MEASURING THE EFFECTIVENESS OF DRUG UTILIZATION REVIEW IN A HEALTH MAINTENANCE ORGANIZATION

by

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ABSTRACT

This study attempted to evaluate the effectiveness of a Drug Utilization Review (DUR) Committee in altering the physician's prescribing patterns in a Health Maintenance Organization. Methods employed were: (1) a retrospective examination performed on computer drug profile printouts and activities of the Committee during an eighteen month period, and (2) a questionnaire exploring physician attitudes concerning the effectiveness of the Committee.

The following changes during the posttest period provided some evidence that the DUR Committee did alter the physician's prescribing patterns: (1) decreases in the ratio for the number of potential drug related problems which were brought to the attention of the Committee/total number of drug profile printouts, the number of drug related problems which were deemed important enough for follow-up action, and the number of times the same patient would appear for follow-up action, and (2) increase in the number of responses to the letters sent by the Committee. In addition, fifty-eight percent of the responses to the questionnaire indicated that the DUR Committee did assist the physicians in improving their prescribing patterns.

Four recommendations were formulated from this study, and if implemented, the method employed in this study may be used to evaluate other DUR programs.

CHAPTER 1

INTRODUCTION

It is readily apparent to the casual observer that the cost of health care in the United States is increasing at a rapid pace. It has been projected that our society will be spending between $156 to $189 billion for health by the end of the current decade which will be 8 to 9.8 percent of our gross national product (Cathcart, 1972). As the result of the public's concerns regarding the cost of health care, the federal government enacted in 1972, Public Law 92-603, the Professional Standard Review Organization (PSRO) Legislation, and in 1973, Public Law 93-222, the Health Maintenance Organization Act.

Public Law 92-603 fostered the use of the peer review concepts to evaluate the quality of health care provided by requiring the development of utilization review programs in institutions receiving Medicare, Medicaid, and Title V monies for patient care (Kabat et al., 1975). The Professional Standard Review Organization is viewed by the government as a management tool to insure the effective and efficient distribution of medical services (West and Stevens, 1974). The PSRO is generally looked upon as part of an attempt to get health care costs and quality of health care under control before any program of national health insurance is instituted.

Public Law 93-222 provided federal assistance in the development of a health maintenance organization (HMO's). The primary goal of a HMO is to provide high quality care most efficiently with the

greatest cost effectivenss (DeMarco, 1974). The health maintenance strategy established a priority for providing preventive care rather than episodic care, the focus of care was to be outpatient rather than institutional services (Johnson and Campbell, 1973). The Health Maintenance Act of 1973 included the requirement that a participating HMO provided for "an ongoing quality assurance program for its health services which...stresses health outcome..." (Schroeder and Donaldson, 1976, p. 49). This act provided the foundation for peer review. An HMO is a health care organization which is intended to provide comprehensive services to a voluntarily enrolled membership at a prepaid fixed fee (Carnoy and Koo, 1974). It is generally thought that national health insurance will revolve around some type of single-package health delivery system which could be similar to the HMO model (McCarthy, 1974).

Peer review refers to the evaluation of practicing professionals by other professionals who are in the same speciality, preferably the same type of geographical location, and same type of population density as the professionals they are reviewing. The primary purpose of peer review is to improve the quality, appropriateness, and effectiveness of medical services as performed by health care professionals (West and Stevens, 1974). The direct and indirect review of medical treatment by peers is not a new concept. This concept has been employed in the past as well as the present in such activities as: (1) consultations, (2) referral of patients and their records, (3) hospital staff roundings, (4) hospital medical staff programs, (5) maternal and prenatal mortality review committees, (6) tissue committees, (7) medical audit committees, and (8) utilization review committees.

There are two goals of drug utilization review. The first is to improve the quality of patient care, and the second is to contain or reduce drug costs through the prescription and the use of appropriate drugs in conditions for which their use, based on sound medical judgment, is indicated and at a minimal cost consistent with an acceptable quality of care (Brodie, 1972).

The most common type of drug utilization review committee is the Pharmacy and Therapeutics Committee. In most existing health organizational structures, the Pharmacy and Therapeutics Committee makes recommendations only, since it does not have inherent authority. In its advisory capacity, the primary purposes of the Pharmacy and Therapeutics Committee are to recommend the adoption and/or assist in the formulation of broad professional policies regarding the evaluation, selection, procurement, distribution, use, safety practices, and other matters pertinent to drugs utilized in patient care. The Pharmacy and Therapeutics Committee's other specific functions are to set up a drug formulary system, an investigational drug control system, an interest in drug distribution systems, a strengthening of the drug information systems, a drug surveillance program, a continuing drug education program, a system of clinical and pharmaceutical evaluation of drugs, the creation of a drug quality control program, and the evaluation of other contemporary pharmacy service concepts (Derewicz, 1968). The Pharmacy and Therapeutics Committee may be employed as part of the ongoing quality assurance program of a health maintenance organization in its drug utilization review function.

Purpose

The purpose of this study was to investigate the effectiveness of the Pharmacy and Therapeutics Committee in altering the Group Health Medical Associate's physician specialists prescribing patterns. Group Health Medical Associates is a professional corporation which provides medical services for the patient population of Group Health of Arizona which is a local health maintenance organization.

In order to determine the effectiveness of the Pharmacy and Therapeutics Committee in altering the prescribing patterns of the medical practitioners, the null hypothesis was tested. The null hypothesis being tested was that the Pharmacy and Therapeutics Committee will not affect the prescribing habits of the various physician specialties.

Assumptions

There were three assumptions for this study. First it was assumed that the patients enrolled in the Group Health of Arizona had their prescriptions filled at the Pharmaceutical Services of Tucson Pharmacies. Second, the pharmacists recorded all Group Health of Arizona prescriptions on the appropriate Pharmaceutical Card System forms correctly. Third, the Exceptional Patient Report identified all potential drug related problems of the medical group.

Limitations

This study had three limitations. First, this study was limited to an eighteen month period to examine the activities of the Pharmacy and Therapeutics Committee.

Second, the Pharmaceutical Card System Computer only printed profiles of patients who received more than the established: (1) maximum acquisition cost of prescriptions dispensed in one month, (2) maximum number of prescriptions dispensed in one month, and/or (3) two prescriptions of the same therapeutic class dispensed in the same month such as antibiotics.

Third, conclusions from this study are applicable only to the Drug Utilization Review Program employed by the Group Health of Arizona.

Definitions

1. Drug Profile is defined as the list of all drugs prescribed, including frequency of use, dosage forms, prices, and so on (Brodie, 1972).
2. Drug Utilization Review is defined as the process wherein peer groups look at usage data, determine which drugs are being used inappropriately and how they are misused, and then attempt to influence prescribers to improve their prescribing practices (Miller, 1974).
3. Exceptional Patient Report is defined as the patient profile that is printed by the Pharmaceutical Card System computer of anyone receiving more than $10.00 or $12.50 worth (acquisition cost) of prescriptions in any one month, more than three or four prescriptions in any one month, or more than two prescriptions of the same therapeutics class (such as antibiotics) in any one month.

4. Health Maintenance Organization is defined as a health care organization that is intended to provide comprehensive services to a voluntarily enrolled membership at a prepaid fee (Carnoy and Koo, 1974).

5. Patient Profile is defined as the record of medication prescribed and dispensed (and presumably consumed) for each patient, the amount dispensed, the prescriber, the provider, the acquisition cost, prescription number, age of patient, date filed, drug code, and co-pay.

6. Peer Review is defined as the evaluation of practicing professionals by other professionals, preferably the same type of geographical location, and the same type of population density as the professionals they are reviewing. Its primary purpose is to improve the quality, appropriateness, and effectiveness of medical services as performed by physicians (West and Stevens, 1974).

7. Pharmacy and Therapeutics Committee is defined as the advisory group of physicians and pharmacists which functions as the Drug Utilization Review Committee for Group Health of Arizona.

8. Prescription Drug is defined as a drug which by Federal Law may be dispensed only on the order of a physician, dentist, or other legally designated health care professionals. Drugs not in this category are non-prescription drugs (Pelosi, 1975).

CHAPTER 2

RELATED LITERATURE

Drug surveillance or "drug monitoring" studies are concerned with the clinical effects of drugs, especially adverse effects, while drug usage studies or "drug utilization" studies are concerned with identifying which drugs are used in a particular environment and describing how they are used (Miller, 1974). Drug usage review or drug utilization review is a process wherein peer groups examine usage data, determine which drugs are being misused, and then attempt to influence prescribers to improve their prescribing practices (Rucker, 1970).

A review of Index Medicus and International Pharmaceutical Abstracts revealed that there were numerous articles on the varied facets of drug utilization review. The journals were repleted with articles on drug usage review programs, computerized drug usage review systems, patterns of drug usage, and relationships between prescribers' characteristics and their prescribing.

Drug utilization review may be defined as an authorized, structured, and continuing program which reviews, analyzes, and interprets patterns (rates and costs) of drug usage in a given health care delivery system against pre-determined standards. This definition was the foundation for the conceptual model for drug utilization review proposed by Brodie and Smith (1976). Brodies' conceptual model was constructed around these five utilization review principles: (1) authority, (2) operational and demographic characteristics of the

delivery setting and service population, (3) knowledge of the existing pattern of utilization, (4) comparison of the latter with local standards, and (5) evaluation of the impact of review on utilization patterns.

Another general conceptual model of drug use review and control was proposed by Campbell et al. (1975) which consisted of four components. Goals and objectives which were conceptualized using Myer's criteria of good medical care which consisted of four essential and interdependent elements of accessibility, continuity, quality, and efficiency comprised one of the four components. Another component of Campbell's Model was the standards which were based on Donabedian's measures of structure, process, and outcome. The third and fourth components consisted of control methods which included local implementation, voluntary techniques and impersonal control techniques, and control agents.

