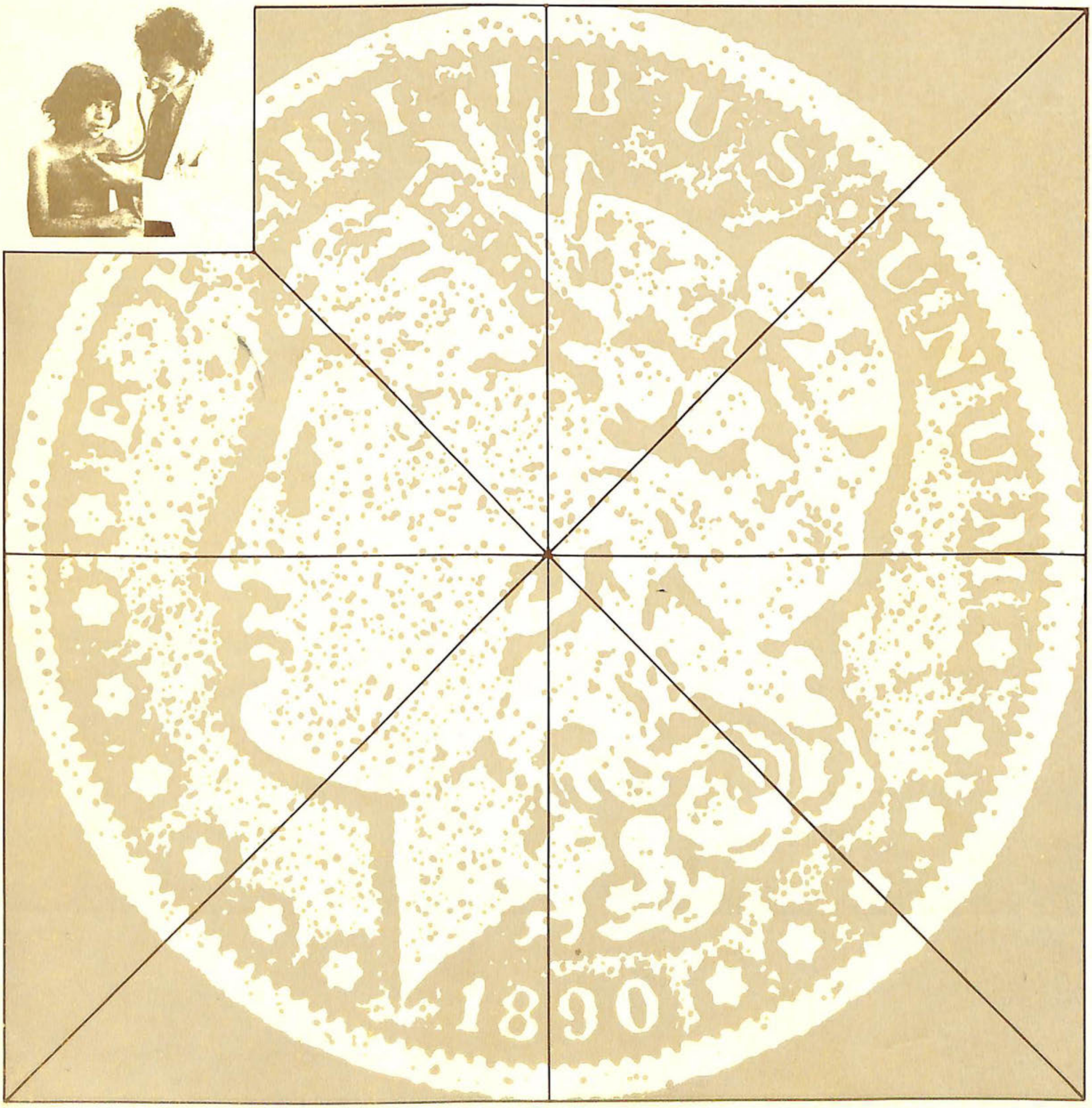
Cost Effectiveness of Physician's Assistants

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Resources Administration



FINAL REPORT

Cost Effectiveness of Physician's Assistants

HMEIA Contract N01-MB-44173(P)

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
Health Resources Administration
Bureau of Health Manpower

and

Kaiser Foundation Health Services Research Center
4610 S. E. Belmont Street
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April 28, 1976

Ms. Susan M. Horowitz
Project Officer
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Dear Ms. Horowitz:

This letter and the accompanying papers constitute the Final Report of the HMEIA Research Project [contract N01-MB-44173(P)] on the Cost Effectiveness of Physician's Assistants in the Kaiser-Permanente System of the Portland metropolitan area. The contents of the Report fully meet-- indeed, overreach-- the contractual obligations.

You and your colleagues in the Division of Medicine and we here at the Center, including the Associate Project Director, Dr. Joan E. O'Bannon, have been particularly eager to make the Project's findings as widely and as quickly available as possible. For that reason, we took advantage of an opportunity to present the basic methodology and the central findings to the Health Economics Research Organization (HERO) of the American Economic Association at the AEA annual meeting in Dallas at the end of December. That paper, revised, is Part I of the Project's final report. The paper was well received by health economists at that meeting and by others whose appraisal we have sought subsequently. Suggested amendments were minor, and most of them have been incorporated in the paper.

As you know, I presented the preliminary findings to an interdivision staff seminar in Washington on December 3. The Project's findings also were included in a presentation titled "Cost Effectiveness of New Health Professionals in HMOs: Research Issues and Experience in the Kaiser-Permanente System" which I made in San Antonio on February 11 at a conference on "Primary Health Care in the HMO/Prepaid Group Practice," sponsored jointly by the Group Health Foundation, the American Nurses Association, and the American Academy of Physician's Assistants (AAPA).

For the Fourth Annual Conference on New Health Practitioners held in Atlanta in April under the joint sponsorship of AAPA and the Association of Physician's Assistant Programs, we submitted a paper called "Evolution of a PA Program in the Oregon Kaiser-Permanente System: Policies, Practice Patterns, and Quality of Care." The authors, in addition to Dr. O'Bannon and me, are Dr. Robert H. Blomquist, an internist who coordinates the PA program in the Department of Medicine, and Mr. Benjamin Berger, chairman of the system's PA group. Mr. Berger made the presentation in Atlanta. The paper is presented here as Part II of the Final Report. There is of necessity some overlap between this paper and the one presented to the American Economic Association in December; that is, between Parts I and II of the Report.

Some data from the observation, focusing on provider-time variances between PAs and MDs within morbidity categories, were analyzed by Dr. O'Bannon, Dr. John Mullooly, and Ms. Marilyn McCabe of the Project research team and presented at the Ninth Annual Health Systems Symposium at Carmel, California in November, 1975. Although that paper, titled "Determinants of Lengths of Outpatient Visits in a Prepaid Group Practice Setting," went beyond the HMEIA contract requirements, it has been made an appendix (F) to the Final Report. As indicated in the Report, the findings of the paper influenced the way in which we handled some of the observation computations in assessing cost effectiveness.

Other speeches which I am scheduled to make about issues concerning new health professionals will provide an opportunity to include findings from the HMEIA Project; for example, at the Annual Conference of the Group Health Association of America in Denver in June and a Midwestern Veterans Administration conference on health costs in St. Louis in July.

We are moving as quickly as possible to get the Project findings published. Already four papers are in preparation for submission to journals. In addition to the Record-O'Bannon-Blomquist-Berger and O'Bannon-Mullooly-McCabe papers, two articles will issue from the HERO presentation: one, concentrating on methods of developing and analyzing the various kinds of data, will be written for submission to a social science journal; the other, focusing on the findings and their implications, will be prepared for submission to a medical journal. It is estimated that at least six or eight papers, based directly on or drawing heavily from the Project's findings, will be published. Eva Cohen and Ann Bliss at Yale have asked that two or three papers be submitted for inclusion in their forthcoming volume on new health professionals, to be published by Aspen. In sum, we hope to get the

Project's findings into good outlets, where they will be available for critical evaluation and for use by policy makers, as quickly as possible.

In closing, may I express to you again my warm appreciation for all of your courtesies. You have been an exemplary Project Officer.

Sincerely,

Jane Cassels Record

Jane Cassels Record
Project Director

JCR:ajd
Enclosures

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1. THE CENTRAL QUESTIONS

Are physicians' assistants (PAs) cost effective in the delivery of primary outpatient care by a large health maintenance organization? If so, what is the least-cost combination of physicians and PAs for delivering an annualized bundle of services, given the system's substitution policy? How much of a cost saving would be achieved annually if PAs were assigned to all of the outpatient services which the system defines as PA-appropriate and for which they are cost-effective? To what extent would the potential cost saving be frustrated by either (a) legal constraints or (b) physician preferences concerning case mix?

These are the central questions which the paper addresses. Section 2 discusses briefly the origins of the study and outlines the Kaiser-Permanente (K-P) system in the Portland Metropolitan area, the system which provided the laboratory for the study. Section 3

*An earlier version of this section of the report was presented to the Health Economics Research Organization of the American Economics Association at the AEA annual meeting in December, 1975, at Dallas. The authors listed for that paper were Jane Cassels Record, Joan E. O'Bannon, Paul D. Lairson, and John P. Mullooly. The paper as presented here has been rewritten for a more general audience. The paper also contains some refinements of data and analytical methods, which show PAs to be even more cost effective than the earlier estimates.

outlines the basic research strategy. Section 4 describes the kind of data required and the method of developing each data set. Section 5 sets forth the analytical framework, and also the findings, which show that the use of PAs can result in substantial savings for the system, under varying assumptions, as summarized in Table 4 on page 71 Section 6 discusses the findings and suggests some of their implications.

2. THE BACKGROUND

This paper discusses the primary methodologies and the findings of a research project funded on July 1, 1974, by the Bureau of Health Resources Development (BHRD)[1] under its Health Manpower Education Initiative Awards (HMEIA) program. The Kaiser Foundation Health Services Research Center at Portland already had done several studies assessing the delivery system's experiences with new health professionals. Those studies had inquired into the system's initial responses to PAs and nurse practitioners and had described the patterns of practice established by the newcomers.[2]

By the middle of 1974, the Department of Medicine had had nearly four years of experience with PAs in outpatient services -- long enough to permit an evaluation of PA efficiency. For that purpose the Research Center staff designed a two-phase study. Phase I, for which this report is done, focuses on Kaiser-Permanente's present policy with respect to PA substitution for physicians and asks the questions listed in Section 1, above. Phase II, which was funded by the Division of Medicine in the Bureau of Health Manpower (BHRD's successor) in August, 1975, and will be completed next August, starts from a different perspective. A panel of physicians, PAs, nurse practitioners, medical sociologists, medical economists and a medical social worker, using the experience of K-P and other systems, is inquiring into the outer perimeter[3] of substitutability, for inpatient as well as outpatient services, given only the constraint of quality assurance at an acceptable level. The study will go on to calculate the most efficient combination of physicians and new health professionals assuming that substitution is pushed to the outer perimeter, the total cost savings thereby achievable, the degree to which physician preferences and statutory limitations would prevent full substitution, and the "price tags" for those constraints in terms of frustrated savings to the system and/or to the public.[4]

A brief description of the Kaiser-Permanente delivery system in the Portland metropolitan area is appropriate. With a central hospital and five outlying ambulatory-care clinics,[5] the system has provided comprehensive prepaid health services to nearly 200,000

Health Plan members,[6] or approximately 18% of the area's total population. One clinic is across the Columbia River in Vancouver, Washington, a fact of some importance because the PA laws and regulations are somewhat different for the two states.

Medical services are provided by a partnership of 188 physicians,[7] representing almost all of the medical services. At the beginning of the study in 1974, the primary care services in the Department of Medicine were offered by 48 internists, 4 general practitioners, 2 family practitioners plus 5 PAs. The system's first PA began practice in September, 1970. PA services are confined to ambulatory care, and the 5 medical PAs are distributed among four clinics as follows: three clinics have one each; the fourth clinic, in Vancouver, has two. There are PAs in other departments -- Surgery, Orthopedics, and Pathology -- and there are nurse practitioners in Pediatrics, Obstetrics-Gynecology, and Medicine. This study, however, covers only the 5 PAs assigned to the Department of Medicine.

