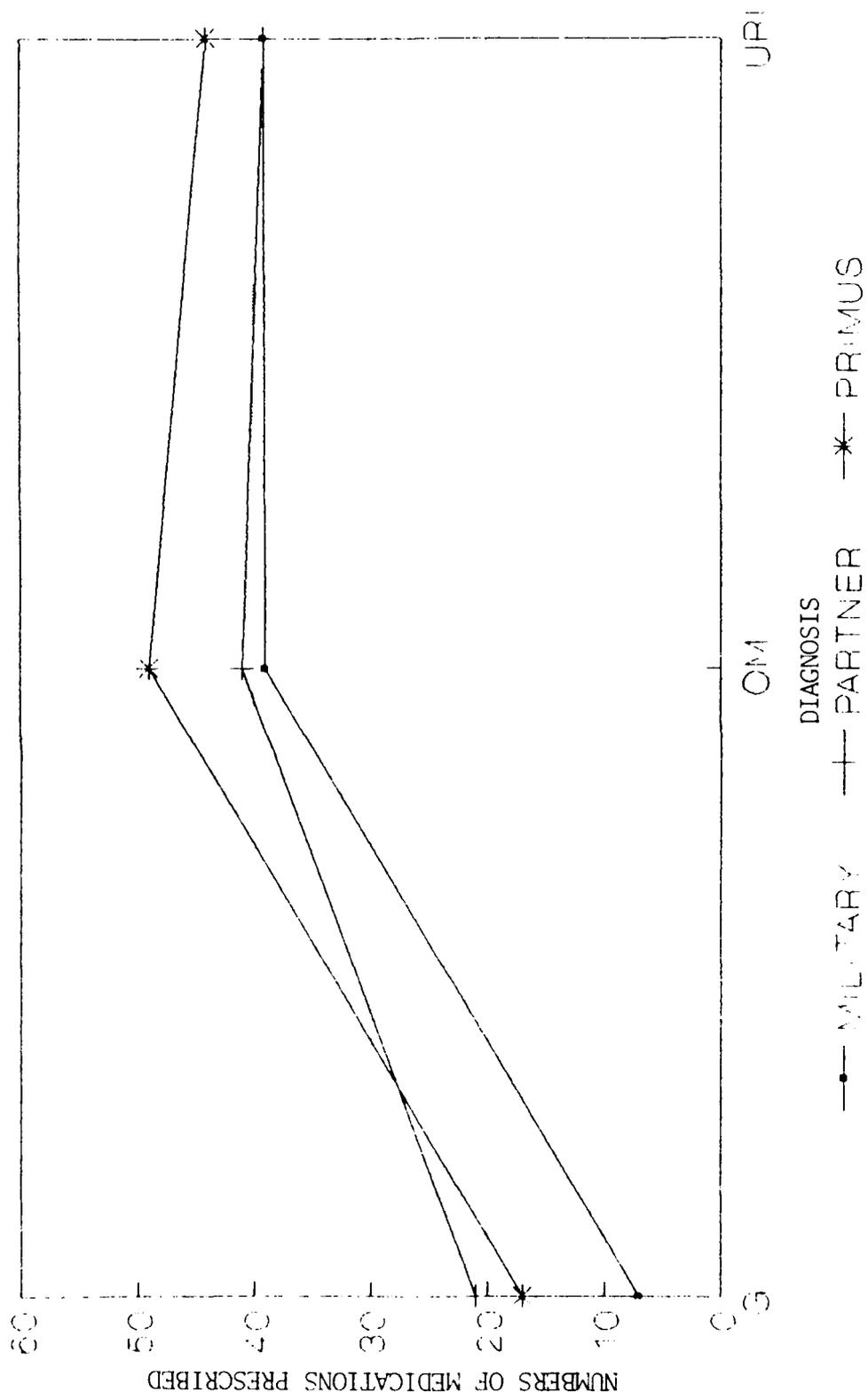


Figure 2. Frequency of Prescriptions by Diagnosis and by Provider Group