A comprehensive program of drug utilization review should include a three phase system (Kabat et al., 1975). One of these phases was a prospective or pre-initiation screening of which the primary objective was to determine the appropriateness of a proposed diagnostic/therapeutic measure before initiation. Another was the concurrent monitoring of which the primary objectives were to insure that the right patient was receiving the right drug in the right amount at the right time by the right route of administration and to aid the clinician in detecting and minimizing adverse drug reactions or drug interactions early in the patients' therapy. The third and final phase was a retrospective review which will determine patterns of drug use for provider education. Drug utilization review has been shown to be of little value in improving

care in those programs which do not have a viable feedback mechanism or educational benefit for the prescriber (Kabat et al., 1975).

Brodie (1972) has outlined eight steps which pertained to the planning and development of most drug utilization programs. The first was to determine the sponsor's need and develop objectives for the program. The second was to determine the specifications of the data to be collected and how they were to be analyzed. Establishment of a system to collect and organize data according to the requirement of the program comprised the third step. The fourth and fifth steps were to develop programs to create profiles of drug utilization and to develop a capacity to interpret profiles of utilization. Next was the determination of what physical, personnel, and financial resources were required. The development of a program of education for physicians, pharmacists, nurses, and patients comprised the seventh step. The final step was to provide for evaluation of and the flexibility in the program as changes in drug utilization occur.

There were two goals of drug utilization review defined by Brodie (1972). The first was to improve the quality of patient care. The second was to contain and reduce drug cost which may be attained by the process of education. Utilization review without any feedback or educational benefit aimed at the prescribers was considered worthless (Gibson, 1970). This was different from the old traditional view of drug utilization review efforts which were focused on management activities. These activities were directed toward apprehending participants who were defrauding the program rather than placing a high

priority on improvement of the quality of drug prescribing and usage (Rucker, 1970).

The passage of the 1972 Professional Standard Review Organization Legislation, an amendment to the Social Security Act and the Health Maintenance Act of 1973, included an ongoing quality assurance program. This resulted in an increased number of drug utilization review studies and programs throughout the United States. Important stimulants to the development of current systems for drug utilization review were the introduction of private health insurance plans and the extension of the use of computers to utilization review process as necessitated by the administrative responsibilities for Title XVIII and XIX of the Social Security Act (Knoben, 1976). Most existing drug utilization review systems have been ambulatory care based, retrospective in nature (review of a prescribed drug occurs after the medication has been dispensed), and involved the review of drug reimbursement claims for pharmaceutical services covered under the Social Security Act (Knoben, 1976).

One of the earliest Drug Utilization Review Studies was the San Joaquin Program (Laventurier, 1972). In August 1970, a Drug Utilization Review Committee (DURC) was formed in the San Joaquin area which operated on the basic philosophy that a selected group of local practicing health professionals would review patterns of drug utilization in a program which they participated. In addition, they would establish parameters of current practice based on computer reports, determined variances from accepted local standards which should be researched, and from this study prepare guidelines of proper drug utilization. The Drug Utilization Review Committee's philosophy was one of using

persuasion rather than coercion in requesting compliance with the local and usual standard of good drug utilization practice. There was an educational program of professional enrichment designed to promote better patient care. The San Joaquin Medical Foundation, in conjunction with PAID Prescription, Inc. has been successful in demonstrating the effectiveness of voluntary drug use control techniques using peer pressure and ethical persuasion technique (Campbell et al., 1975). However, built into the system was the legal support by a section of the California Civil Code No. 43.7 (Laventurier, 1972). This code conferred immunity from liability to members of the Peer Review Community who engaged in review activities involving recommendation for denial of payment of claims and/or dismissal or participants from the drug program for cause.

North Carolina was the first state to incorporate drug utilization review into its Title XIX, Medicaid coverage which was based upon techniques that were similarly developed by Laventurier and his group in California for the Medi-Cal population (Hull et al., 1975). PAID Prescription administered the Title XIX, Medicaid Program for prescription benefits as well as the program for drug utilization review. The results of the peer review system have brought about a reduction in drug costs to state and federal governments in the Medicaid Program (Hull et al., 1975).

The early efforts of PAID in the area of drug-utilization review dealt with overutilization and other cost-control concerns. However, PAID has become more directly engaged in identifying quality-of-care problems and applying provider/recipient educational approaches

(Terselic, 1977). Terselic (1977) reported that PAID has provided such services as (1) routinely monitoring patient claims history in the drug program, (2) checking for drug interactions, (3) checking for medically inappropriate lengths of therapy for certain therapeutics classes, and (4) providing practitioners with the accessibility to a Professional Drug Information System.

A survey was conducted on the nature and extent of drug system services and costs within eleven health maintenance organizations (Johnson and Campbell, 1973). Settings were identified and analyzed, and the relationships among drug system attributes were identified in 1971. The results of Johnson and Campbell (1973) study suggested that only two of the eleven HMO's provided a formal prescription review and control, the other nine provided an informal prescription review and control.

An eighteen month study of 2,000 Medicaid subscribers at the George Washington University Health Plan was conducted in comparing diagnostic accuracy and therapeutic outcomes for contraception, depression, and hypertension relevant to the study population with ideal standards established by the HMO (Schroeder and Donaldson, 1976). The data collection was hampered by shifts in geography and financial eligibility among the denominator population and low response rates (38-63%) to telephone mail surveys. The results revealed widespread underdiagnosis (44-74%) in each condition, unacceptable therapeutics outcomes in depression and hypertension, and the need for additional studies of this and other outcome approaches to quality assessments (Schroeder and Donaldson, 1976).

In addition to the studies conducted in the Health Maintenance Organizations, hospitals have been conducting drug utilization studies. Montana Deaconess Hospital in Great Falls had begun data collection in accordance with the recommendations of the Joint Commission on Accreditation of Hospitals and the legal requirements for Medicare and Medicaid patients (Holbrook, 1975). The data accumulated began to show patterns of individual physician practice which will be useful in establishing future utilization review guidelines. It was expected that the new established utilization review guidelines would contribute to improved utilization and cost containment for all medical services (Holbrook, 1975).

At the Medical University of South Carolina Family Practice Clinic, a computer-based system designed to monitor outpatient drug utilization has been established which will store drug profiles and accumulate data as the basis for detecting problems (Braunstein and James, 1976). Since the physician in an outpatient setting is at a greater disadvantage than his hospital-based colleague in supervising his patients' drug therapy, a computer was used to screen for many potential drug related problems. Many of these problems included: (1) the patient may not have the prescription dispensed or he may have obtained less medication than was prescribed (often because of financial reasons), (2) the patient may have taken too much or too little of the prescribed agent, (3) the patient may have taken drugs which may interact or interfere with each other, (4) the patient may have erroneously obtained a medication in which he or she is known to be allergic, (5) the patient may have received duplicate prescription orders or

prescription orders for medications which were therapeutically equivalent, and (6) the patient may not have understood the proper use of the drug (Braunstein and James, 1976).

Utilization review has been a requirement of all skilled nursing facilities certified for participation in the Medicare and Medicaid Programs. This was the basis of a study conducted by Stewart et al. (1976) in five skilled nursing facilities in the Minneapolis - St. Paul area used to test the usefulness of the 10 drug protocols. It was recommended by Stewart et al. (1976) that the patterns of drug usage measured by a review system such as the one used in the five skilled nursing facilities could best be improved through peer review.

The New Mexico Professional Standard Review Organization had implemented a review system involving an initial screen of individual drug entity. The goals of the program were aimed at an ongoing identification of potentially significant drug-drug interactions, contraindicated prescribing based on diagnois, and deficiencies in drug-specific laboratory test requirement for outpatients (Knoben, 1976).

Drug utilization review should reflect city, county, and state-wide patterns of use which may be used in continuing education and assessment of quality of care (Pierpaoli and Bowman, 1972). There were several studies conducted in this area. One of the earliest studies on patterns of drug usage was conducted in a teaching hospital outpatient clinic involving 180 indigent outpatients who were taking a total of 403 presciption medications (Latiolais and Berry, 1969). The results of Latiolais and Berry (1969) showed four distinct patterns of drug usage. Seventy seven (42.8 percent) of the 180 patients sampled misused at

least one of their medications in some manner as defined under the guidelines for misuses of medication. Most frequently, types of misused medications were overdosage and omission of doses. Of the 77 patients who were misusing their medication, 46 of them (59.8 percent) were over 50 years of age, and 22 (28.6 percent) were over 60 years of age. The 77 patients misusing their medications were taking a total of 207 prescription medications which represented a prescription-patient ratio of 2.7 as compared to 1.8 for those patients taking their drugs correctly.

Another usage pattern study was conducted at Los Angeles County--University of Southern California Medical Center (Maronde et al., 1971). Fifty-two thousand seven hundred thirty-three (52,733) consecutive prescriptions were examined. Seventy-eight drug products most frequently dispensed to outpatients represented more than four-fifths of all the outpatient prescriptions. Thirteen percent represented excessive-quantity prescriptions which most frequently involved sedatives and tranquilizers. Only 1.7% of all the prescriptions were considered to involve too frequent prescribing of the same drugs, by either the same physicians or different physicians (Maronde et al., 1971).

A one year study of an American community's drug prescribing pattern indicated that a substantial proportion of the drugs prescribed were psychotropic agents (sedative or stimulant). These drugs accounted for 17% of all prescriptions, with almost 13% of all the patients receiving one of these agents through a doctor's prescription (Stolley et al., 1972b).

A comparison study of maintenance and non-maintenance outpatient prescriptions was conducted in a six county geographic region centered around a major midwest urban community (Gagnon et al., 1975). The results indicated that maintenance drug prescriptions tended to have lower dosage directions, lower costs per day, and lower frequencies of administration. In addition, maintenance drugs had higher quantities prescribed and dispensed, higher prescription prices, and extended length of duration. Gagnon et al. (1975) found that the frequency of administration and quantities prescribed had the greatest influence on the cost per day and length of duration for maintenance drug prescriptions.

Data derived from a 1968-69 household survey of 3,481 persons in the Baltimore Standard Metropolitan Statistical Area revealed several facts (Rabin and Bush, 1975). The rates of use for both prescribed and nonprescribed medicine were higher in females and varied with age, with nonprescribed varying less than prescribed. Nonwhites were less likely than whites to use either prescribed or nonprescribed medicines in all social status categories. The use of prescribed medicines increased with the increasing severity of acute and chronic illness, but use of nonprescribed medicines varied little with morbidity. The use of prescribed or nonprescribed medicine did not vary with economic class.