3. THE BASIC RESEARCH STRATEGY

The primary questions to be answered are: How many PAs would be required if PAs were assigned to <u>all</u> of the services which meet these two conditions: (a) the system deems the service to be appropriate for PAs to handle and (b) PAs can handle the service more cheaply than physicians? How many physicians would be required to do the rest of the work? How much money would the system save by adopting that combination of PAs and MDs?

Answering those questions requires the following:

1. A way of measuring the total output of services for the Department of Medicine during a given period, in this case a year.
2. A clear definition of system policy regarding:
   - A. Those services which are to be handled only by MDs
   - B. Those services which may be handled by PAs working under general MD supervision
   - C. Those services which a PA may handle only with specific MD consultation.
3. Annual frequencies for each of the services in A, B, and C.
4. The time which MDs on the average consume in providing each service in group A.
5. The time which PAs on the average consume in providing each service in group B, and the time which the average MD takes to provide those same services.
6. The average time which PAs and MDs, respectively, contribute in jointly handling each service in group C, and the average time which MDs, working alone, use in providing each of those same services.

7. The cost of a PA minute or hour or year and the cost of a physician minute or hour or year.

8. The number of hours in the PA year and in the MD year.

The above information can be used to sort out those services in group B which can be provided more cheaply by a PA than by an MD, and those in group C which can be provided more cheaply by a PA-MD combination than by an MD working alone. For each of those services, the annual frequency multiplied by the PA average time is the PA time required for that kind of service for the year. The sum of all such computations is the total PA time required during the year. That time figure, in total hours, divided by the hours in an average PA year, gives the number of PAs needed to perform all of the services for which they are both competent and cost-effective. When a similar calculation is worked out for the remaining services, an estimate can be made of the number of MDs that would be required.

The number of MDs multiplied by the average cost of a year of MD time plus the number of PAs multiplied by the annual average PA cost gives the total provider costs for the least-cost combination of MDs and PAs. That figure compared with what the total MD costs would be if no PAs were employed gives the cost savings of using PAs for all of the services for which they are both qualified and cost-effective.

We now proceed to describe how we developed the data necessary to make those and other computations; that is to say, the data requirements spelled out in 1-8, above.

4. DATA COLLECTION

Annual Output

Services included in the annual "output bundle" for this study fall into three categories: (1) primary-care services performed in the outpatient clinics by providers in the Department of Medicine; (2) other services, such as subspecialty work, day call/night call, administrative duties, and meetings, which also are regularly scheduled in advance; and (3) services, such as hospital rounds, which are not regularly scheduled in advance. Total annual hours were estimated for each of the three, using a different method in each case. Estimating (2) and (3) were relatively easy: the system's official schedules were the source for (2), and providers were interviewed for information about (3). For (1) it was necessary to select a uniform unit of measure, to break services into categories to which the system's policy concerning the substitution of PAs for physicians could be applied, and to estimate average provider times for each category by observation in the clinics.

Before more fully describing the methods of collecting data for (1), (2), and (3), respectively, it might be helpful to point out that the study views the providers' practices essentially as based in the primary outpatient services, with the services in (2) and (3) constituting an "overhead" of supportive functions which are largely derivative from primary care. The system uses PAs almost exclusively in the primary outpatient services. We therefore begin with (1).

The basic unit of measure selected for those services was the office visit (OV). It was chosen, despite its widely recognized frailties, because it was the best measure available.[8] The unit having been chosen, the next step in making an estimate of total annual output of primary outpatient services was to retrieve a two-year cut of out-patient data from the Research Center's computer-stored collections. For a 5% sample of health plan subscriber units the Center compiles, by routine medical chart analysis, a comprehensive record of all contacts with the system. For OVs, the record includes data on presenting and associated morbidities, with initial and updated diagnoses; types of visit, according to whether with or without appointment, initial or continuing; medical, x-ray, laboratory, and other procedures used in diagnosis and treatment; patient age and sex; and type of provider. The data are coded by expanded versions of the

International Classification of Diseases, Adapted (ICDA) and the California Relative Value Studies (CRVS).

For the base period of the study, two years rather than one were selected to get a larger numerical base, which then could be annualized. July 1, 1971, through June 30, 1973, was the most recent two-year period for which the Center's storage processes had been completed at the time the project was begun. Should initial or updated diagnoses be used? The latter were chosen primarily because this study in effect has a hindsight perspective: How much would the system have saved if the least-cost combination had been applied to a given bundle of output? A prospective approach to the same output bundle already had been designed, as Phase II, focusing on the sorting mechanism itself, with the use of chief complaints, symptoms, and other before-the-OV data as triage aids. Moreover, the difference between the initial and updated diagnosis per se would contribute little to either approach in view of the fact that only 6% of the initial diagnoses in the retrieved data were eventually changed.

It was hypothesized that provider time would be influenced by whether the OV was a "walk-in" (sometimes referred to as WA, meaning without appointment) or was scheduled; whether it was an initial or return visit for the illness episode; whether it was scheduled for 30 minutes or for the more common 15-minute interval; and whether it was for a complex or relatively simple morbidity, even when both were given 15-minute appointments. The annual output was broken down accordingly. The three major groups of morbidities and their subdivisions are discussed in the next section, in relation to alternative modes of providing services. (Table 1)

To obtain average provider times for the resulting 28 sub-categories (and to acquire other data), a clinical observation process was designed as follows. The 56 MDs then in the Department were sorted into 14 strata according to their productivity as measured by the average number of OVs handled per day. One physician was drawn randomly from each stratum, to provide a 25% sample. All 5 of the PAs were included in the observation.[9] Twelve weeks of observation were spread over November, 1974, February-March, 1975, and May-June, 1975, in three equal segments. Sitting outside of examination rooms, trained observers monitored 2681 OVs, in 160 clinic half days for MDs and 81 clinic half days for PAs, timing minutes spent by providers with each patient. The half days were distributed over clinics, providers, days of the week, and mornings and afternoons. In addition to observers recording the movements of providers, the medical chart for each OV was analyzed by the Center's medical record technicians, to provide morbidity and other useful data not available to the observers. The morbidity frequencies for observed OVs permitted the staff to judge the relative quality of the time data; subcategories were collapsed where frequencies were too low, as discussed later.

Although the observers, with one minor exception discussed subsequently, clocked only the provider-patient contact time, they did note for each half day the provider entrance and exit,[10] so as to be able to estimate the average clinic half-day. Of course, not all of the clinic time is spent with patients. Ideally, the average time estimate for a particular kind of OV would include both time spent with the patient and time spent on peripheral activities related to <u>that</u> OV type, such as telephone calls to order drugs, arrange hospitalization, or check lab results; writing in the patient's chart; and so on. Unfortunately, observers were not able to apportion noncontact time discretely among the OVs. Yet the noncontact time had to be included in the total OV output numerator in some fashion. How should that be done?

One alternative was to divide the total noncontact time for a clinic period by the number of OVs handled in that period. That kind of averaging, however, might seriously distort estimation of the least-cost combination if the ratio of contact to noncontact time is substantially different for relatively simple and relatively complex morbidities. Specifically, if the average noncontact time for complicated cases is different from that for simple cases, allowance must be made for the difference when estimating, for example, the number of physicians required after all of the simple cases are shifted to the PAs. To test for noncontact time differences, half days with varying mixes of "easy" (PA-appropriate) and "difficult" (physician-requisite) cases were compared, and it was found that the mix did make some difference in the ratio of contact to noncontact time. For that reason different ratios were applied to the categories. (See Table 1.) The formula for total annualized primary care hours, taking into account the noncontact time for each category, is:

$$20\,(F_1 T_1 + F_2 T_2 + \ldots\ldots\ F_n T_n)$$

where F = total frequency for the category

$T = t_c + t_{non-c}$

t_c = average patient contact time, observed

t_{non-c} = average noncontact time, derived residually[11]

20 = converter for 5% Sample

To this estimate of total annual hours required to produce the primary outpatient services must be added the total annual hours for (2) subspecialty work, administrative duties, and other regularly scheduled activities and (3) non-scheduled activities such as hospital rounds. For (2), the hours listed in the system's schedule records for the physicians in the study sample were annualized, then divided by the number of sample physicians, then multiplied by the number of physicians in the department. The few PA services in this group were treated similarly. For services in (3), observers interviewed the provider, during the observed clinic half day, about activities during the preceding 24 hours. These results were annualized for the whole department by imputation from the sample of physicians. The methods of collecting and annualizing the data for (2) and (3) are described in considerable detail in the discussion of The Provider Year, below.

The System's Substitution Policy

The system permits PAs to do only primary outpatient services. The only PA activities in (2) and (3), above, are in the hospital's outpatient services on Sunday, when the regular clinics are closed, plus meetings and travel time.

With respect to the clinics' primary-care services, the system may be viewed as having three production modes, or ways of handling the OVs: the physician working alone (MD Mode), the PA working alone (PA Mode), and the PA working with specific MD consultation (PA-MD Joint Mode). Physicians are perceived as completely substitutable for PAs and PAs as only partially substitutable for physicians.[12]

Because the degree of substitutability is defined in this study by K-P's present policy, it is necessary to state that policy as clearly as possible. When the system's first PA began practice in 1970, triage personnel were given a few general instructions about the kinds of OVs which PAs were not to handle: chronic diseases, physical exams for patients over 40, and complicated or life-threatening situations. Despite the fact that no morbidity lists were given to the triagers, the first PA study in 1972[13] revealed the triage error rate to be quite low; although there was no detailed protocol, the OVs sorted to PAs, as reviewed by policy-setting physicians in retrospect, appeared to be appropriate with few exceptions. There were several additional matters of policy. Patients were to be so informed when they were offered the services of a nonphysician, and they could opt for an MD. When PAs were introduced in the Oregon clinics in the summer of 1971, it was decided that they essentially would handle only walk-ins. Moreover, the patient was to see a physician no later than the third visit for the same complaint or illness.

Over the years PA practice patterns changed in some respects. For example, although walk-ins continued to be the major generator of PA services, the first PA in the Vancouver clinic began to develop, almost from the beginning, a small panel of patients who perceived him as their primary provider, and Oregon PAs eventually began to do more follow-up services for the walk-ins. Furthermore, the upper age limit for physicals and the third-visit rule became less firm. The respective PA and supervisor teams developed somewhat distinctive methods of working together within a few general policy constraints.

Because of the generality of the system's stated PA policy and its evolution over several years, the study staff decided that the definition of system policy should be essentially empirical rather than documentary: What were the PAs actually doing? To get at the answer, the OVs retrieved from the 5% Sample data for the two years prior to mid-1973 were categorized by type of provider; specifically, they were divided into morbidities (ICDA numbers) which had been triaged to PAs and those which had not been triaged to PAs. Each of the two sets was further divided into initial and continuing visits (for the same illness episode) because the propriety of triaging a patient to a PA is not always the same for the two.