The Kaiser-Permanente Medical Center in San Francisco conducted an outpatient study which revealed four distinct patterns of drug usage (Lech et al., 1975). The heavy users of outpatient prescription drugs were more likely to be older, female, and white and to have blue collar occupations if male, or to be housewives, if female. The heavy drug

user tended to be a Health Plan member for several years--longer than the light user if under 65, shorter if over 65. Heavy drug use was associated with greater use of other medical care and was usually a persistent characteristic. Prepayment for drug prescriptions was not associated with heavy use.

A study of 53,306 Medi-Cal ambulatory and nursing home patients who were taking a total of 401,663 prescriptions during the fiscal year ending July 31, 1972, was examined for potential drug interactions by use of a computerized retrospective analysis (Laventurier et al., 1976). The study conducted by Laventurier et al. (1976) revealed two distinct patterns of drug usage. The first was that nursing home patients had considerably higher utilization rates than do ambulatory patients--42.1 versus 9.2 prescriptions per patient per year. The other pattern was that over 22 percent of the confined patients were exposed to at least one potential interaction situation, while only six percent of the ambulatory patients from the same population base were similarly exposed.

An examination of drug usage pattern for one year in two typical Australian cities, Traralgon, Victoria, and Sydney, New South Wales was performed (Wade, 1976). The study revealed that the Australian used between 6 and 7 prescriptions per capita which was a higher usage than the United States which was between 4 and 5 prescriptions per capita in 1973.

In addition to the drug usage pattern studies, there have been several studies which focused on the relationship between physicians' characteristics and their prescribing patterns. One of the earliest was conducted by the Los Angeles-University of Southern California Medical

Center (Maronde et al., 1971). There was a prescribing population of approximately 800 physicians in which 30 accounted for about 50% of the excessive quality prescriptions, and 20 of them accounted for about 50% of the cost of the excessive quantities. Maronde reported that when a physician wrote prescriptions for excessive quantities of one drug, he or she followed the same pattern with other drugs.

A survey of primary care physicians in private practice of a county with a population of approximately 112,000 persons located in a middle-Atlantic state was conducted by Becker et al. (1972) and Stolley et al. (1972a). This study revealed several characteristics of the more appropriate or better prescribers. The better prescribers were younger, more recent graduates who had taken additional courses and postgraduate training, but who had fewer years of experience in practice, maintained larger, hurried practices with more ancillary assistants, and spend less time with each patient. These practitioners were more cosmopolitan, modern, and concerned with both psychosocial and quality dimensions of medical care. Frequently, the more appropriate or better prescribers consulted with (and referred more of their patients to) other physicians and relied most heavily upon journal articles for drug information. They were critical of the pharmaceutical industry and supported an expanded role for the Federal Government in regulating drug quality and cost.

A review of literature by Dr. Russell R. Miller (1973) revealed three distinct relationships between physicians' characteristics and their prescribing patterns. Younger physicians appeared to be better prescribers and may introduce new drugs into their practice

sooner than older physicians. Scientifically oriented physicians utilized their colleagues as a reference group, rather than their patients and apparently introduced new drugs relatively early. The third relationship revealed that superior prescribers appeared to have questioning, critical attitudes toward prescribing and medical practice in general.

There has been much research on the varied facets of drug utilization review, but there has not been enough research on the documentation of the effectiveness of drug utilization review committees in modifying the prescribing pattern of physicians. Donald C. Brodie (1972) has stated that until an evaluation of the effectiveness of the review procedures has been made, improvement in any program is only conjectural.

In a Drug Utilization Review program, evaluation should be built around the following criteria: (1) changes in drug consumption and costs based on changes in the drug profile in successive years following establishment of the existing profile of utilization, (2) changes in apparent quality of patient care as evidenced by reduction in the incidence of adverse drug reactions, overutilization, and underutilization, and utilization of selected classes of drugs, (3) changes in the cost of the patient care as evidenced by the drug inventory, patient or third-party expenditures for drugs, and (4) the attitudes of both providers and receipients of care toward a Drug Utilization Review program (Brodie and Smith, 1976).

CHAPTER 3

DESIGN OF STUDY

Introduction

This study attempted to evaluate the effectiveness of the Pharmacy and Therapeutics Committee in altering the Group Health Medical Associate physicians' prescribing patterns. The necessary clearance was granted by the Group Health of Arizona's Pharmacy and Therapeutics Committee to conduct this study.

Group Health of Arizona (GHA) is a Health Maintenance Organization located in Tucson, Arizona, which has several unique features. The board of directors is composed entirely of community representatives, rather than physicians or a combination of physicians and community representatives. The Group Health Medical Associates (GHMA) is contracted as the professional corporation which provides the medical services for the patient population. The initial membership of Group Health Medical Associates was seven family practitioners, three internal medicine specialists, two pediatricians, and four nurse practitioners. Group Health of Arizona has no in-house pharmacy. To meet this need, Pharmaceutical Services of Tucson (PST), composed of thirty-nine independent community pharmacy owners, formed a non-profit foundation. Pharmaceutical Services of Tucson is the professional corporation which provides the pharmacy services for Group Health of Arizona.

The Pharmacy and Therapeutics (P and T) Committee is composed of physicians and pharmacists who are members of Group Health Medical Associates and Pharmaceutical Services of Tucson, respectfully. Patients who may have potential drug related problems are reviewed by the P and T Committee. Reviews of the patients' medical charts are completed during the Committee's monthly meetings. After discussion of the patients' medical cases, the P and T Committee determines if follow-up actions should be implemented. The Committee has two courses of action which are aimed toward improving the physicians' prescribing habits: (1) inserting notes into the patients' medical charts which state the drug related problems identified by the P and T Committee, and (2) sending letters to medical practitioners which identify the drug related problems uncovered by the P and T Committee and provide opportunities for them to respond to the letters. These letters are sent if the drug related problems are considered serious. The P and T Committee is employed as part of the ongoing quality assurance program of Group Health of Arizona in its drug utilization review function.

Methodology

Brodie and Smith (1976) recommended that in any Drug Utilization Review Program, evaluation should be centered around four principle criteria. The examination of changes in drug consumption and cost based on drug profiles of successive years following the establishment of an utilization profile was one criterion. The second criterion was the monitoring of changes in the quality of patient care as evidenced by reduction in the incidence of adverse drug reactions, overutilization,

and underutilization, and utilization of selected classes of drugs. The third criterion was to monitor changes in the cost of patient care as evidenced by drug inventory, patient or third party expenditures for drugs. The final criterion was to seek out the attitudes of both the providers and recipients of care toward a Drug Utilization Review Program.

Taking into consideration Brodie and Smith's recommendations, two of their methods were modified and employed to evaluate the effectiveness of the P and T Committee in altering the GHMA physicians' prescribing patterns. The first method employed was to determine whether or not any significant changes had occurred in the physicians' prescribing patterns during an eighteen month period. A retrospective examination was performed on the Exceptional Patient Report printouts and the activities of the P and T Committee during the eighteen month period were reviewed. The second method employed was a questionnaire which obtained the necessary data to determine the attitudes of the GHMA physicians toward the P and T Committee.

Examination of the Exceptional Patients Reports

A retrospective examination of the Exceptional Patient Reports (EPR) printouts was performed during an eighteen month period (January 1976 through June 1977). The eighteen months were divided into the following two periods: pretest period (January 1976 through June 1976) and posttest period (January 1977 through June 1977). The Pharmaceutical Card System (PCS) provided the monthly EPR printouts. The PCS forms (Appendix A) completed by the pharmacists when dispensing GHA

prescriptions provided the data base for the Exceptional Patient Reports. An Exceptional Patient Report was generated by the PCS computer if any patient fell within any of the three established parameters: (1) maximum acquisition cost of prescriptions dispensed in one month, (2) maximum number of prescriptions dispensed in one month, and/or (3) more than two prescriptions of the same therapeutic class dispensed in the same month such as antibiotics.

During the eighteen month period, two of the three parameters used to trigger the printing of the Exceptional Patient Reports were modified. The maximum acquisition cost of prescriptions dispensed in one month and maximum number of prescriptions dispensed in one month were the two parameters which changed. The pretest group was comprised of patients who received more than $12.50 worth (acquisition cost) of prescriptions in one month, more than four prescriptions in one month, and/or more than two prescriptions of the same therapeutic class in the same month. The posttest group was comprised of patients who received more than $10.00 worth (acquisition cost) of prescriptions in one month, more than three prescriptions in one month, and/or more than two prescriptions of the same therapeutic class in the same month. Any effects on the evaluation of the P and T Committee's activities caused by the two parameter changes have been taken into account by the use of proportions in the comparison of the pretest and posttest groups.

Pharmacy and Therapeutics Committee's Activities

Prior to the Pharmacy and Therapeutics Committee monthly meeting, an examination of the EPR printouts was performed. The

Exceptional Patient Report was the patient profile which provided information on: record of the medication prescribed and dispensed (and presumably consumed) for each patient during the past three months, amount dispensed, prescriber's identification number, pharmacy identification number, acquisition cost, prescription number, age of the patient, date dispensed, drug code, and copay (Appendix B). The EPR printouts provided the information used to identify potential drug related problems. Overutilization of medication, underutilization of medication, drug interaction, antibiotic switches, check potassium blood levels for patients taking digoxin and thiazide diuretics, and medication prescribed which may be contraindicated because of patient's age comprised this study's potential drug related problems. Hansten's Drug Interaction and the American Pharmaceutical Association's Evaluation of Drug Interaction texts were the reference base for the drug interaction problems.

The P and T Committee retrospectively reviewed usage of medications which occurred ninety days prior to the monthly meetings. Patients who may have potential drug related problems were reviewed by the Committee, and review of the patients' medical charts were performed during the Committee meeting. After a discussion of the patients' medical cases, the P and T Committee would then determine if follow-up action should be implemented. The Committee would follow-up by sending letters to medical practitioners and/or inserting notes into the patients' medical charts.