There are several reasons for not trying to read the system's PA policy literally from those print-outs without modification. First, the mere fact that morbidity X on at least one occasion had been triaged to a PA would not establish the appropriateness of PA services under K-P policy. In the same vein, the fact that the empirical data did not show a single instance of morbidity Y having been triaged to a PA would not necessarily indicate its inappropriateness: A low-frequency morbidity might not appear at all in a 5% sample; if it did, its numerical chances of being triaged to one of 50 physicians would be greater than to one of five PAs, even if the morbidity was clearly PA-appropriate. One of the study's consulting physicians reviewed the lists for such incongruities; the resulting amendments were relatively few, especially with respect to nonappropriate PA services.[14]

A second, and more serious, reason for reviewing the lists was the unfortunate circumstance that the charts from which the data originally were collected do not always indicate whether the PA handled the OV alone or sought specific physician help, beyond routine supervision; that is to say, whether the PA consulted the MD about the patient (perhaps even had the MD examine the patient).[15] The issue is important because a PA managing the OV alone is a production mode quite different, in time and cost implications, from a PA managing an OV with a discrete physician input. Because we could not break the two modes neatly apart in the retrieved data, and because PA practices had continued to change somewhat after mid-1973, the five PAs and their supervisors were asked in the spring of 1975 to go over the morbidity lists to sort OVs into six subcategories according to system policy as it was then being carried out in the clinics:[16]

Category A - Appropriate only for MD (MD-requisite)
  Initial Visit
  Continuing Visit

Category B - Appropriate for PA without specific help (PA-appropriate)[17]
  Initial Visit
  Continuing Visit

Category C - Appropriate for PA with MD consultation (PA-appropriate with consultation)
  Initial Visit
  Continuing Visit

The team reports varied substantially, especially with respect to whether and in what circumstances morbidities properly triagable to the PA should be handled alone or with physician consultation. One PA might state that he or she never handled morbidity X. Another might say he or she did handle it, alone; still another that consultation routinely occurred. In the case of many morbidities the same PA sometimes consulted the MD and sometimes did not, and the determinants of choice were not always capturable in the basic data -- or quantifiable even when the variables were identifiable.

Therefore, it seemed preferable to make a fresh start with two basic OV groupings: those morbidities which under present policy should be triaged only to MDs and those which are appropriately triaged to PAs. The PA bundle then could be subdivided into "handle alone" and "consult MD" by treating the "consults" as a percentage of the total category. Fortunately, in the observation (as opposed to the 5% Sample) data, consultations can be cut cleanly out of the total OVs handled by PAs; the resulting figure for consultations is 12% of the PA bundle.[18]

The three basic morbidity categories established in the above manner, and their derivative production modes, are shown in Table 1. The physician is an appropriate mode for all three categories of output. The PA unassisted is an appropriate mode only for Category B. (Theoretically, the PA-MD joint mode is also appropriate for Category B in the sense that the mode comes within the quality constraints of present policy, but it has no practical significance because of the way in which Categories B and C are defined.) The MD and the PA-MD modes are the only acceptable modes for Category C.

Costs

The Output section described the way in which a year's output could be calculated in total services provided by the Department. The section on The System's Substitution Policy described the division of annual output so as to reveal which services are appropriate for PAs to perform either alone or jointly with the physician, as defined above.

The next question is which of the PA-appropriate services can be performed more cheaply by PAs than by MDs. The answer for Category B, for example, depends upon (a) the relative cost-per-minute of a PA and of an MD and (b) the average minutes it takes PAs and MDs, respectively, to perform services in that category. For Category C the same kind of comparison must be made for the MD working alone as opposed to the MD/PA combination. The observation produced the time data; following paragraphs describe the way in which the cost data were developed.

With respect to overhead costs, investigation revealed no appreciable differences between MDs and PAs, within the range of PA competence, for space and equipment in primary care services. (See footnote to Table 2.) The same was true for malpractice insurance because, at the time the cost calculus was made, the carrier billed the system on the basis of the size of the Health Plan population rather than on the number of providers.

In the realm of variable costs, the most striking differential between PAs and MDs is in basic salary or income plus fringe benefits. Should average or starting incomes be used? Average incomes for 1972 were chosen because the issue is not whether an MD or a PA should be added to an existing staff but how many MDs presently working in the Department would be replaced by PAs. In 1972, the average income including fringe benefits was $47,626 for MDs.[19] For PAs the average salary with fringe benefits was $14,612.

An adequate cost comparison is, of course, much more complex than that. Do PAs and MDs on the average use system resources differentially? It seems reasonable to assume that the answer in some cases, such as general medical supplies, is no. In two cases the answer is obviously yes. First, PAs are aided by clinic assistants; doctors, by RNs or LPNs. The average "nurse cost" differential, annualized, was $3,177 per PA.[20] That figure appears in the PA cost column of Table 2 with a minus.

Second (and more important in that it is not primarily a system idiosyncrasy as is the nurse cost differential), PAs require MD supervision. The MD input into PA services[21] has both a divisible and an indivisible component, and the two can be separated for analytical purposes. The MD's schedule is supposedly lightened by half an hour in the morning and the same in the afternoon for supervision of the PA. Supervisors were asked whether an hour per day (five hours per week) is an accurate measure of the physician's PA-related activities, including consultation on specific OVs as well as routine review of PA charts (after the patient has left the clinic), paper work, education, and other such activities. The answers were yes. From the observation data, specific consultations were estimated as an hour per week. The other four hours were annualized (they constitute 7.83% of the MD year) and treated as a PA cost item. In other words, among the various costs of employing a PA is 7.83% of an MD's time for general supervision.[22]

The other component of MD input into PA services -- consultation on specific OVs -- is more appropriately handled in another way. That cost is divisible and therefore can be treated as directly chargeable to individual OV subcategories. Those individualized charges were included in the cost calculation of alternative production modes to determine the most efficient mode for producing a particular category.

Other cost-differential possibilities were investigated. For instance, do MDs and PAs use laboratory and x-ray resources differently for the same morbidity situation? It had been hypothesized that PAs might use such supportive services more heavily because of greater uncertainty or less confidence than MDs.[23] A physician consultant compiled a list of lab-sensitive morbidities and a list of x-ray-sensitive morbidities, all in the PA-appropriate range so that MD and PA use of supportive services could be compared within the same morbidity frames. Because the results were so close,[24] and because homogeneity is so difficult to assure, this comparison was ignored in the final cost calculus.

There are several other cost-sensitive areas. Take the problem of triage errors. If many patients are erroneously sent to PAs and then transferred to physicians, the mistakes can reduce substantially the cost savings achievable by employing PAs. The same is true if PAs have greater "down time" than MDs because of a higher "no show" or appointment-cancellation rate; or if it takes PAs longer than MDs to diagnose an illness and the system thereby incurs extra OVs.

Attempts to make comparisons in these areas got mixed results. In the observed OVs handled by PAs, a triage error, as determined and reported by the PAs themselves, occurred in 1% of the cases for Categories B and C taken together. Therefore, extra minutes of PA cost and/or MD cost (see Table 1) were included in the cost comparison of MDs and PAs for subcategories in B and C.

PAs have about the same appointment-failure as MDs do: 6.5% versus 7% for patients who do not appear and do not cancel, and 6.8% versus 5.9% for patients who call ahead to cancel. Moreover, empty slots in the schedule almost always are filled by walk-ins, and because neither PAs nor MDs appear to experience much down time, a cost differential here is unlikely.

The effort to compare PA and MD diagnostic prowess came to little. Although comparison was made only with respect to relatively noncomplex, high-frequency morbidities, the protocol used was not sophisticated enough to control for nonhomogeneity. (See Part II, Section 5.)

In sum, the nondivisible cost items--costs which do not vary directly with output, such as nurse costs and general MD supervision--are set forth in Table 2, which shows the cost to the system of a year of PA time and a year of MD time. The two divisible costs, specific MD consultation and triage error, which do vary with output and can be attributed to specific OV subcategories, have been included in the analytical model as extra inputs of provider time, and therefore extra costs, where they occur. For example, although MD general supervision time is included in the calculation of a PA's annual cost and therefore in the cost of a PA minute for Category C, the MD's specific input for that category is computed in MD costs per minute and added to the cost calculation for the OV groups. As it turned out, there tended to be little difference between the MD's time input whether he handled the OV alone or jointly with a PA, so that what the system lost in such cases was the PA's time. More will be said about this in Section 5, in the discussion of which OV groups can be handled more cheaply by MDs alone than by a PA-MD combination.

As shown in Table 3, the annualized cost of a physician is $47,626; the annualized nondivisible cost of a PA (including 7.83% of a physician) is $15,164. Thus the nondivisible cost of a PA for a calendar year is roughly 32% of an MD calendar year. The PA hourly cost, however, is 49% of the MD hourly cost because of the longer physician work week, as shown in the next section. (See Table 2.)

<u>The Physician Year and the PA Year</u>

The data described thus far will permit the calculation of total annual hours of output to be performed by MDs and PAs, respectively. To get the number of MDs and PAs required to produce the two bundles of output, perceived as numerators, the respective denominators -- that is, the MD average year and the PA average year -- are needed.

The MD year is composed of (1) scheduled hours of primary care, (2) scheduled hours of subspecialty work, day call, administrative duties, and so on, and (3) nonscheduled services such as rounds. (See Table 3.)

Estimation of the annual primary care hours for physicians began with the average hours worked in a clinic half day as observed in 107 half days over eight weeks (the second and third observation months.)[25] That figure multiplied by the total number of half days produced by the 14 physicians in the observation sample and then divided by 14 and by eight gave the average hours per week per physician. The question then arose as to the number of weeks in the physician year.

The 14 physicians in the observation sample actually worked a total of 690 clinic half days during the eight weeks. In that same period physicians took 79 half days of vacation and educational leave.[26] Most physicians are entitled to four weeks of vacation and two weeks of educational leave per year; they tend to take all of the vacation and about half of the leave. In calculating the doctor's clinic year for primary care, the five weeks of absence could be handled in two ways: (1) by adding the 79 vacation-and-leave half days to the 690 and using a 47-week year or (2) by adopting the 690 figure and using a 52-week year. For this study the first option was chosen.[27] Thus the total half days in the clinic for all 14 doctors during the eight weeks were stated as 769. Of that group, 692 applied to clinics with a normal five-day work week and 77 to one clinic which was experimenting with a four-day work week. The average hours per half day, as observed, were 3.81 and 4.07,[28] respectively. Thus the average clinic hours per physician per year are approximately 1238, calculated as follows:

$$47 \times \left(\frac{3.81 \times 692}{8 \times 14}\right) = 1106.40$$

$$47 \times \left(\frac{4.07 \times 77}{8 \times 14}\right) = 131.51$$

$$\overline{}$$

$$1237.91 \text{ Total}$$

To the clinic hours must be added, to get the physician year, the annualized hours for (2) scheduled nonprimary-care activities and

(3) nonscheduled activities -- what we have defined as the supportive services. The hours for (2) were estimated for each kind of activity by using the following formula (drawing upon official schedules for the information about hours, including vacation and leave):

$$47 \times \left(\frac{\text{Total hours for 14 MDs for the eight weeks}}{8 \times 14} \right)$$

The hours for (3) were estimated for each activity by using the following formula (drawing upon provider interviews for information about hours):

$$47 \times \left(\frac{\begin{array}{c}\text{Total hours reported during} \\ \text{twelve weeks by 14 MDs}\end{array}}{\text{160 24-hour periods}} \right) \times \begin{array}{c}\text{Number of days per week} \\ \text{service performed}\end{array}$$ [29]

The result was a doctor year of approximately 2477 hours, which, divided by 47, gives a doctor week of nearly 53 (52.70) hours.

A similar method was used to calculate the PA work year and work week.[30] (See Table 3 for a summary of MD and PA hours.) When the scheduled nonprimary-care and the nonscheduled hours were added to the primary-care hours, the average PA work year came to just over 1610 hours and the average work week to nearly 34 (33.54) hours. As Table 3 shows, the clinic portion of the PA's work life is much greater than that of the MD -- 93.5% vs. 50.0%.

5. ANALYTICAL METHODS AND FINDINGS

Analytical methods were selected to answer the specific questions listed at the beginning of this paper, using data collected by the strategies described. We begin with the least-cost calculus, using 1972 cost figures. The discussion makes frequent reference to Table 1, because the table contains the system's primary care services, where the PAs are assigned. It might be well for the reader to review that table at this point. Note that the services are described in terms of office visits (OVs), grouped according to whether they are MD-requisite or PA-appropriate (with or without physician consultation). Frequencies are given for the system's outpatient experience in the period from mid-1971 to mid-1973, as that experience was collected in the Center's 5% Sample; the frequencies were annualized and multiplied by 20. There are also frequencies from the 1974-75 observation and average provider minutes for handling the OVs in various subgroups of Categories A, B, and C.