In order to determine the effectiveness of the Pharmacy and Therapeutics Committee in modifying the prescribing patterns of the

various physician specialties, the null hypothesis was tested by the following comparisons; the Pharmacy and Therapeutics Committee will not affect the prescribing habits of the various physician specialities:

1. The monthly average of patients who received more than two prescriptions of the same therapeutic class dispensed in the same month per patient enrollment for the pretest and posttest groups.
2. The total number of potential drug related problems which were brought to the attention of the P and T Committee per EPR printout during the pretest and posttest periods.
3. The total number of drug related problems which the P and T Committee deemed important enough for follow-up action per EPR printout during the pretest and posttest periods.
4. The number of times letters were sent to each physician specialty during the pretest and posttest periods.
5. The total number of responses to the letters sent to the physician specialties per letter sent during the pretest and posttest periods.
6. The number of times the same patients appeared for follow-up action by the P and T Committee during the pretest and posttest periods.

Statistical Analysis

Differences between the pretest and posttest groups were accomplished by examining the calculated z for differences in proportions. This two-tailed test was applied to all the appropriate data and alpha

was set at .05 (critical z value = $\pm$ 1.96). P_1 was the proportion = f_1/n_1 in which f_1 was the number from the pretest population which possessed the characteristic being observed, and n_1 was the random sample drawn from the pretest population. P_2 was the proportion = f_2/n_2 in which f_2 was the number from the posttest population which possessed the characteristic being observed, and n_2 was the independent random drawn from the posttest population. The formula applied is shown below (Glass and Stanley, 1970):

$$z = \frac{P_1 - P_2}{\sqrt{\left(\frac{f_1 + f_2}{n_1 + n_2}\right)\left(1 - \frac{f_1 + f_2}{n_1 + n_2}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Questionnaire

A questionnaire was developed to obtain the necessary data to determine the attitudes of the GHMA physicians toward the P and T Committee (Appendix D). The chairman of the P and T Committee sent a memorandum to each member of the medical staff prior to the distribution of the questionnaire which explained the intent of the questionnaire. A cover letter was attached with each questionnaire which also explained the intent of the questionnaire (Appendix C). During the next medical staff meeting which followed the mailing of the questionnaire, an announcement regarding the questionnaire was made. In order to assure a good response to the questionnaire, the above three different techniques were employed.

The information requested in the questionnaire was divided into several areas. Inquiry was made into the background of the various physicians to whom the questionnaires were sent. There were two questions which focused on whether or not the physicians understood the functions of the P and T Committee. In an attempt to sensitize the medical practitioners to their prescribing problems and to improve their prescribing patterns, these two procedures were employed by the P and T Committee: (1) inserting notes into the patients' medical charts, and (2) sending letters to the patients' physicians. Information regarding the effectiveness of these two methods utilized during the last six months prior to the mailing of the questionnaire was sought. Each physician also had the opportunity in the questionnaire to identify the strengths and weaknesses of the GHMA Pharmacy and Therapeutics Committee.

Likert-type scales were used to measure the attitudes of the medical practitioners regarding the Pharmacy and Therapeutics Committee. The questionnaire asked the physicians to indicate their degree of agreement or disagreement with the various statements. The lower the attitudinal score the more the respondent was in agreement with the statements. The following values were assigned to the responses for the purpose of analysis of the overall attitudes of physicians regarding the P and T Committee: strongly agree = 1, agree moderately = 2, no opinion = 3, disagree moderately = 4, and strongly disagree = 5.

CHAPTER 4

RESULTS AND DISCUSSION

Table 1 shows the number of patients enrolled in the Group Health of Arizona program and the number of prescriptions dispensed per month during the two test periods. Through the pretest period, there was an average of 4,146 prescriptions dispensed per month, and a total of 24,875 prescriptions dispensed. The monthly average patient enrollment was 18,145 during this period. There were increases in the number of prescriptions dispensed and individuals enrolled in the program during the posttest period. A monthly average of 5,099 prescriptions were dispensed during this period, and a total of 30,975 prescriptions were dispensed. There was a monthly average of 21,495 patients enrolled in the program during the posttest period.

The average monthly utilization ratios for the numbers of prescriptions used per enrollee during the two test periods were: (1) the pretest period was .228 and (2) the posttest period was .237. The result indicated that there was an increase in the usage ratio for the number of prescriptions prescribed for the number of patients enrolled in the program during the posttest period compared to the pretest period. The reason for the increase in usage ratio could not be identified in this study. A possible explanation for the cause of this increase in the usage ratio may be attributed to an increase in the number of prescriptions received by the new patients added to the program during the posttest period.

Table 1. Number of patients enrolled in the program and prescriptions dispensed per month during the two test periods.

Month	Number of patients per month		Number of prescriptions per month	
	Pretest[a]	Posttest[b]	Pretest[a]	Posttest[b]
January	16,013	21,223	4,235	6,039
February	16,882	21,565	3,256	4,409
March	16,971	21,449	3,843	5,803
April	19,659	21,445	4,115	5,102
May	19,543	21,537	5,574	3,690
June	19,801	21,751	3,852	5,552
Monthly Average	18,145[e]	21,495[f]	4,146[c]	5,099[d]

[a]Pretest period = January 1976 through June 1976.

[b]Posttest period = January 1977 through June 1977.

Pretest usage ratio (c/e) has a mean value of .228 with a standard deviation value equal to ± .035

Posttest usage ratio (d/f) has a mean value of .237 with a standard deviation value equal to ± .039.

Total number of prescriptions during the pretest period = 24,875.

Total number of prescriptions during the posttest period = 30,595.

Examination of the Exceptional Patient Reports

A summary of the Exceptional Patient Report (EPR) printouts during the pretest and posttest usage periods may be seen in Appendix E. There were a total of 980 printouts (monthly average of 163.3) for the pretest period and a total of 1,752 printouts (monthly average of 292) for the posttest period. This result indicated that there was an increase in the ratio (.014) for the monthly average EPR printouts/the monthly patient enrollment during the posttest period compared to the ratio (.009) for the monthly average EPR printouts/the monthly patient enrollment during the pretest period. This increase in the ratio must be attributed to the changes in two of the three parameters employed to trigger the printing of the EPR printouts.

There were 68 patients (a monthly average of 11.3) who received more than two prescriptions of the same therapeutic class in the same month during the pretest period. During the posttest period, there were a total of 71 patients in this category and a monthly average of 11.8 patients. There was no significant increase in the ratio for the monthly average of patients who received more than two prescriptions of the same therapeutic class in the same month/the average monthly patient enrollment during the posttest period compared to the pretest period. Since this was the only parameter of the three which was not changed, the following hypothesis was tested: the ratio in the posttest period for this category should remain relatively the same as the pretest period. There was a slight decrease in the ratio, but not enough to consider significant ($z = 0.20$, $p < 0.05$); see Appendix F.

Activities of the Pharmacy and Therapeutics Committee

A summary of the potential drug related problems which were brought to the attention of the Pharmacy and Therapeutics (P and T) Committee meetings during the months of March 1976 through August 1976 (pretest period) and March 1977 through August 1977 (posttest period) is shown in Table 2. This table actually represents the retrospective examination for drug usage during the months of January 1976 through June 1976 and January 1977 through June 1977. The potential drug related problems identified in this study were overutilization, underutilization, drug interaction, antibiotic switching, checking for potassium blood levels for patients taking thiazide diuretics and digoxin, and medication prescribed which may be contraindicated because of patient's age.

There were 98 potential drug related problems which were deemed serious enough to be brought to the attention of the P and T Committee during the pretest period. Of the 98 potential drug related problems identified from the 980 EPR printouts (10 percent), 70 were related to overutilization, and 20 were related to antibiotic switches. The other potential drug related problems identified were: drug interaction (4), checking potassium blood level for patients taking thiazide diuretics and digoxin (1), and medications prescribed which may be contraindicated because of patient's age (2).

During the posttest period, there were 113 potential drug related problems which were brought to the attention of the P and T Committee. This was 6.4 percent of the 1,752 EPR printouts which appeared during this period. During the posttest period, there were decreases in two

Table 2. Summary of potential drug related problems which were brought to the attention of the Pharmacy and Therapeutics Committee during the two test periods.

	Month													
	March		April		May		June		July		August		Total	
Problem	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post
Over - Utilization	14	11	15	14	11	14	10	8	11	13	9	9	70	69
Under - Utilization	0	2	0	1	0	2	0	0	0	2	0	0	0	7
Drug Interaction	0	5	1	1	1	3	2	0	0	1	1	2	5	12
Antibiotic Switches	3	3	1	2	4	4	5	3	3	2	4	3	20	17
Check K Level	0	2	1	2	0	0	0	0	0	0	0	0	1	4
Age Question	0	0	0	0	1	0	0	2	1	2	0	0	2	4
Total	17	23	18	20	17	23	17	13	15	20	14	14	98	113

Pre = Pretest period = March 1976 through August 1976.

Post = Posttest period = March 1977 through August 1977.

Pretest ratio (total number of potential drug related problems/total number of printouts) = 0.10.

Posttest ratio (total number of potential drug related problems/total number of printouts) = .064.

categories: overutilization (70 to 69) and antibiotic switches (20 to 17). There were increases in the other four categories: drug interaction (5 to 12), underutilization (0 to 7), checking for potassium blood levels for patients taking thiazide diuretics and digoxin (1 to 4), and medication prescribed which may be contraindicated because of patient's age (2 to 4).

The result indicated that there was a significant decrease in the ratio for the number of potential drug related problems which were brought to the attention of the P and T Committee/the total number of EPR printouts during the posttest period ($z = 3.6$, $p < 0.05$); see Appendix F. The ratio for the pretest and posttest periods were 0.10 and 0.64, respectively. The hypothesis was that the number of potential drugs related problems per EPR printouts would not change during the posttest period. The data did not seem to support this hypothesis. There was a decrease in the ratio which suggested that the P and T Committee was effecting the prescribing habits of the medical practitioners.