The Least-Cost Combination of MDs and PAs

The first step here is to examine each kind of OV in the PA-appropriate Category B to determine whether it can be handled more cheaply by a PA than by an MD, and then to make the same comparison between a PA-MD combination and an MD working alone for each kind of OV in Category C. The answer in each case depends, of course, upon the relative production time (in minutes) and the relative costs. If, for example, the PA can handle an OV as quickly as an MD, the PA is clearly more efficient because he costs less per minute than the MD.

The cost comparison is about 16¢ (15.7¢) per PA minute and 32¢ per MD minute; the PA/MD cost ratio is .49. Thus in Category B, PAs would be more efficient than physicians for every kind of OV where PA contact minutes times .49 is less than MD minutes, provided that that advantage is not offset by triage errors, or by the higher rate of noncontact time (58% to 50%) for PAs than for MDs. The computations showed PAs to be substantially more cost effective than MDs in all of the B subcategories. That was almost certain to be true, given the fact that a PA minute costs only about half of an MD minute.

Category C is another matter. The PA-MD Joint Mode is cheaper than the MD Mode only for the scheduled initial visits. In the other subcategories, the PA-MD Mode, even when using fewer MD minutes than the MD Mode, has much larger numbers of total provider minutes, including MD-PA overlaps of time, which run up costs. Incidentally, for PA consultations with MDs, the observers often were able to record not only the time spent with patients but also consultation time when it occurred outside the patient's presence. Those minutes are included in the Joint Mode time.

At this point something should be said about the quality of the data for (a) some of the observation frequencies, (b) the triage errors, (c) the relation of contact to noncontact time, (d) the provider times for Category B, and (e) the provider work year. We shall discuss these five data sets sequentially.

The original draft of Table 1 broke 30-minute regularly scheduled OVs into physical exams and nonphysicals, but the observation frequencies generally were too small for the latter on initial visits, and for the former on continuing (follow-up) visits. The two 30-minute subcategories therefore were combined in each instance. For similar reasons it seemed best to collapse the original PA-MD Joint Mode subgroups for Category C into walk-ins and regularly scheduled appointments. The MD Mode for Category C continues to show a breakdown of appointments into 15 minutes and 30 minutes, because of the intrinsic value of those data; but the two are treated as a single group (weighted average) for cost comparisons of the MD Mode and the PA-MD Mode.

The triage error rate, although it averages about 1% for all OVs sorted initially to a PA, differs among the OV subcategories. The error rate for each subcategory was applied to the annualized frequency by multiplying the latter by the ratio of number of observed errors to observed frequency of the OVs. The resulting figures show triage errors occurring in 596 initial visits for the PA Mode in Category B, for example, with a breakdown of 107, 243, and 246 errors, respectively, for the three OV subcategories.

As indicated earlier, the observers recorded triage errors as reported by the PA; the error rate is therefore based on a PA judgment that an OV in Category B or C should have been sorted to an internist by the triager. It is important to note that although in either case the patient should have gone to the MD initially, in the PA's opinion, the way in which the error is handled is quite different for Categories B and C. In Category B there is no immediate MD input. (This is true by definition, because "PA alone" is the only PA Mode for Category B.) The patient in these cases is asked to make an appointment to see an internist later.

If the PA seeks physician help immediately, the visit by definition becomes a Category C visit. The cost of the error for Category B is calculated as the average time which PAs spent with such patients. The cost of the error for Category C is the combined time of the PA and MD in handling the visit minus the time it would have taken an MD to handle the visit alone. For this reason the triage-error OVs were included in the estimate of what Category C (and therefore the PA by indirection) costs the system in extra inputs of provider time as cited earlier.

Incidentally, if the PA provides some service to the patient even though asking the patient to come in later to see an MD, the encounter is not a system resource waste, assuming that the service saved at least an equivalent amount of MD cost; here, of course, we are discussing something difficult to measure. (From the patient's point of view the time may or may not have been wasted.) Moreover, if the physician to whom the patient is referred is a specialist to whom an internist also would have sent the patient, there is no extra PA cost. A true triage error occurs when a patient should have been sent to an internist. Once the error has occurred, whether the PA seeks the aid of his internist supervisor immediately, within that visit, or asks the patient to return, is the PA's decision, governed largely by the clinical situation. If the patient returns to an internist, the OV presumably is included in Category A.

Next, some words about noncontact time need to be said. Table 1 shows that the MD's ratio of noncontact time to total time varies directly with OV complexity. Thus 58% of the clinic day is spent in activities other than face-to-face patient services for Category A, which contains the most difficult OVs. Noncontact time drops to 54% for Category C (the next most difficult OVs) and to 50% for Category B (the simplest OVs).[11] The same direction characterizes noncontact time for the PAs: 62% for Category C and 58% for Category B. We emphasize, however, that the noncontact time was estimated residually. The observers could clock face-to-face minutes with patients, but, as said earlier, there was no satisfactory way to observe the content of the noncontact time so that its components could be clocked.

Why is the noncontact time a larger percentage of total time for the PA than is true for the MD, in both Category B and Category C? There is some evidence (see below) that within Category B the MD tends to get somewhat sicker patients, and therefore if the correlation of complexity and noncontact time held true <u>interprovider</u> as well as <u>intraprovider</u>, the PA presumably would spend less noncontact time on OVs than the MD does, especially since the MD noncontact time includes supervision of PAs. Does the PA spend more time than the physician in searching reference books, deliberating upon the situation before making a decision, or doing other things related to a given OV? If so, and if that approach is inherent in the PA level of competence, the larger amount of noncontact time is properly included in comparative cost calculations for MDs and PAs.

We are inclined to think, however, that the noncontact time is more apt to be a creature of scheduling practices. Although there appeared to be little down time for PAs in any clinic, the work pace for PAs varied from clinic to clinic (as well as from day to day), as informally noted by the observers, depending largely upon the differential press of walk-ins. Because PAs handle as many OVs per clinic day as do MDs, on average, and because the PAs' handling time tends to be shorter, there obviously is more noncontact time if the latter is described as a residual. (See Part II, Section 4, beginning at page 97 for a discussion of interclinic variance in PA practice patterns and of MD and PA productivity.)

If the PA noncontact time is indeed a matter of scheduling, the present PAs may be operating below their productivity potential; specifically, they might be able to see more patients per day without undue stress, in which case fewer PAs could handle the total bundle of PA-appropriate services in the least-cost combination, as calculated below, with even larger cost savings resulting for the system. Even so, we have elected to use the noncontact time as shown in Table 1, in keeping with our general approach of erring on the conservative side in estimating PA cost effectiveness. (More is said about this approach later at page 56.)

With respect to provider times for Category B--the number of patient-contact minutes which PAs and MDs, respectively, average for each subcategory--we have confidence in the Table 1 figures. We have reason to believe, however, that the subcategories are at least to some extent nonhomogeneous. (See Part II, Section 5, and Appendix F.) One of the problems in trying to group OVs by morbidity is the uncertainty that diseases which have the same ICDA numbers are always of the same complexity. The patient's age or sex, the number of associated morbidities, and other variables may make morbidities bearing the same ICDA label quite different in level of provider judgment and provider time required. If triage personnel consciously or unconsciously are sending somewhat sicker patients within Category B to MDs on the initial visit--even though PAs are competent to handle the services required--and if the longer time spent with patients by MDs is attributable to that fact, then it logically follows, other things held constant, that PAs also would spend more minutes with such patients. If all Category B services are given to PAs, some allowance must be made for the time differential. The best approach, in our opinion, is to average PA and MD contact minutes when such a shift is made, and that was done.

Finally, several things should be said about the difference in the PA and MD work weeks and therefore in the work years of the PA and the MD. First, because PAs are used almost exclusively in ambulatory services, the hours of the outpatient clinics basically define their work week. Although the regular clinic hours are 9:00 to 5:00, the scheduled lunch break is an hour and a half, and 5 days produce only about 32 clinic hours.[31] As recorded by the observers, PA services typically push into the lunch hour and beyond 5:00 less often and less heavily than is the case for MDs; thus even in the clinic the MD average hours are somewhat longer.

Second, a much larger percentage of the PA's work week than of the MD's (93.5% vs. 50.0%) was observed, as opposed to being taken from official schedules or estimated by interview after the fact. The scheduled hours other than primary care represent 27.2% of the physician's work week, as opposed to 4.1% of the PA's. How accurate are the schedules? For a five-month period in late 1974 and early 1975, all scheduled half-days, clinic and nonclinic, were checked for the 14 physicians in the observation sample, after the schedules had been permanently filed. Except for vacation and educational leave, only 1% of the scheduled half-days had been canceled by physicians (for illness, court appearances, and the like).

The nonscheduled hours, obtained by interview, are 22.8% of the physician's week, versus 2.4% of the PA's week, and here the error potential is greater than for scheduled hours. Even the most conscientious interviewee is more likely to overestimate than to underestimate unscheduled work time. That the interviewee in this case was reporting activities within the immediately previous 24 hours no doubt reduced, but it did not necessarily eliminate, the error.[32] (General supervision time also may be inaccurately estimated. See page 20.) To the degree that a physician work week of 53 hours is for these or other reasons an overstatement, the number of physicians estimated for the most efficient MD-PA combination is too low. Because overestimation would mean that more MDs would be required, the total cost savings would be portrayed as lower than they are.

Against the backdrop of the foregoing paragraphs concerning the quality of the data for observed frequencies, triage errors, noncontact time, provider minutes for OV groups, and provider work years, we now turn to calculation of the least-cost provider mix. We have computed the most efficient mix in several ways, depending upon the assumptions made, and we shall discuss them in order. (Reference to Table 4 on page 71 should be helpful in comparing the results of the various computations.) The focal issue here is:

Given the system's annualized output of primary care services contained in Table 1, plus the overhead or supportive services described earlier; given the time inputs which providers seem to require; and given the provider's relative costs, what combinations of MDs and PAs can produce the system's output most cheaply?

For each OV categorized in B, and for the one subcategory in C which belongs in the PA bundle, annual frequency was multiplied by contact minutes (with an average of PA and MD minutes used in B). Noncontact time was added in this way: The contact minutes for each category were divided by the percentage of contact time to total time for that category (see Table 1). The hours thus obtained were combined with hours for the supportive services (the other scheduled and unscheduled activities of PAs) for a total of 48,551 PA hours for the year. Because the average PA year is 1610 hours, 30.16 PAs would be needed to handle the PA work load.

How many MDs would be required to provide the rest of the services? For each subcategory of primary care assigned to physicians by policy or efficiency (all of A and the other 3 subcategories in C) annual frequency was multiplied by MD contact minutes (which were adjusted to include noncontact time) to arrive at a primary-care hours figure; this was added to physician hours for overhead or supportive services plus general supervision time for the 30.16 PAs. The resulting total, divided by the physician year of 2,477 hours, gives an MD staff of 37.13. (We carry these figures to two decimal places because, with an average physician cost greatly in excess of an average PA cost, small variances affect cost savings substantially.)

At this point it might be helpful to show the numerical distribution of total OVs among the three basic categories in Table 1:

	No. of OVs	%
Category A	40,970	21.14
Category B	136,450	70.42
Category C	16,350	8.44
TOTAL	193,770	100.00

The percentage of total primary-care OVs which PAs can handle alone, except for general physician supervision, is approximately 70%. Nearly 80% of the primary services can be handled by PAs if specific physician help is given in about 8-1/2% of the total OVs (12% of the total PA-appropriate OVs). The reference here is, of course, to the system's policy concerning PA-appropriate activities rather than to PA cost effectiveness in the various services.

Total Savings

If all of the system's services -- primary care as well as the supportive services -- were delivered by MDs, it would require about 51 physicians (51.20 is the estimate) at $47,626 per year, for a total cost of $2,438,451. How much would full exploitation of PA substitutability under present system policy save the system? The total savings can be estimated by subtracting the total costs for the least-cost mix of MDs and PAs from the total costs of an all-MD system.

The total provider costs of the least-cost combination are calculated as follows: 30.16 PAs @ $15,164, plus 30.16 MD supervisors @ 92.17% of $47,626 (a general supervisory cost of 7.83% of an MD is already included in the PA's cost), plus the residual 6.97 non-supervisory MDs @ $47,626 = $2,113,233. The latter figure, subtracted from the all-MD figure of $2,438,451 = $325,218, which, divided by 30.16 PAs, is about $10,783 per PA.

Incidentally, the hours as calculated for the all-MD staff include MD supervision time for the 5 present PAs (the noncontact time includes supervision). This supervisory time is about 1% of the total primary-care hours for an all-physician system. We left the supervisory hours in, even though there would be no PAs to supervise, because the supervisory hours are part of the regular clinic day as scheduled and therefore presumably would be used by the physicians to provide other services. In calculating the least-cost mix, primary-care hours for the MDs in the mix were reduced by 1% before adding supervision time for the specific number of PAs in the mix.

Alternate Least-Cost Computations and Savings Figures

The above least-cost estimate assumed that patients would be triaged to MDs in the subcategories where the MD Mode is more efficient than the PA-MD Joint Mode. But is that assumption realistic? Data described in Part II, Section 3, suggest that it may not be possible to predict, at the triage level, whether the PA will need to consult a physician for a given OV. If that is true, it is more realistic to presuppose that all OVs within the PA general competence range will be triaged to the PA and that a physician will have to be consulted in a certain percentage of the cases. (Subgroups in Category C, as stated earlier, are percentages of their counterparts in B; the percentages, which vary from subgroup to subgroup but average 12%, are based on consultation frequencies recorded during the clinic observation.)

Recalculating the least-cost mix on that basis gives a combination of 34.46 PAs and 37.11 MDs, as opposed to 30.16 PAs and 37.13 MDs in the first estimate. In other words, about 4-1/3 additional PAs would be needed to make initial inputs of time for OVs in the continuing-visit subcategories and the initial-visit walk-ins of C if those OVs cannot be identified at the triage level and sent directly to MDs. On the other hand, the number of MDs required is unchanged primarily because the average doctor input is about the same whether the physician handles the OV alone or helps the PA to handle it. The savings which the system would realize in the first approach would be reduced by $48,218 if the OVs for which the MD Mode is more efficient could not be sorted to the MD. The magnitude of the cost savings suggests the importance of developing better predictors of consultation. See Appendix F for findings which are somewhat promising in this realm.

Recalculations of the least-cost combination can also be made with changes in the method of handling the supportive services. In the above calculations we assumed, for example, that the system's output (which had to be produced by an all-MD staff or by some combination of MDs and PAs) included the supportive services presently provided by 50 MDs and 5 PAs, on the premise that these amounts of supportive services were roughly the overhead required for that level of primary services in the clinics. We say "roughly" because the relation of primary to supportive services is far from predictable and because at least two components of the supportive services used here -- hours currently spent in meetings and in intrasystem travel while on duty -- are questionable as fixed figures in the overhead, even within the present frame of reference. Would the total travel time and the number and length of meetings (to say nothing of the size of committees) remain the same for 30 PAs and 37 MDs as for 5 PAs and 50 MDs? The figures are available in Table 3 for recalculation on the basis of various conjectures.

A more serious "overhead" problem is the use of 1975 supportive hours for 1972 primary-care services. At the beginning of the Project, 1972 (1971-73, annualized) was the most recent period for which 5% Sample data on primary-care OVs were completely processed. But because we could not observe retrospectively, the data for supportive services had to be gathered in 1975. How much did the system grow in the interim? What is the best index of growth?

If the relationship of Medical OVs to supportive services is fairly stable, the 1975 supportive services could be deflated by the ratio of 1972 OVs to 1975 OVs in the Medical Department, to give a good estimate of overhead for 1972. Unfortunately, the system made a change between 1972 and 1975 in the way OVs were distributed among various departments and subgroups in official tabulations. For that reason, OVs for the whole system (rather than OVs for the Department of Medicine) were used for the two years: $\frac{\text{1972 OVs}}{\text{1975 OVs}} = 82\%$.

Deflating the 1975 overhead hours by 18%, we recalculated the least-cost mix of PAs and MDs to produce total services for 1972, using the first approach described in this section (which assumes triage of consultation visits to MDs where MDs are more cost effective). The results were 30.10 PAs and 32.62 MDs, and total cost savings of $324,475 (as compared with an all-MD staff, using the deflated estimate of total services). The interesting comparison here is the drop in MDs from 37.13 to 32.62, for the least-cost combination, as a result of the deflator. Note that the number of PAs remained virtually the same (30.10 as opposed to 30.16). These comparisons reflect the fact that it is the MDs who provide most of the overhead services. Note also that the cost savings are about the same here as the cost savings for the calculation which used undeflated overhead figures. That is true because the number of physicians in the all-physician staff is also smaller (46.66 vs. 51.20) when the overhead is deflated. In other words, the primary impact of the deflation is about 4-1/2 fewer MDs. (For an analysis of a similar issue, see Appendix D.)

Substitution Ratios

The issue concerning the marginal rate of substitution between two factors of production -- in this case the substitution of PAs for MDs --

can be expressed in this way: What amount of one factor must be added to offset a given reduction of the other factor, so that total output remains the same? Various combinations of PAs and MDs can produce the system's output, as defined. The combination we are primarily interested in is that for which the system incurs the lowest level of total factor costs. For the first calculation of least-cost mix in the foregoing section, the result was 30.16 PAs and 37.13 MDs. Because the all-physician staff was estimated as 51.20 MDs, the 30.16 PAs are in effect substituting for 14.07 MDs (51.20 minus 37.13). Thus the $\frac{\text{MD}}{\text{PA}}$ substitution ratio is $\frac{14.07}{30.16}$, or .47. (See Table 4.)

The substitution ratio is heavily affected by the difference in PA and MD work years -- 1610 and 2477 hours, respectively. Suppose, for example, that PAs worked 40 hours per week instead of 33.5 hours, for the same salary. The PA year would total 1920 hours, and 25.29 PAs could do the same work that would require 30.16 PAs at 33.5 hours per week. The number of MDs would be lowered from 37.13 to 36.75 because there would be fewer PAs to supervise. The original MDs for the all-physician staff minus 36.75 equals 14.45 MDs for which the 25.29 PAs would be substituting. Thus the ratio would be $\frac{14.45 \text{ MDs}}{25.29 \text{ PAs}}$ = .57, which is higher than the .47 ratio for a PA year of 1610 hours. What this says is that a PA can substitute for 57% of a physician rather than for only 47% of an MD. The total costs of the new PA-MD combination are $2,039,447, which, subtracted from the all-MD total costs, yields cost savings of $399,004. That figure divided by 25.29 PAs is $15,777 per PA per year, assuming the same supervisory costs.

To completely neutralize the work-year difference as a determinant of the $\frac{\text{MD}}{\text{PA}}$ substitution ratio, we need to suppose that the PA works 2477 hours per year, the same as the estimate for physicians. In that case, 19.60 PAs would be needed to handle the PA-appropriate services; the number of MDs would be 36.30; the substitution ratio would be $\frac{14.90 \text{ MDs}}{19.60 \text{ PAs}} = .76$; and the total annual cost savings would be $485,502, or $24,771 per PA.

We hasten to add, however, that such an arrangement is quite unrealistic in this system. Given a policy which confines PAs to outpatient services, and given a clinic day of 6 to 6 1/2 hours, there would be no practical way for a PA to work a 52-hour week (2477 hours per year divided by 48 weeks). Certainly PAs would demand substantially higher salaries for such a work load, and that would reduce the total cost savings. (Indeed, PAs no doubt would press for higher pay if their work week were raised from 33.5 to 40 hours. The computation for a 40-hour week, above, assumes that that work week was established from the outset.) The main reason for presenting a computation based on a PA year of 2477 hours is to show the substitution ratio without the difference in work year. With the latter eliminated, the ratio rises sharply, from .47 to .76; thus a PA could substitute for 76% of a physician if the work-year differential were eliminated.

Legal Constraints

As discussed in Part II, Section 3, the state PA laws in Washington and Oregon are not directed at the kinds of morbidities which should be assigned to PAs. The legal constraints most likely to frustrate part of the potential cost savings from the least-cost mix of PAs and MDs have to do with the number of PAs that an MD can supervise and whether the MD has to be immediately available, in person, to the PA during work hours.

Both states require a 1:1 supervisory ratio, but only Oregon requires the physical proximity of the supervising physician. (Part II, Section 3, has a long discussion of the legal requirements.) That requirement would prevent the effectuation of the least-cost combination because the latter would shift so much of the MDs' work load away from primary-care services that there simply would not be enough physicians in the clinics to provide immediate supervision of 30 PAs.

In the first approach to the problem we used this formula:

$$\frac{\text{Total Clinic Hours of all MDs}}{\text{MD factor year}} = \frac{\text{Total Clinic Hours of all PAs}}{\text{PA factor year}}$$

The result was 17.67 PAs and 17.67 MDs in the clinics. Supportive services would require another third of a PA, for a total of 17.99 PAs; plus an additional 26.09 (nonsupervisory) MDs, for a total of 44.08 MDs. The total provider savings for that combination are \$133,381 (\$7,414 per PA), which is \$191,837 less than the least-cost savings of \$325,218. In other words, about 59% of the potential savings would be frustrated by the legal constraints. Most of the frustration results from focusing on MD heads rather than on MD hours. The MDs would be doing 60% of the clinic hours. (It is assumed that the system would adopt the same policy for its Washington and Oregon clinics, even though the Washington law does not require the MD to be immediately accessible to the PA.) Another approach would be to equate MD and PA clinic hours. The results would be 22.75 PAs and 41.36 MDs (including the supporting services and supervision), for total cost savings of \$208,493. That figure frustrates only 36% of the potential cost savings from the least-cost mix, but this approach would rearrange work content in the clinic in a manner difficult to measure with precision.

It is not our purpose to suggest whether the supervisory MD should be physically proximate or how many PAs the MD should monitor. Because some states permit a 1:2 ratio of supervisor to

PAs, we have calculated the legal constraint for that ratio using the first approach to the calculation of the 1:1 ratio, above, with the following results: 12.67 MDs and 25.34 PAs in the clinics for primary services; a total of 39.69 MDs and 25.67 PAs for all services; and total provider costs of $2,183,775, which, when compared with the all-MD staff costs of $2,438,451, gives total cost savings of $254,676 ($9,921 per PA). The total savings figure is 78% of the cost savings of the original least-cost combination. In other words, the legal constraint of not more than 2 PAs per MD, even when physical accessibility of the supervisor is required, frustrates only 22% of the savings which would be possible without a constraint on supervisory ratios. This figure is in contrast to a 59% frustration for the 1:1 ratio. In this arrangement the MDs are doing very little of the PA-appropriate work in the clinics. (Again we refer the reader to Table 4, which summarizes the various calculations.)

In the calculation immediately above, we have assumed that the general supervision time for two PAs is twice that for one PA. Is that a realistic assumption? The marginal or added cost of the second PA, in physician time, is almost certainly less than the cost of the first PA (7.83% of an MD), but we have no present way of determining the difference. To get an idea of how an alternative assumption would affect total savings, we used the figure of 11.75% of a physician (1.5 x 7.83% rather than 2 x 7.83%) for the supervisory costs of 2 PAs. The resulting level of total savings was $278,521 per year, or $10,850 per PA. Only 14% of the potential least-cost savings is denied by this approach.

Physician-Preference Constraints

Near the end of the observation, 9 of the MDs in the observation sample of 14 were asked by observers to complete a short questionnaire concerning outpatient case mixes. Essentially, each physician was asked (a) what portion of his OVs, on the average, he felt he could shift to PAs under the system's present policy of quality maintenance; (b) what percentage of the shiftable OVs he would prefer to retain; and (c) why. (The reasons are both profession- and patient-related. See Appendix E for the questionnaire and a summary of the answers.)