Table 3 reveals the number of drug related problems which the P and T Committee deemed important enough for follow-up action. There were 25 drug related problems which the Committee deemed important enough for follow-up action during the pretest period. Of the 25 drug related problems deemed important enough for follow-up action identified from the 980 EPR printouts (2.5 percent), twenty-four were related to overutilization, and one was related to a possible drug interaction. The number of drug related problems deemed important enough for follow-up

Table 3. Number of drug related problems which the Pharmacy and Therapeutics Committee deemed important enough for follow-up action during the two test periods.

	Total Number	
Problem	Pretest	Posttest
Overutilization	24	10
Drug Interaction	1	2*
Other problems**	0	0
Total	25	12

Pretest = March 1976 through August 1976.

Posttest = March 1977 through August 1977.

*Brought to the attention of the Medical Staff of Group Health of Arizona.

**Other problems: underutilization, antibiotic switches, age question, and check K level.

Pretest ratio (total number of drug related problems deemed important/ total number of printouts) = .025.

Posttest ratio (total number of drug related problems deemed important/ total number of printouts) = .007.

action by the P and T Committee decreased to twelve (0.7 percent of the 1,752 EPR printouts) during the posttest period. Of the twelve drug related problems, ten were related to overutilization (decrease of 14),

and two were related to a possible drug interaction (increase of 1). The two drug interaction problems were deemed so important that both were brought to the attention of the Group Health of Arizona medical staff.

These findings indicated that there was a decrease in the ratio for the number of drug related problems which the P and T Committee deemed important enough for follow-up action/the total number of EPR printouts for the posttest period ($z = 4.5$, $p < 0.05$); see Appendix F. The ratios for the pretest and posttest periods were 0.25 and .007, respectively. The hypothesis was that the number of drug related problems deemed important enough for follow-up action per EPR printouts would remain the same in the posttest period as the pretest period. The data did not seem to support this hypothesis. There was a decrease in the ratio which suggested that the Committee was improving the prescribing habits of the practitioners.

The number of notes written in the patient's medical charts and/or letters written to the patients' physicians during the pretest and posttest periods were listed by physician specialities in Table 4. There were twenty-one notes written in the medical charts, and four letters written to the patients' physicians during the pretest period. Internal Medicine and Family Practice had the largest memberships of all the specialty groups in the program. Internal Medicine had the greatest number of drug related problems which the P and T Committee deemed important enough for follow-up action. Thirteen notes were written in the Internal Medicine's patients' medical charts, and one letter was written to a member of the Internal Medicine Group. The next physician specialist group which received the greatest amount of

Table 4. Number of notes and/or letters written listed by physician specialists during the pretest and posttest periods.

Physician Specialty	Follow-up Action			
	Pretest		Posttest	
	N	L	N	L
Family Practice Pediatrics	6	1	0	5
Obstetrics General Surgery	0	1	0	0
Internal Medicine Dermatology	15	2	1	6
Total	21	4	1	11

Pretest = March 1976 through August 1976.

Posttest = March 1977 through August 1977.

N = notes written in patients' medical charts.

L = letters written to patients' physicians.

follow-up action from the Committee was the Family Practice Group (6 notes and 1 letter). The only other physician specialty group receiving follow-up action from the Committee was Dermatology (2 notes and 1 letter).

During the posttest period, there was one note written in the patient's medical chart (decrease of 20), and eleven letters written to the patients' physicians (increase of 7). Internal Medicine had the greatest number of drug related probems which the P and T Committee deemed important enough for follow-up action (1 note and 5 letters). There was a decrease of twelve notes written in the patients' medical charts, but an increase of four letters written to the members of the Internal Medicine Group. The next physician specialty group which received the greatest number of follow-up action was the Family Practice Group (4 letters). There was a decrease of six notes written in the patients' medical charts, but an increase of three letters written to members of the Family Practice Group. Both the Pediatrics and Dermatology Groups had one letter sent by the P and T Committee to a member in their respective groups. We would have expected both the Internal Medicine and Family Practice Groups to receive the greatest number of notes and/or letters since they comprised the largest memberships of all the specialty groups in the program and also prescribed more often.

For comparison purposes, one point was assigned for notes written in the patients' medical charts, and two points were assigned for letters sent to the patients' physicians. The point assignments were based on severity of the drug related problems. If a drug related problem was not severe, a note was written, and a letter was written if the drug

related problem was considered very serious. During the pretest period, twenty-one notes were written (21 points), and four letters were written (8 points). There was one note written (1 point) and eleven letters written (22 points) during the posttest period. The result from the scoring method revealed that there was a reduction of six total points between the pretest period (29 total points) and the posttest period (23 total points). Even though the results seem to suggest that there was an overall improvement in the prescribing patterns of the practitioners, the number of letters increased which may imply that the number of serious drug related problems increased. The cause of this increased number of letters may be attributed to the two members added to the Committee during the posttest period. Their influence on the Committee may have been to write letters instead of notes.

During the pretest period, the various physician specialties received four letters, but there were no responses to these letters sent. In the posttest period, there were eleven letters sent to the various physician specialties, and of the eleven, seven received responses from the physicians. Two of the letters were also brought to the attention of the medical staff. These two were drug interaction problems which were considered clinically significant: (1) aspirin and probenecid (decrease uricosuric activity of probenecid caused by aspirin), and (2) Norflex® and propoxyphene (result in confusion, anxiety, and tremor). The other four letters were sent to the same physician who did not respond. The hypothesis was that there would be no change in the number of responses to the letters sent by the Committee to the practitioners during the posttest period. The

data did not seem to support this hypothesis. There was an increase in the number of responses which suggested that the Committee was affecting the practitioners' prescribing patterns. In the posttest period, there was a 64 percent increase in the number of responses to the letters sent by the Committee to the practitioners. The increase in the number of responses would indicate that the practitioners were paying more attention to the follow-up action implemented by the Committee.

If there was improvement in the prescribing patterns of the practitioners influenced by the Committee, there would have been a decrease in the number of times the same patients would have appeared for follow-up action by the Committee during the posttest period. The data seem to support this hypothesis (Table 5). In the pretest period, there were four patients who appeared for follow-up action more than once. There was only one patient who appeared for follow-up action more than once during the posttest period. Eighteen different patients appeared for follow-up action during the pretest period, and only ten different patients appeared for follow-up action during the posttest period. The hypothesis was that there would be no change in the number of times the same patients would have appeared for follow-up action by the Committee during the posttest period. The data did not seem to support this hypothesis (Table 5). There was a decrease in the number of times the same patients appeared for follow-up action by the Committee during the posttest period which suggested that the practitioner's prescribing patterns were altered by the Committee.

Table 5. Number of different patients for whom the Pharmacy and Therapeutics Committee sent letters to their physicians and/or notes written in their medical charts during the monitored periods.

	Total number of letters and/or notes written for each patient				
Monitored period	#1	#2	#3	#4	Total
March-August 1976 (Total number of patients)	14	2	1	1	18
March-August 1977 (Total number of patients)	9	0	1	0	10

Responses to the Questionnaire

Of the twenty physicians surveyed, nineteen responded to the questionnaire for a 95.0 percent return. Seven of the nineteen who responded were members of the P and T Committee (4 from Family Practice, 1 from Pediatrics, 1 from Internal Medicine, and 1 from General Surgery). The average number of years in medical practice for those who responded to the questionnaire was 13.9 years (range = 1 year to 39 years in medical practice). Table 6 represents the physician profile of the GHMA members who responded to the questionnaire based on years in medical practice and listed by physician specialties.

There were two questions which focused on whether or not the physicians understood the functions of the P and T Committee. Eighteen of the nineteen physicians who responded to the questionnaire indicated they were familiar with the functions of the Committee. Nine indicated the primary function of the P and T Committee was drug utilization review, and four indicated education of the medical staff was the

Table 6. Physician profile of those who responded to the questionnaire.

Physician Specialty	Years in Practice				
	1-5	5-10	10-15	15-20	20+
Family Practice	2	0	0	1	2
Pediatrics	1	2	1	0	0
Obstetrics	0	0	1	0	1
Internal Medicine	0	0	3	1	1
General Surgery	1	0	0	0	1
Dermatology	1	0	0	0	0
Total	5	2	5	2	5

Total responded = 19

primary function. Five listed more than one answer, and one did not respond. The responses to the eighteen physicians are shown in Table 7.

Table 7. Summary of the responses to the question asking to identify the primary function of the Pharmacy and Therapeutics Committee.

Primary Function Response	Number
Drug Utilization Review	9
Education of the Medical Staff	4
More than one answer given	5
No response	1
Total responses	19

Two questions were aimed toward gaining insight into the effectiveness of the letters which were sent to the physicians. The responses to the two questions are shown in Table 8. The group generally expressed a neutral attitude toward the statement which stated that the letters had brought to the physician's attention additional information regarding their patients which they were not aware of, and had a mean value for this statement of 3.05; see Appendix G. The group as a whole also expressed neutrality toward the statement which stated that the letters were useful to the practitioners, and had a mean value for this statement of 2.79; see Appendix G. A score of 3 was considered neutral.

Table 8 also reflects the responses to the two questions which were aimed toward gaining insight into the effectiveness of placing notes into the patients' medical charts. The group generally expressed

Table 8. Value rating (mean ± SD) for the various attitudinal statements.

Statement	Value
Letters had brought to the physicians' attention facts regarding their patients which they were not aware of.	3.05 ± 1.20
Letters were useful to the physicians.	2.79 ± 1.24
Notes inserted into the patients' medical charts had brought to the physicians' attention facts regarding their patients which they were not aware of.	3.32 ± 0.85
Notes inserted into the patients' medical charts were useful to the physicians.	2.79 ± 1.00
Pharmacy and Therapeutics Committee had assisted in improving the physicians' prescribing patterns.	2.58 ± 1.23

neutrality toward the statement which stated that the notes inserted into the patients' medical charts had brought to the practitioners' attention additional information regarding their patients which they were not aware of, and had a mean value for this statement of 3.32; see Appendix G. The group as a whole also expressed neutrality toward the statement which stated that the notes inserted into the patients' medical charts were useful to the practitioners. There was a mean value for this statement of 2.79; see Appendix G. A score of 3 was considered neutral.