Eight physicians filled in the questionnaire. With respect to the portion of shiftable OVs answers ranged from 10% to 80%. With respect to the portion of shiftable OVs the physician would prefer to retain, the answers ranged from zero (2 physicians) to 50%. The mean of the answers that the MDs as a group gave in effect suggested a preferred outpatient case mix which would include about 11% of his present PA-appropriate OVs.

To estimate the force of physician case-mix preference, 11% of each subcategory in Category B was shifted back to MDs.[33] The result was a combination of 38.60 MDs and 26.99 PAs with total system savings of $291,457. In other words, $33,761 (about 10%) of the least-cost savings of $325,218 would be frustrated by the constraint of physician preferences concerning their morbidity mix of outpatient OVs.

Physicians were not questioned about their preferences with respect to the clinic and nonclinic proportions of their work load.[34] Those preferences might constrain substitution more stringently than preferences about outpatient case mix. This issue is discussed in Section 6.

Cost Savings from Present Use of PAs

What the 5 PAs presently employed in the Department of Medicine save the system annually is difficult to calculate with precision, but data collected for the other computations permit a fairly good estimate.

The cost effectiveness of a PA depends basically upon how the PA compares, in cost and productivity, with the replaced MD, or with an MD who might replace the PA. In 1975 salaries and incomes, PAs on average cost the system $19,576 for a work year of 1610 hours;

the resulting hourly rate was $12.15. These figures include the cost of general supervision and the nurse-cost differential (see Table 2). The average hourly cost of a physician was $21.63--$53,593 divided by 2477 hours. If a PA's productivity was essentially the same as an MD's, a PA may be perceived as having saved the system 1610 x ($21.63-$12.15), or $15,263 for the year. (The savings would have been $15,762 in 1972 salaries because the average rate for a PA was only 49% of a physician's for that year, in contrast to 56% for 1975.)

In fact, the savings for the first PA who might have entered the system in 1975 in those conditions almost surely would have been even larger. On the whole, we have viewed primary care as the generator of subspecialty work, hospitalization, and other supportive services. A PA in this system is an alternative to an MD only with respect to noncomplex primary-care OVs. If to reduce physician overload in that area the choice is to hire a PA or to hire a full-time physician, employment of a PA would save the system the full difference between the cost of a PA and the cost of a physician--$53,593 minus $19,576, which is about $34,000.

The PA in that case would take over 1610 hours of noncomplex services in the clinic (actually somewhat fewer hours because the 1610 figure includes a small amount of travel and meeting time, as shown in Table 3; see also page 41). The PA thus would free 1610 hours of physician time for more complex OVs and for supportive services which PAs cannot perform. Those 1610 hours of PA services would tend to be drawn from the physician group as a whole rather than from a single physician. A new MD's contribution, assuming that his practice pattern was similar to other MD practices, would be spread over the simple and complex OVs and the supportive services rather than concentrated at the level of noncomplex primary services.

The first PAs in the Kaiser-Permanente system were employed primarily to relieve the physician burden in simple walk-in OVs, and PA services are still concentrated in that area, where physician time would be bought at $21.63 an hour as opposed to the PA's rate of $12.15. These remarks are offered to suggest the striking potential cost effectiveness of a first or second PA, especially in a large system. Of course, the marginal savings from employment of PAs eventually would fall. Certainly there would come a point, in adding PAs, where the growth of derivative supportive services would cause the MDs to insist upon hiring another physician.

We cannot trace these developments neatly in the system's addition of PAs over the past 5 1/2 years, because other variables have intruded. (It is worth mentioning at this point that the supportive services derivative from a PA's practice are almost certainly smaller than those growing out of an MD's primary services because of the complexity differential.) Because the present ratio of 5 PAs to about 50 MDs in the Department is still fairly small (as compared, for instance, with 30 to 37 in the least-cost mix), the average cost savings from PA employment probably are at least in the middle of the range between $15,263 and $34,017 (see above), assuming that PA productivity is equal to that of MDs for noncomplex services.

But is that assumption, which underlies all of the foregoing discussion, true? We have no fine comparisons of PAs and MDs providing exactly the same kinds of services during an adequate sample of discrete time periods such as hours or clinic days, but we do have some clues. In Category B of Table 1 the average minutes spent by PAs on OVs tend to be somewhat less than the average MD minutes, probably because the MD sees sicker patients within the same subcategories, as discussed earlier. In averaging the PA and MD minutes for OV subcategories in B, as we did when we gave all of that category to the PAs in the least-cost mix, one assumes essentially that PA and MD times tend to be the same for the same OV complexity. We are speaking here of face-to-face time with patients. The time data in Table 1 describe not what a hypothetical number of PAs and MDs would do if given all of the OVs in Category B but what 5 PAs and 50 MDs were doing when observed in 1974-75.

Even if we assume, however, that the patient-contact minutes are the same for PAs and MDs when OV homogeneity obtains, there are other productivity-sensitive variables for which the average PA and MD performances are disparate. For example, for most of the OVs in Category C MDs working alone are more efficient than the PA-MD Joint Mode. In the first least-cost calculation, those OVs were assigned to MDs; but in a recalculation which assumed they would be triaged to the PAs to be handled jointly with the MDs, the result was a loss of $48,218 to the system because that approach would require about 4 1/3 (34.46 as opposed to 30.16) more PAs despite the fact that the number of MDs required would remain the same (see page 40). The $48,218 divided by 34.46 PAs is about $1400 per PA, which might be viewed as an extra PA cost for triaging those OVs to PAs, as is now done in the system and probably has to be done for reasons discussed earlier. Therefore the cost-savings estimate for PAs must be reduced by roughly that amount. (That figure was based on 1972 rather than 1975 salaries and costs, but the MD-PA differential was larger in 1972.)

Two other items which relate to productivity are the triage error rate for Category B (the triage errors for Category C are included in the $1400, above) and the difference between noncontact time for PAs and MDs in the clinic. Triage errors for Category B average 2 minutes of PA time lost, and their estimated annual frequency is 119 per year per PA. This translates into about 4 hours of a PA's time. In 1975 salaries that is about $50, which must be taken into account in estimating PA cost effectiveness because triage errors of that kind would not occur if PAs were not employed (see page 40).

It is more difficult to assign a cost figure to the noncontact time difference, because the noncontact time estimates are residuals. The PA sees as many patients per day, on average, as does the MD (see Part II, Section 4), but he sees them more quickly. Triage errors take up some of the residual time.

The middle of the $15,263-$34,017 range is about $24,600. It does not seem unreasonable to conjecture that, even taking into account generously all of the apparent productivity differences between MDs and PAs, the PAs presently employed save the system in the neighborhood of $20,000 per PA per year. Certainly it seems safe to estimate that at the very least they save $15,263, which is the difference between MD and PA hourly costs for 1610 hours of work at the PA level.

6. DISCUSSION OF THE FINDINGS

The study from which this paper is taken should be viewed as a modest attempt to analyze as carefully as possible, within the framework of a few specific questions, the PA experience of a single system -- a system which does not typify health care delivery in the United States. In general the findings are more suggestive than definitive, and their exportability declines as intersystem gaps widen.

Even for other HMOs the findings should be understood to rest upon certain assumptions and compromises. For example, the ceteris paribus assumption of the least-cost combination -- that other things would remain equal under personnel shifts of such magnitude -- is somewhat heroic.

Yet the findings do have a ram. They show that PAs can improve the system's efficiency even given an enormous difference (33.5 hours to 52.7 hours) in PA and MD work weeks. Furthermore, PA efficiency has been assessed in this study quite conservatively. At virtually every juncture where the data did not point the way decisively we chose to err on the side of caution. Thus we adopted the system's definition of the hours allotted to MDs for supervising PAs even though inquiry into the clinical realities revealed that the average hours actually spent on supervision may be fewer than the formal allotment. We continued to use 12% as the percentage of OVs for which PAs seek MD help even after the medical-chart sampling described in Part II, Section 3 called that figure into question as too high. And so on throughout the paper, as indicated in the seriatim discussion of these issues. Had we used lower figures, the estimated cost savings would have been substantially higher.

With respect to the exportability of the findings, the estimated least-cost combination does help define the range of immediate staffing alternatives for new HMOs (and other large outpatient centers), as well as the range of alternative staffing targets for established HMOs. For the latter the changes, whether incremental or substitutive, would tend to occur gradually, making only small, sequential thrusts against the existing clinic environment and against the established proportions of output components (for instance, primary care versus supportive services). Whether the seriatim thrusts would sum to major alteration of the system -- for example, in the basic clinic environment -- would depend upon the system's commitment to its established arrangements and its ability to absorb change. Hence the ceteris paribus assumption may be less fragile than it appears to be at first sight.

A finding of some importance, in view of increased interest over the country in delivering outpatient health care by provider teams, is the costliness of the joint MD-PA Mode. Cost effectiveness would require that most OVs with a high likelihood of an MD input be triaged to the MD directly rather than to the PA, assuming that those OVs can be identified at the triage level. Another consideration here is whether the triage error rate would increase, and whether the portion of PA-appropriate OVs which require MD consultation would rise from 12%, if enough PAs were hired to handle all of the system's OVs in those morbidity subcategories. It is certain that all of the diseases in those bundles are not uniformly uncomplicated and almost certain that even where OVs have the same ICDA classification there is variance in the skill and judgment required to handle them well. The intraclass differences may relate to patient age and sex or to other variables, identifiable and nonidentifiable. If the triagers presently are sorting the simpler cases to the 5 present PAs, as suggested by some of the findings, the average number of MD consultations per PA per clinic period might rise after the shift.

Would cost savings of $325,000 or even $400,000 (an alternate calculation -- see Table 4) be enough to justify the large personnel changes directed by the least-cost combination of PAs and MDs? The savings are not negligible -- 13% of total 1972 incomes and fringe benefits for the 50 MDs and 5 PAs. Moreover, the total savings figure derives from rationalizing (employing the most efficient provider mix for) only one component -- a little more than half -- of the output as presently arranged, in only one department of the system. The savings would be larger, for example, if PAs were substituted for nonclinic MD services, where appropriate, in the Department of Medicine. Furthermore, a PA work week of 40 hours or more not only would raise the system's savings but also would provide more time for nonclinic duties. (How the PAs might be used effectively and efficiently in supportive services is one of the issues to be addressed in Phase II.)

A change to the least-cost combination also might result in some favorable scale effects for physicians. Spread over fewer MDs, rounds, for example, probably would fall in total frequency and rise in length, saving travel time; and it is not certain that total time spent by physicians in meetings would remain constant if constancy required a rise per MD from 128 to 179 hours per year in order for fewer MDs to make all the convocations.[35] That issue was discussed more fully in the section on Substitution Ratios.

The nurse-cost differential for MDs and PAs appears to be largely systemic. The beginnings of the PA program coincided with an administrative interest in reviewing nurse costs in the outpatient clinics. To the extent that the more complicated morbidity situations seen by MDs require a higher level of nurse assistance, the assignment of higher-level nurses to MDs has a nonsystemic rationale;[36] and to the extent that an RN is permitted to perform tasks denied to nurses in other grades, assignment of RNs to MDs conserves a more costly input than their assignment to PAs would conserve. Perhaps of more importance in the nurse distribution, however, were several other considerations. The PAs were new in the system, whereas most doctor-nurse teams already were established. Furthermore, even in cases where turnover occurs, the MD typically is able to pursue his preferences more effectively with administrators than is the PA. The nurse-cost differential is not trivial. It represents about 30% ($95,818) of the total cost savings resulting from the least-cost combination.

The comparative rates of pay for physician and PA invite comment. The PA's hourly rate of $9.43 is 49% of the physician's hourly rate of $19.22. The degree to which that differential adequately reflects differences in skill and productivity, or has been shaped by characteristics of the respective markets for MDs and PAs and by other variables, including chance, is beyond the purview of this study. It is worth noting that although PA productivity in hours per week is relatively low, PA productivity per clinic day worked, measured by average number of OVs handled, compares favorably with MD output rates for the same OV categories. If, after the least-cost combination was implemented, MDs effectively demanded higher rates of pay for the larger proportion of complicated OVs they were handling, the total cost savings figure would be smaller. Savings would be reduced from another direction if, as other systems demanded PAs, the PA market position tightened so that PAs could press effectively for larger salaries.

At this point it is appropriate to ponder alternative distributions of the total benefits which employment of PAs makes possible. How much would go to physicians (as suggested above) or to PAs in the form of higher salaries; how much would be retained by the system; and how much would take the form of lowered (or not-so-rapidly-rising) prices to the consuming public, who, as citizens, paid the training bill for the PAs and thus made the economic benefits possible? The answer would depend upon circumstances difficult to predict; for example, degree of organization on the supply side of the provider markets and degree of competition in the product market. If the total benefits in the present case were distributed to consumers, in reduced prepayment rates or as a drag on rate rises, the distribution, divided among the approximately 59,900 Health Plan subscriber units (single persons or families) for the year of 1972, would amount to about \$5.40 to \$6.65 per unit per year, depending upon the assumptions; and that decrease in rates is the result of trying to rationalize only one aspect of one department. Earlier in the paper reference was made to the high receptivity of patients to PAs and nurse practitioners. Whether receptivity would remain that high if 30 rather than 5 PAs were hired is not safely predictable at this point.

Although the study is firm-oriented, with a focus on economizing provider inputs for one delivery system, the social-cost implications should not be ignored. Most of the educational and training costs of health care providers are borne by the public. The Institute of

Medicine of the National Academy of Sciences estimated average annual educational costs for the medical student to be about $9, 700 in 1972-73.[37] The annual figure for students in PA programs, though presently high, is likely to be considerably less when start-up costs are spread over more graduates.[38] Moreover, there is a great disparity in the number of years required to train MDs and PAs. Added to four years of medical school are not only the internship -- and the residency for specialists -- but also, typically, four years of undergraduate study in the relatively expensive science curricula. Students in the early PA programs, on the other hand, typically came to the programs not from baccalaureate backgrounds but from the armed forces, where the value of their services as corpsmen probably offset the training costs for the job.[39] Thus the total training bills for MDs and PAs are widely disparate, and even if the differential is spread over the whole medical career, the public savings almost certainly would come to several thousands of dollars per head per year. Those thousands, added to the system's current savings per PA (see page 50) are an appropriate consideration for national health manpower planners.

Some of the implications of the final set of findings -- concerning legal and physician-preference constraints on substitution -- merit brief discussion before this section ends. In policy making, price tags have a force that nonmonetized concepts or principles rarely match. One of the earliest objectives of the Center's PA studies was to develop a methodology for "costing out" legal impediments which may be more stringent than quality assurance would require. The findings of this study include a first, cautious step. It is interesting that the legal constraint which frustrates savings is expressed in the one-to-one supervisory ratio rather than in the definition of PA-appropriate services. It is also worth noting that within the same Department of Medicine, five primary-care nurse practitioners, functioning under nursing rather than under medical statutes and boards, are operating a health-appraisal clinic with a single internist as supervisor.[40]

Physician preferences may turn out to be the ultimate limiting force with respect to substitution,[41] especially if legal restrictions on the supervisory ratio are softened. It is, in most cases, physicians who determine whether the system should hire a PA and, if so, which services she or he should perform.[42] Although in the beginning, when PAs are new and their numbers are small, physician reservations may be expressed as a patient-oriented concern about threats to quality of service, MD-PA combinations such as suggested by the study's least-cost findings obviously pose a threat to physician interests, including the physician's control over his work content. The questions which observers directed to the nine physicians in the clinics were confined to physician priorities concerning outpatient case mix. At that time the impact of the least-cost combination on the primary care fraction of the MD work week was not yet calculable. It is virtually certain that at least some (and probably many) physicians would resist the sharp change in work-week components which implementation of the least-cost combination ultimately would entail. The least-cost combination's impact on MD job content can be seen in the following figures:

	Primary Care	Supportive Services
Present	50%	50%
Least-Cost Combination	33%	67%

There is another issue here. Even the physician who did not object to (indeed, who might welcome) such a division of primary care and other activities might not wish to supervise a PA (let alone 2 PAs), or might not be a good supervisor, for temperamental or other reasons. Yet the least-cost combination, with a 1:1 supervisory requirement and physical proximity not mandated, would result in 81% of the MDs supervising PAs. Even with the physician's personal presence required by law, and a resulting drop in number of PAs to 19, nearly half of the physicians would be supervising PAs.

Would selective recruitment of physicians, as vacancies occurred, eventually solve the problems? If not, physician preference would tend to set the outer limit to substitution. Of course, to the degree that system policy, quality assurance, and law might permit PAs to assume more of the supportive services such as rounds and day call/night call, the impact on the proportional content of MD practices would be blunted.

It should be recalled at this point that the issue here has been the cost effectiveness of PAs, which is only one consideration to be taken into account in the decision to hire or not to hire PAs. The assumption in this paper has been that the product quality is not changed by substitution of PAs for physicians. When that assumption has been questioned in other settings the concern usually has been that product quality might be lowered, but further research is needed concerning possible quality movements in both directions. Part II, Section 5 contains the results of our initial efforts to assess the quality of PA performance.

We have chosen to present the materials in Part I in prose rather than in econometrical language not only because we want to make the discussion available to noneconomists but also because the narrative approach makes engagement of empirical reality easier. Digging in the empirical vineyards has been a sobering experience for us. At this stage in the development of methodology in the field, the issues which need the most intensive empirical exploration are often issues which elegant models must sweep aside.

We could have used linear programming techniques, for example, to vary output so as to study the impact of output changes on input relationships. The potential nonlinearities, however, are legion, as we have tried to show throughout the discussion. In attempting to identify relationships which may not be linear, and in raising some of the questions which a satisfactory methodology must comprehend, we may have made some contribution to the field.

TABLE 1

COMPARISONS OF PRODUCTION MODES, BY OUTPUT CATEGORIES

Type of Appointment	Initial Visits: Average Provider Time	Initial Visits: Annualized Frequency (5% Sample x 20)	Initial Visits: Observation Frequency	Continuing Visits: Average Provider Time	Continuing Visits: Annualized Frequency (5% Sample x 20)	Continuing Visits: Observation Frequency
Category A (MD-Requisite)						
MD Mode						
Without appointment	8.9	1,890	14	8.8	3,670	33
15-Minute Regularly Scheduled	9.7	1,830	19	8.4	18,050	247
30-Minute Regularly Scheduled	18.2	12,970	135	21.7	2,560	35
Contact time to total time	42%*					
Category B (PA-Appropriate)						
MD Mode						
Without appointment	6.6	54,590	455	7.4	16,370	127
15-Minute Regularly Scheduled	9.9	14,840	133	8.2	31,570	439
30-Minute Regularly Scheduled	17.3	14,010	122	17.5	5,070	41
Contact time to total time	50%*					
PA Mode						
Without appointment	5.8	54,483	507	7.4	16,370	64
15-Minute Regularly Scheduled	8.7	14,597	60	10.0	31,570	58
30-Minute Regularly Scheduled	13.5	13,764	56	9.5	5,070	10
Triage Error**	2.0	596	3			
Contact time to total time	42%*					

(Continued on next page)

TABLE 1, Continued

COMPARISON OF PRODUCTION MODES, BY OUTPUT CATEGORIES

Type of Appointment	Initial Visits			Continuing Visits		
	Average Provider Time	Annualized Frequency (5% Sample x 20)	Observation Frequency	Average Provider Time	Annualized Frequency (5% Sample x 20)	Observation Frequency
Category C (PA-Appropriate with Consultation)						
MD MODE						
Without appointment	6.1	6,060	189	7.2	2,660	51
15-Minute Regularly Scheduled	10.3	1,470	60	8.0	3,900	94
30-Minute Regularly Scheduled	17.7	1,220	111	14.5	1,040	7
Contact time to total time	46%*					
PA-MD JOINT MODE						
Without appointment						
MD	3.6	5,501	59	8.9	2,418	10
PA	9.9	5,501	59	15.6	2,418	10
Regularly scheduled						
MD	4.5	2,466	11	6.3	4,940	9
PA	14.9	2,466	11	11.1	4,940	9
Triage Error**						
MD	6.9	1,025	8			
PA	13.9	1,025	8			
Contact time to total time						
MD	46%*					
PA	38%*					

*The Contact time to total time percentage applies to all visits within the production mode for that ouput category.

**See Part I, Section 5, under "Least-Cost Combination.

NOTE: The output frequencies for Category A are overstated because certain subspecialty visits could not be separated from the primary care visits. The number appears to be small.

TABLE 2

PA AND MD COSTS, 1972 AND 1975

	1972		1975	
	PA	MD	PA	MD
Average Annual Cost to System				
Basic Income and Fringe Benefits	\$ 14,612.00	\$47,626.00	\$ 19,265.00	\$53,593.00
Nurse-Cost Differential	- 3,177.00	-	- 3,885.00	-
Supervision (7.83% of an MD)[a]	+ 3,729.00	-	+ 4,196.00	-
TOTAL	\$ 15,164.00	\$47,626.00	\$ 19,576.00	\$53,593.00
Average Cost Per Week				
Annual cost ÷ 48 (PA), 47 (MD)[b]	\$ 316.00	\$ 1,013.00	\$ 407.00	\$ 1,140.00
Average Cost Per Hour				
Weekly cost ÷ 33.5 (PA), 52.7 (MD)[b]	9.43	19.22	12.15	21.63
Average Cost Per Minute	.16	.32	.20	.36

PA/MD Cost Ratio[c]	1972	1975
Per Year	.32	.37
Per Week	.31	.36
Per Hour or Minute	.49	.56

[a] For general supervision only. Another 1.86% of an MD is required for inputs into specific office visits (consultation).

[b] Weeks in year and hours in work week taken from 1975 observation data. The $\frac{PA}{MD}$ ratio in average annual hours $= \frac{1610}{2477} = .65$.

[c] The small difference in PA and MD weeks per year (48 vs. 47) makes only a slight variance between the yearly and weekly cost ratios. The figures for 1972 are .3183 and .3119, and for 1975 .3653 and .3570. However, the large difference in PA and MD hours per week (33.5 vs. 52.7) raises the hourly cost ratio sharply.

NOTE: The system's 1973 "overhead" allocation to the outpatient clinics, under Part B of the Medicare Cost Report, was \$2,607,965, which, divided by 188 physicians and 12 PAs (in Medicine and other departments), is approximately \$13,040 per provider. The overhead items include depreciation, taxes, insurance, and administration, none of which appear to affect PAs differentially.