Fifty-eight percent of the physicians who responded to the questionnaire expressed that the P and T Committee did assist them in improving their prescribing patterns. One of the physicians who responded positive to this statement indicated that the P and T Committee meetings

were the factors which improved his prescribing patterns rather than the letters sent or the notes written in the medical charts. The group as a whole expressed agreement toward the statement which stated that the P and T Committee did assist them in improving their prescribing patterns. There was a mean value for this statement of 2.58 (see Appendix G), where a score of 2 indicated moderate agreement.

The physicians had the opportunity in the questionnaire to identify the strengths and weaknesses of the P and T Committee. The physicians could list more than one strength and/or weakness. These were the strengths identified by the physicians: (1) nine listed drug utilization review, (2) six listed maintaining a formulary, (3) three listed education of the medical staff, (4) three listed discussion of new drugs, (5) three listed identification of drug interaction, (6) one listed that the P and T Committee has multispecialties which comprised the Committee, (7) one listed that both the physicians and pharmacists participate together, and (8) one listed the Committee also monitored the pharmacists' performances. There were nine weaknesses identified by the physicians: (1) two responded that some physicians were not aware of the P and T Committee's functions, and (2) the following weaknesses were listed by one physician only: manual review limited in scope, invasion of privacy of patients, long dull meetings, unable to screen out enough bad treatment, not enough attention to who has primary care of patient, restricted prescribing certain medication, not updating the formulary often enough, and need more drug interaction monitoring.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The findings of this study provide some evidence that the Pharmacy and Therapeutics Committee did alter the Group Health Medical Associates physicians' prescribing patterns. The ratio for the number of potential drug related problems which were brought to the attention of the Committee/total number of Exceptional Patient Report printouts decreased during the posttest period (ratio = 0.064) compared to the pretest period (ratio = 0.10). This decrease implied that the P and T Committee may have altered the GHMA physicians' prescribing patterns.

There was a decrease in the number of drug related problems which were deemed important enough for follow-up action in the post-test period (12) compared to the pretest period (25). In addition, there was a significant decrease in the ratio for the number of drug related problems which the P and T Committee deemed important enough for follow-up action/total number of EPR printout for the posttest period (ratio = 0.007) compared to the pretest period (0.025). These decreases provided further evidence that the P and T Committee had altered the GHMA physicians' prescribing patterns.

The point assignments for the notes and letters written were based on severity of the drug related problems. The result from the scoring method revealed a reduction of six total points between the pre-test period (29 total points) and the posttest period (23 total points).

Even though the results seem to suggest that there was an overall improvement in the prescribing patterns of the practitioners, the number of letters increased which implied that the number of serious drug related problems increased. The cause of this increased number of letters may be attributed to the two members added to the Committee during the posttest period. Their influence on the Committee may have been to write letters instead of notes. The total number of follow-up action by the P and T Committee did decrease during the posttest period.

There was a decrease in the number of times the same patient would appear for follow-up action by the P and T Committee during the posttest period if improvement in the prescribing patterns of practitioners influenced by the Committee. This seemed to be the situation indicated by the data. There was a reduction of eight patients who appeared for follow-up action between the pretest period (18) and the posttest period (10). During the posttest period, there was only one patient who received follow-up action more than once, while in the pretest period, there were four patients who received follow-up action more than once.

If the P and T Committee was affecting the practitioners' prescribing habits, we would have expected an increase in the number of responses to the letters sent by the Committee to the practitioners during the posttest period. The increase in the number of responses would indicate that the practitioners were paying more attention to the follow-up action implemented by the Committee. There was a 64 percent increase in the responses to the letters sent by the P and T Committee to the practitioners in the posttest period. This provided

additional evidence that the P and T Committee had influenced the medical practitioners.

In addition to the evidence provided by the P and T Committee's activities during the eighteen months, the responses from the questionnaire also provided some evidence that the P and T Committee may have altered the prescribing habits of approximately 50 percent of the medical practitioners. A summary question inquired whether or not the P and T Committee did assist them in improving their prescribing patterns. Fifty-eight percent of the responses indicated that the P and T Committee did assist them in improving their prescribing patterns. The group as a whole expressed agreement toward the statement that the P and T Committee did assist them in improving their prescribing patterns. There was a group mean value rating for this statement of 2.58 where a score of 2 indicated moderate agreement.

In this study, there were some evidence which provided support that the P and T Committee did assist the GHMA physicians in improving their prescribing patterns.

Recommendations

Even though this study provided some evidence that the P and T Committee did assist the GHMA physicians in improving their prescribing patterns, further studies are needed to investigate the impact on the total drug program. It is recommended that an additional study be conducted to examine the cost/benefit ratio of the P and T Committee on the drug program. There is a need to establish a drug utilization profile for successive years. The results of such a study could show

the benefits from the changes in the physicians' prescribing patterns (i.e., changes in drug consumptions and costs) caused by the P and T Committee.

It is recommended that a follow-up study be conducted in which the methodology utilized to evaluate the P and T Committee's activities in this study be refined. The number of variables need to be reduced. In this study, we were unable to control for three important variables. The first was the modification of two of the three parameters which triggered the EPR printouts. In a follow-up study, the three parameters will remain the same. In this study, there was no control over the composition of the P and T Committee. The composition of the P and T Committee will have to be the same throughout the follow-up study. Since the program was at a period of growth, it was not possible to control the physician membership of Group Health Medical Associates. In a follow-up study, the same individual physicians rather than the speciality groups will be monitored throughout the study.

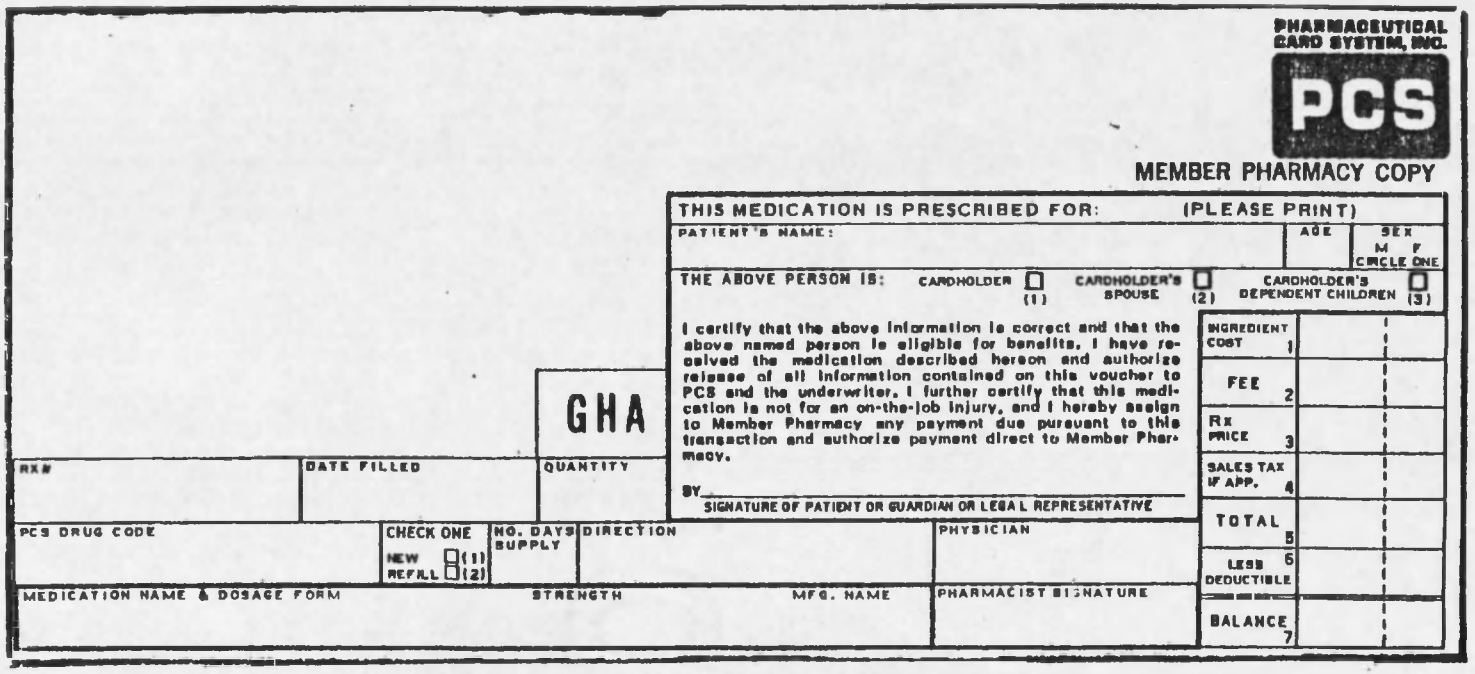
It is recommended that additional computer programs be sought to increase the efficiency of the drug utilization review procedure. The drug utilization review procedure employed in this study consisted of a semi-manual review of the computer printout information. This limited the scope of the drug utilization review to only a few areas, and by increasing the computer capabilities we could expand the range of the review process. An additional column of information should be added to the Exceptional Patient Reports to include the number of days supply of medication prescribed. This would provide information on how many times the medication should be taken. This additional

information would provide a better screen for identifying overutilization, and underutilization types of drug related problems. The degree of compliance could be seen directly from the printouts instead of having to pull the patients' medical charts, and this in turn would improve the efficiency of screening for this category. This is only one example of additional computer programs which might be sought.

The final recommendation is to employ additional parameters to the three utilized in this study. This study had its source of data limited by the three parameters (maximum acquisition cost of the total amount of prescriptions for one month, maximum number of prescriptions dispensed in one month, more than two prescriptions of the same therapeutic class in the same month) which triggered the printing of the Exceptional Patient Reports. These three parameters may have only identified potential drug related problems in certain areas. Further studies are needed to identify other parameters which might be employed in identifying additional potential drug related problems which may not have been identified by the three parameters which were employed in this study. Two possible parameters which might be included in future studies are: (1) drug interaction parameter, and (2) identification of patients who may be using too much or too little of a specific therapeutic class for more than one month (e.g., narcotic analgesic).

APPENDIX A

PHARMACEUTICAL CARD SYSTEM (PCS) FORM



PHARMACEUTICAL CARD SYSTEM, INC.

PCS

MEMBER PHARMACY COPY

THIS MEDICATION IS PRESCRIBED FOR: (PLEASE PRINT)

PATIENT'S NAME: | AGE | SEX M F CIRCLE ONE

THE ABOVE PERSON IS: CARDHOLDER (1) ☐ CARDHOLDER'S SPOUSE (2) ☐ CARDHOLDER'S DEPENDENT CHILDREN (3) ☐

I certify that the above information is correct and that the above named person is eligible for benefits. I have received the medication described hereon and authorize release of all information contained on this voucher to PCS and the underwriter. I further certify that this medication is not for an on-the-job injury, and I hereby assign to Member Pharmacy any payment due pursuant to this transaction and authorize payment direct to Member Pharmacy.

BY_____
SIGNATURE OF PATIENT OR GUARDIAN OR LEGAL REPRESENTATIVE

GHA

RX#	DATE FILLED	QUANTITY

PCS DRUG CODE	CHECK ONE NEW (1) ☐ REFILL (2) ☐	NO. DAYS SUPPLY	DIRECTION	PHYSICIAN

MEDICATION NAME & DOSAGE FORM	STRENGTH	MFG. NAME	PHARMACIST SIGNATURE

INGREDIENT COST 1	
FEE 2	
Rx PRICE 3	
SALES TAX IF APP. 4	
TOTAL 5	
LESS DEDUCTIBLE 6	
BALANCE 7	

APPENDIX B

EXCEPTIONAL PATIENT REPORT (EPR)

THE FOLLOWING MALE PATIENTS AGE 35-65 USED MORE THAN $12.50 OF RX'S PROCESS DATE 06/30/76

PHARMACY NUMBER	PATIENT ID		DRUG NAME	AGE	PHYSICIANS NUMBER	RX NUMBER	DATE FILLED	DRUG CODE	FORM ULARY	QTY	INGR COST	CO-PAY
03-0324	526-18-4989	00	COUMADIN TABLETS 5MG	62	AN3066398	0272137	05/04/6	21015		030	1.37	2.00
03-0324	526-18-4989	00	HYDRODIURIL TABLETS 50MG	62	AN3866398	0272139	05/04/6	23016		100	5.14	2.00
03-0324	526-18-4989	00	INDERAL TABLETS 40MG	62	AN3866398	0272136	05/04/6	21181		060	3.36	2.00
03-0324	526-18-4989	00	INDERAL TABLETS 40MG	62	AN3866398	0274737	06/08/6	21181		060	3.37	2.00
03-0324	526-18-4989	00	COUMADIN TABLETS 5MG	62	AN3866398	0274735	06/08/6	21015		100	4.89	2.00
03-0324	526-18-4989	00	HYDRODIURIL TABLETS 50MG	62	AN3866398	0274736	06/08/6	23016		100	5.14	2.00

THE FOLLOWING FEMALE PATIENT, AGE 1?9 USED MORE THAN 2 DRUGS WITHIN A THERAPEUTIC CLASS ARDC859 DATE 06/30/76

PHARMACY NUMBER	PATIENT ID		DRUG NAME	AGE	PHYSICIANS NUMBER	RX NUMBER	DATE FILLED	DRUG CODE	FORM ULARY	QTY	INGR. COST	CO. PAY
03=0535	527=90=2829	00	DIMETAPP ELIXIR	01	AV6000343	0047115	06/05/6	80063		240	2.04	1.00
03=0535	527=90=2829	00	NEOSPORIN OPTH. SOLU. 10C	01	AV6000343	0047114	06/05/6	31060		010	1.63	1.00
03=0535	527=90=2829	00	AMPICILLIN LIQ=250 MG/5CC	01	AV6000343	0047113	06/05/6	31140		200	4.40	1.00
03=0535	527=90=2829	00	AMOXICILLIN 125MG/5CC 150	01	AV6000343	0047466	06/10/6	31780		150	5.30	1.00

THE FOLLOWING FEMALE PATIENT, AGE 35-65 USED MORE THAN 4 RXS PROCESS DATE 06/30/76

PHARMACY NUMBER	PATIENT ID	DRUG NAME	AGE	PHYSICIANS NUMBER	RX NUMBER	DATE FILLED	DRUG CODE	FORM ULARY	QTY	INGR. COST	CO-PAY
03-0200	527-18-6284 01	TYLENOL W/COD 1/2GR #3	49	AG3314248	0244981	04/12/6	01043		024	1.83	2.00
03-0200	527-18-6284 01	DRIXORAL TABLETS	50	AG3314248	0244979	04/23/6	00065		100	9.96	2.00
03-0200	527-18-6284 01	TYLENOL W/COD 1/2GR #3	50	AG3314248	0244981	04/23/6	01043		024	1.83	2.00
03-0200	527-18-6284 01	VALIUM TABLETS 5MG	50	AG3314248	0245763	04/23/6	42091		050	3.89	2.00
03-0200	527-18-6284 01	TYLENOL W/COD 1/2GR #3	50	AG3314248	0246799	05/05/6	01043		050	3.81	2.00
03-0200	527-18-6284 01	CHLORPHENIRAMINE MALEATE	50	AG3314248	0246600	05/05/6	00076		100	1.00	2.00
03-0200	527-18-6284 01	PYRIDIUM TABLETS 100MG	50	AG5316345	0247012	05/26/6	03047		012	.80	2.00
03-0200	527-18-6284 01	VALIUM TABLETS 5MG	50	AG3314248	0245763	05/19/6	42091		050	3.89	2.00
03-0200	527-18-6284 01	VALIUM TABLETS 5MG	50	AG3314248	0247478	06/07/6	42091		060	4.94	2.00
03-0200	527-18-6284 01	LANOXIN TABLETS 0.25MG (D	50	AG3314248	0247476	06/07/6	21852		100	.46	2.00
03-0200	527-18-6284 01	DRIXORAL TABLETS	50	AG3314248	0247477	06/07/6	00065		100	9.97	2.00
03-0200	527-18-6284 01	AMINOPHYLLIN TABLETS 1 1/	50	AG3314248	0244978	06/23/6	02014		120	1.00	2.00
03-0200	527-18-6284 01	TYLENOL W/COD 1/2GR #3	50	AG3314248	0246799	06/23/6	01043		050	3.81	2.00
03-0200	527-18-6284 01	CHLORPHENIRAMINE MALEATE	50	AG3314248	0246600	06/23/6	00076		100	1.00	2.00

THE FOLLOWING MALE PATIENTS AGE 10-35 USED MORE THAN $10.00 OF RX'S PROCESS DATE 06/30/77

PHARMACY NUMBER	PATIENT ID	DRUG NAME	AGE	PHYSICIANS NUMBER	RX NUMBER	DATE FILLED	DRUG CODE	CONF QUARY	QTY	INGR. COST	DOS. PAY
03-0371	489-48-2441 00	ACTIFED TABLETS	27	AN3866398	0433582	04/07/7	00002		090	4.28	2.00
03-0371	489-48-2441 00	LIBRIUM CAPSULES 10MG	27	AN3866398	0439914	04/07/7	42022		060	2.23	2.00
03-0371	489-48-2441 00	LIBRIUM CAPSULES 10MG	27	AN3866398	0439914	05/23/7	42022		060	2.52	2.00
03-0371	489-48-2441 00	TYLENOL W/COD 1/2GR #3	27	AN3866398	0426615	05/23/7	01043		060	4.48	2.00
03-0371	489-48-2441 00	ACTIFED TABLETS	27	AN3866398	0433582	05/23/7	00002		090	4.28	2.00
03-0371	489-48-2441 00	DISOPHROL CHRONOTABS	27	AN3866398	0457427	06/13/7	00060		060	7.38	2.00
03-0371	489-48-2441 00	VANQUIL	27	AN3866398	0457428	06/13/7	02720		017	0.00	2.00

THE FOLLOWING FEMALE PATIENTS AGE 10-99 USED MORE THAN 2 DRUGS WITHIN A THERAPEUTIC CLASS PROCESS DATE 06/30/77

PHARMACY NUMBER	PATIENT ID	DRUG NAME	AGE	PHYSICIANS NUMBER	RX NUMBER	DATE FILLED	DRUG CODE	FORM ULARY	QTY	INGR COST	DSP PAY
03-0372	058-44-9755 00	AMINOPHYLLIN TABLETS 1 1/	25	AN3866398	0400294	04/11/7	02014		100	1.20	2.00
03-0372	058-44-9755 00	ALUPENT REFILL 15CC	25	AN3866398	0400295	04/11/7	02156		015	3.71	2.00
03-0372	058-44-9755 00	ALUPENT TABLETS	25	AN3866398	0401865	04/11/7	02196		060	4.68	2.00
03-0372	058-44-9755 00	AMINOPHYLLIN TABLETS 1 1/	25	AN3866398	0400294	04/30/7	02014		100	1.20	2.00
03-0372	058-44-9755 00	ALUPENT TABLETS	25	AN3866398	0401865	04/30/7	02196		060	4.68	2.00
03-0372	058-44-9755 00	ALUPENT REFILL 15CC	25	AN3866398	0400295	05/10/7	02156		015	3.71	2.00
03-0372	058-44-9755 00	AMINOPHYLLIN TABLETS 1 1/	25	AN3866398	0400294	05/22/7	02014		100	1.20	2.00
03-0372	058-44-9755 00	ALUPENT TABLETS	25	AN3866398	0401865	05/22/7	02196		060	4.68	2.00
03-0372	058-44-9755 00	ALUPENT REFILL 15CC	25	AN3866398	0400295	05/22/7	02156		015	3.17	2.00
03-0372	058-44-9755 00	ALUPENT TABLETS	25	AN3866398	0401865	06/06/7	02196		060	4.68	2.00
03-0372	058-44-9755 00	AMINOPHYLLIN TABLETS 1 1/	25	AN3866398	0400294	06/06/7	02014		100	1.20	2.00
03-0372	058-44-9755 00	ALUPENT TABLETS	25	AN3866398	0401865	06/10/7	02196		060	4.68	2.00
03-0372	058-44-9755 00	COMPAZINE SUPROS, 25MG	25	AB5316305	0410357	06/14/7	42014		012	4.15	2.00
03-0372	058-44-9755 00	ALUPENT REFILL 15CC	25	AN3866398	0400295	06/10/7	02156		015	3.17	2.00

THE FOLLOWING FEMALE PATIENTS AGE 35-65 USED MORE THAN 3 RXIS PROCESS DATE 06/30/77

PHARMACY NUMBER	PATIENT ID	DRUG NAME	AGE	PHYSICIANS NUMBER	RX NUMBER	DATE FILLED	DRUG CODE	FORM. VUARY	QTY	INGR. COST	CO. PAY
03-0200	487-03-3042 00	ERTHROMYCIN TABS 250MG(NO	60	AG5316345	0252711	04/01/7	31338		020	1.00	2.00
03-0200	487-03-3042 00	PREMARIN TABLETS .625MG	60	AM6370364	0252835	04/08/7	26018		300	4.31	2.00
03-0200	487-03-3042 00	AMINOPHYLLIN TABLETS 1.2/	60	AN3866398	0252880	04/11/7	02014		200	1.00	2.00
03-0200	487-03-3042 00	THYROID TABLETS 1GR	60	AM6370364	0252879	04/11/7	36032		300	.50	2.00
03-0308	487-03-3042 00	NORFLEX TABLETS	60	AM6370364	0503728	04/20/7	24002		024	4.60	2.00
03-0200	487-03-3042 00	DECADRON TURBINAIRE 02.00	60	AM6370364	0253213	04/27/7	35190		015	5.50	2.00
03-0200	487-03-3042 00	NAPROSYN TAB 250MG	60	AM6370364	0253214	04/27/7	22032		040	7.35	2.00
03-0200	487-03-3042 00	NAPROSYN TAB 250MG	60	AM6370364	0253214	05/17/7	22032		040	7.35	2.00
03-0200	487-03-3042 00	ORNADE SPANSULES	60	AN3866398	0253727	05/24/7	60021		060	6.79	2.00
03-0200	487-03-3042 00	THYROID TABLETS 1GR	60	AM6370364	0252879	06/06/7	36032		300	.50	2.00
03-0200	487-03-3042 00	NAPROSYN TAB 250MG	60	AM6370364	0253214	06/06/7	22032		040	7.35	2.00
03-0200	487-03-3042 00	AMINOPHYLLIN TABLETS 1.2/	60	AN3866398	0252880	06/06/7	02014		200	1.00	2.00
03-0200	487-03-3042 00	PREMARIN TABLETS .625MG	60	AM6370364	0252835	06/06/7	26018		300	4.31	2.00
03-0200	487-03-3042 00	NAPROSYN TAB 250MG	60	AM6370364	0253214	06/20/7	22032		040	7.35	2.00
03-0200	487-03-3042 00	ERTHROMYCIN TABS 250MG(NO	60	AN3866398	0254253	06/24/7	31338		040	2.00	2.00

APPENDIX C

COVER LETTER

GROUP HEALTH
MEDICAL ASSOCIATES, P.C.

2450 E. 6th St. ◦ Tucson, Az. 85719 ◦ 881-3670
6533 Carondelet Dr. ◦ Tucson, Az. 85710 ◦ 298-7841
ADMINISTRATION OFFICE
823 N. Wilmot Rd. ◦ Tucson, Az. 85711 ◦ 298-0222

February 2, 1978

Dear Doctor:

We are requesting that you complete the enclosed questionnaire. This questionnaire will attempt to determine the effectiveness of the Pharmacy and Therapeutics Committee in modifying the prescribing patterns of the various physician specialties who are members of the Group Health Medical Associates. No individual will be identified in the tabulated results. Please return the completed questionnaire in the enclosed envelope by February 17, 1978.

Thank you for taking the time to complete the questionnaire.

Sincerely yours,

Howard J. Eng, R.Ph.
Member, Pharmacy and Therapeutics Committee

Terry H. Vondrak, M.D.
Chairman, Pharmacy and Therapeutics Committee

sr

Enc.

APPENDIX D

PHARMACY AND THERAPEUTICS COMMITTEE QUESTIONNAIRE

This questionnaire will only take a couple of minutes to complete. Please do it now. From your responses, the Pharmacy and Therapeutics Committee will gain insight into its effectiveness. Your opinion is very important! Thank you.

Howard J. Eng, R.Ph.

How many years have you been in medical practice? _____

Please identify your medical speciality: _____

Are you a member of the Pharmacy & Therapeutics Committee? Yes ___ No ___

PLEASE CHECK THE APPROPRIATE RESPONSE

1. Do you know what are the basic functions of the Pharmacy & Therapeutics Committee?
   Yes ___ No ___

   If you have answered Question #1 with a negative response, proceed to Question #3.

2. Please identify what you perceive the primary function is of the Pharmacy & Therapeutics Committee. (Check only one alternative)

   Drug Utilization Review ___
   Maintain Formulary ___
   Education of Medical Staff ___
   Other ___ (Please specify) _____

RESPONSE CODE FOR QUESTIONS 3, 4, and 5: Please circle your answers.

SA if you strongly agree
A if you agree moderately
D if you disagree moderately
SD if you strongly disagree
NO if you have no opinions

3. As you may know, the Pharmacy & Therapeutics Committee may send letters to practitioners in an attempt to identify prescribing problems. As a mechanism to evaluate this process, we would like to know:

   a) How many letters have you received from the Pharmacy & Therapeutics Committee in the last six (6) months? _____

   b) The letter(s) have brought to my attention facts about my patient(s) that I was not aware of. SA A D SD NO

   c) I find the letter(s) very useful. SA A D SD NO

4. Another mechanism utilized by the Pharmacy & Therapeutics Committee to assist practitioners in their prescribing patterns is to insert notes into patients charts. We would like to know:

   a) How many notes have you received from the Pharmacy & Therapeutics Committee in the last six (6) months? _____

   b) The note(s) have brought to my attention facts about my patient(s) that I was not aware of. SA A D SD NO

   c) I find the note(s) very useful. SA A D SD NO

5. In your opinion the methods utilized by the Pharmacy & Therapeutics Committee have assisted in improving your prescribing patterns.

   SA A D SD NO

6. Please list below what you perceive to be the strengths and weaknesses of Group Health Medical Associates Pharmacy and Therapeutics Committee:

Strengths	Weaknesses
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____

PLEASE USE THE BACK OF THIS SHEET FOR ANY ADDITIONAL COMMENTS. Please return by February 17, 1978.

APPENDIX E

SUMMARY OF THE EXCEPTIONAL PATIENT REPORT PRINTOUTS FOR THE TWO TEST PERIODS

	Maximum acquisition cost		Maximum number of prescriptions		More than two drugs in same therapeutic class		Total	
	$12.50[a]	$10.00[b]	four[a]	three[b]	pre[a]	post[b]	pre[a]	post[b]
January	89	253	21	61	11	15	121	329
February	117	243	27	57	9	11	153	311
March	176	149	29	44	19	9	224	202
April	113	208	25	46	10	12	148	266
May	149	190	29	39	10	12	188	239
June	109	321	28	70	9	14	146	405
Total	753	1364	159	317	68	71	980	1752
Montly average	125.5	227.3	26.5	52.8	11.3	11.8	163.3	292
Standard Deviation[c]	28.7	54.1	2.8	10.8	3.5	2.0	33.5	65.9
Ratio[d]	.007	.011	.0015	.0025	.0006	.0005	.009	.014

[a]Pretest period = January 1976 through June 1976.

[b]Posttest period + January 1977 through June 1977.

[c]Standard Deviation = $\pm$ SD.

[d]Ratio = (Monthly average)/(Monthly average of patients enrolled in the program during pretest period or posttest period).

APPENDIX F

CALCULATION OF z VALUES

$z = 0.20,\ p < 0.05$

$$z = \frac{\left(\frac{11.3}{18145}\right) - \left(\frac{11.8}{21495}\right)}{\sqrt{\left(\frac{11.3 + 11.8}{18145 + 21495}\right)\left(1 - \frac{11.3 + 11.8}{18145 + 21495}\right)\left(\frac{1}{18145} + \frac{1}{21495}\right)}}$$

$z = 3.6,\ p < 0.05$

$$z = \frac{\left(\frac{98}{980}\right) - \left(\frac{113}{1752}\right)}{\sqrt{\left(\frac{98 + 113}{980 + 1752}\right)\left(1 - \frac{98 + 113}{980 + 1752}\right)\left(\frac{1}{980} + \frac{1}{1752}\right)}}$$

$z = 4.5,\ p < 0.05$

$$z = \frac{\left(\frac{25}{980}\right) - \left(\frac{12}{1752}\right)}{\sqrt{\left(\frac{25 + 12}{980 + 1752}\right)\left(1 - \frac{25 + 12}{980 + 1752}\right)\left(\frac{1}{980} + \frac{1}{1752}\right)}}$$

APPENDIX G

PROFILE OF THE VARIOUS PHYSICIAN SPECIALISTS RESPONSES TO VARIOUS STATEMENTS

Statement	Number of Responses				
	SA	A	NO	D	SD
Letters had brought to the physicians' attention facts regarding their patients which they were not aware of.	2	4	7	3	3
Letters were useful to the physicians.	3	5	7	1	3
Notes inserted into the patients' medical charts had brought to the physicians' attention facts regarding their patients which they were not aware of.	0	2	12	2	3
Notes inserted into the patients' medical charts were useful to the physicians.	3	2	11	2	1
Pharmacy and Therapeutics Committee had assisted in improving the physicians' prescribing patterns.	3	8	5	0	3

SA = Strongly Agree

A = Agree Moderately

NO = No Opinion

D = Disagree Moderately

SD = Strongly Disagree

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