TABLE 3

MD AND PA HOURS BY ACTIVITY

TYPE OF ACTIVITY	Hours Per Week Per Provider	Work Weeks Per Year	Hours Per Year Per Provider	Hours Per Provider Group Per Year	Percent of Provider's Time
(1) Primary Care Hours					
MD	26.3	47	1,238	61,900	50.0
PA	31.4	48	1,505	7,525	93.5
(2) Other Scheduled Hours					
Subspecialty					
MD	3.3	47	156	7,800	6.3
PA	-	-	-	-	-
Night Call/Day Call					
MD	7.8	47	365	18,250	14.7
PA	1.3	48	65	325	4.0
Meetings					
MD	.4	47	16	800	.6
PA	<.1	48	2	10	.1
Administration					
MD	1.1	47	52	2,600	2.1
PA	-	-	-	-	-
Research					
MD	1.3	47	60	3,000	2.4
PA	-	-	-	-	-
Medical School Activities					
MD	.6	47	26	1,300	1.1
PA	-	-	-	-	-
(3) Nonscheduled Hours					
Rounds					
MD	6.1	47	288	14,400	11.6
PA	-	-	-	-	-
Meetings					
MD	2.4	47	112	5,600	4.5
PA	.5	48	25	125	1.6
Intrasystem Travel					
MD	2.2	47	105	5,250	4.2
PA	.2	48	8	40	.5
Home Visits					
MD	.1	47	6	300	.3
PA	-	-	-	-	-
Other					
MD	1.1	47	53	2,560	2.2
PA	.1	48	5	25	.3
TOTAL					
MD	52.7	47	2,477	123,850	100.0
PA	33.5	48	1,610	8,050	100.0

TABLE 4

PROVIDER MIX, SUBSTITUTION RATIO
AND TOTAL COST SAVINGS FOR ALTERNATIVE APPROACHES

	Provider Mix		MD/PA Substitution Ratio*	Total Savings	Savings Per PA
	MDs	PAs			
a. All-MD Staff (p. 39)	51.20	-	-	-	-
b. Least-Cost Combination Assuming Triage of Consultation OVs to MDs Where Cost Effective (p. 37)	37.13	30.16	.47	$325,218	$10,783
c. Least-Cost Combination Assuming Triage of All Category C OVs to PAs (p. 40)	37.11	34.46	.41	277,000	8,038
d. Least-Cost Combination With Supportive Services Deflated (p. 42)	32.62	30.10	.47	324,475	10,780
e. Least-Cost Combination With a 40-Hour Week (1920-Hour Year) for PAs (p. 44)	36.75	25.29	.57	399,004	15,777
f. Least-Cost Combination With a 52-Hour Week (2477-Hour Year) for PAs (p. 45)	36.30	19.60	.76	485,502	24,771
g. Legally Constrained Mix With a 1:1 MD-PA Supervisory Ratio (p. 46)	44.08	17.99	.40	133,381	7,414
h. Legally Constrained Mix With a 1:2 MD-PA Supervisory Ratio					
1. 2 x 7.83% of an MD's time (p. 47)	39.69	25.67	.45	254,676	9,921
2. 1.5 x 7.83% of an MD's time (p. 48)	39.19	25.67	.47	278,521	10,850
i. Mix Constrained by Physician Preferences (p. 49)	38.60	26.99	.47	291,457	10,799

*For each approach, the number of MDs in the resulting mix is subtracted from the number of MDs who would be required for an all-MD staff; that figure is divided by the number of PAs in the mix. Rounding sometimes conceals small differences. Note that except in Approaches e and f, the substitution ratio is depressed by the very large difference in the PA and MD work years -- 1610 vs. 2477 hours. In Approach e, a hypothetical 1920-hour year (40-hour week) is used for PAs, and in Approach f the two work years are hypothetically equated. The results are sharp rises in the substitution ratio.

NOTE: System savings for the 5 PAs presently employed are discussed at the end of Section 5, beginning at p. 50). They are substantially higher per PA than the above figures.

Footnotes to Part I

1. BHRD was part of the Health Resources Administration within DHEW. BHRD's successor, the Bureau of Health Manpower, occupies the same structural position.

2. See J.C. Record and H.R. Cohen, "The Introduction of Midwifery in a Prepaid Group Practice," American Journal of Public Health, LXII, 3 (March 1972), 354-360; P.D. Lairson, J.C. Record, and J.C. James, "Physician Assistants at Kaiser: Distinctive Patterns of Practice," Inquiry, XI, 3 (September 1974), 207-219; and J.C. Record, and M.R. Greenlick, "New Health Professionals and Physician Role: An Hypothesis from Kaiser Experience," Public Health Reports, 90, 3 (May-June 1975) 241-247.

3. The assumption is that the outer perimeter is beyond K-P's present policy, even in the outpatient clinics, to say nothing of the use of PAs in inpatient and other supportive services. The reference is to what the well-trained, experienced PA can do.

4. Phase II entails the construction of a comprehensive triage algorithm for outpatient services, to sort each kind of morbidity situation to the most appropriate provider on the basis of the minimum level of medical judgment required to handle the office visit well, given what the triager knows or is able to find out quickly about the patient's chief complaint, symptoms, and medical record. The Phase II Scope of Work is attached to this Report at the end of this Report.

5. In September of 1975 a second hospital was opened. Because the study addresses outpatient services, the second hospital has negligible significance here. Its outpatient clinic, and another small clinic opened a month later for health appraisals by primary-care nurse practitioners, were not covered in the study, although the building in which the latter services are now offered had, at the time of the observation, a small outpatient clinic, and one of the providers observed worked there during the observation period.

6. The system provides services for a relatively small number of nonmembers, on a fee basis. The Center's basic data systems do not include nonmembers except where a subscriber unit, once enrolled and in the data sample, continues to use the system after membership ceases.

7. The physician partnership contracts with the Health Plan to provide services on a capitation basis. Normally MDs are admitted to the partnership after two years of employment in the system. Therefore the income of most physicians is drawing account plus surplus rather than salary. Only 151 of the 188 already are partners.

8. On the drawing boards at the Center is a project to use the management of episodes of illness rather than OVs as the measure of output.

9. All PAs and 13 of the 14 physicians consented to be observed. The 14th physician chanced to go on extended leave before the observation began; a second name was drawn and the substitute consented. After the first month of the observation, another MD went on leave and again a substitute was drawn. Actually, the number of physicians in the universe subsequently was dropped from 56 to 50. For administrative (and perhaps other) reasons, the Department of Medicine includes psychiatrists, allergists, and dermatologists. Psychiatrists were eliminated from the study at the beginning because they are full-time specialists and therefore do not deliver primary care. The same decision was made about 3 dermatologists and 3 allergists but not until after the sample was formed. Fortunately, no dermatologist or allergist was drawn, and the original sample (now 28% rather than 25%) was retained. The OVs retrieved from the computerized data do not include services performed by dermatologists and allergists.

10. Actually, they noted the beginning and end of the clinic half day, which was not necessarily the physical entrance and exit.

11. For each physician half day observed in the clinic we took the percentage of difficult to total OVs. The half days were grouped as 0-19%, 20-34%, and 35% and above, and the contact time to total time was averaged within those three groups. The resulting figures--50%, 46%, and 42%--were applied to Categories B, C, and A, respectively, in Table 1. A similar procedure was followed for PAs.

12. This assumption may not be entirely true; e.g., PAs on average may be able to establish better rapport with certain kinds of patients than can doctors on average.

13. Lairson, et. al., op. cit.

14. The initial triage may have been correct even if the morbidity as updated is not PA-appropriate. System policy is discussed in more detail in Part II, Section 2.

15. From conversations with PAs it appears that a physician's examination of a PA's patient is more likely to be recorded than a PA question to the physician about a patient. Probably a PA would be more apt to note an MD consultation for the record in a case about which the PA felt particularly uncertain. Of course, the PA is always under general supervision.

16. A given morbidity might be in Category A for an initial visit and in Category B or C for a continuing visit, for example.

17. Of course, the PA may seek physician help in any OV. What is determining here is a low probability of physician input.

18. See Part III, Appendix B.

19. For average physician income figures 1962-1971, see E.W. Saward, J. Blank, and H. Lamb, "Some Information Descriptive of a Successfully Operating HMO," DHEW, HSMHA, Health Maintenance Organization Services. We selected calendar year 1972 because it is the middle year of our mid-1971 to mid-1973 study period.

20. Of the 14 MDs in the observation sample, 9 had RNs and 5 had LPNs. Average salary (with fringe benefits) for the clinic assistants was subtracted from a weighted average salary (with fringes) for the RN-LPN group and multiplied by the hours that PAs work in the clinic. A new arrangement of assigning nurse teams to a provider group, including PAs, is in the offing, so that the nurse differential may be eliminated.

21. PA input into MD services is not zero. There are instances in which an MD asked a PA to perform a procedure (e.g., inject a patient for bursitis) or give advice in an area where the PA had had unusually heavy experience. However, the instances are so rare (partly because of the way the system arranges outpatient care) that they can be ignored here.

22. There is always the question of whether the physician performs such functions as an addendum to a regular work week or offsets them by curtailing other activities. Here general supervision time is treated as an opportunity cost--that is, the foregone services the MD could have provided had he not been supervising. (Some clues to whether the supervisory responsibilities are additive or substitutive may be gotten from comparing the same MD's productivity for days he is supervising and for other days. That analysis of the data was made but the sample was too small to encourage confidence in the results.)

23. A contrary conjecture could be made that MDs would use more lab tests and X rays because, knowing more, they would "suspect" more; or perhaps MDs would practice more defensively. One way or the other, the staff expected interphysician and inter-PA differences to be much greater than the difference between the MD average and the PA average. See D.K. Freeborn, et. al., "Determinants of Medical Care Utilization: Physicians' Use of Laboratory Services," American Journal of Public Health, 62, 6 (June 1972) pp. 846-854. The K-P system at Portland was the institution studied.

24. The estimate was made with the use of CRVS values translated into dollars by a formula which K-P uses, based on going rates in the area. A table showing MD and PA differentials by morbidity can be found in Appendix C.

25. During the first four observation weeks observers did not record the beginning and ending times of the half day; hence those weeks could not be used in estimating the average hours for clinic half days.

26. These estimates were made from official schedules. Occasionally a change in schedule is made for reasons other than vacation or educational leave and is not always so labeled; however, the scheduling staff stated that this occurrence is rare.

27. Vacations seem to peak in the summer and during the school's spring vacation. The latter came during the middle observation period.

28. It is worth noting, in passing, that there was less "overtime"--an extension of clinic services beyond the scheduled hours--for the clinic with a four-day week.

29. For example, on 160 occasions (the number of half days observed), an MD was asked how many minutes he had spent during the previous 24 hours on hospital rounds. These were totaled in hours and divided by 160. (Of course, not every MD made rounds every time.) The answer was multiplied by the number of days per week the activity regularly occurs--7 in the case of rounds, 5 in all other cases.

30. Because the 4-day clinic had only one PA, a breakdown of 4-day vs. 5-day average hours per half-day clinic session would personalize the data. When the half days for all clinics are converted statistically to a five-day basis, the average clinic half day, as observed, was 3.5 hours for MDs and 3.3 hours for PAs.

31. During the study period there were six and a half hours except for Saturday, when the clinics opened at 9:30 rather than 9:00. Hours are now somewhat different.

32. Unfortunately, ready checks on the time accuracy of the reports were not available for most of the nonscheduled activities. The staff did clock separately the distances between system points, and those estimates were used for "travel time." Rounds, the largest item in this group, could be checked for frequency from hospital sign-in records, but the difference between sign-in and sign-out time (when physicians remembered to sign out) was not a good measure of round time because other activities in the hospital were often combined with rounds.

33. By taking 11% of the frequency times an average of MD and PA minutes, with a conversion rate of .5 for the noncontact hours.

34. At the time, the least-cost combination had not been calculated. Even so, the questionnaire might have included hypothetical choices of clinic and nonclinic work-load mixes. The issue will be posed in a larger survey of the Department of Medicine staff now being designed.

35. Whether Parkinson's law or some other bureaucratic logos would push expanded PA meetings into the breach is an interesting question.

36. In the earliest discussions of what kind of nurse should be assigned to the PAs, one point of view argued that the PAs by virtue of their lesser training need an RN's assistance more than MDs do.

37. Institute of Medicine, National Academy of Sciences, Costs of Education of the Health Professions, Interim Report, March 30, 1973.

38. The costs of PA and nurse-practitioner training programs are now being studied, along with other aspects of the programs, by the National Center for Health Services Research (NCHSR) under Congressional mandate. The first author is a member of the advisory committee. A report should issue in the latter half of 1976.

39. The NCHSR study will inquire about the backgrounds of students in the training programs. The national PA certification examination is now more accessible to persons who present experience rather than didactic training as prerequisites.

40. There are several internists who take turns in supervising the nurse practitioners, so that one MD is present during each clinic day. The state medical board, which administers the PA law, would require the physical presence of an MD for each PA.

41. Patient receptivity to the new health professionals has been quite high in this system and in others. See Record and Cohen, op. cit., and also Lairson, et. al., op. cit. Of course, reports from this and other systems have been based in large part on early experience with a small number of PAs or nurse practitioners. Would a massive shift to PAs and NPs encounter patient resistance?

42. In an HMO the locus of many cost-significant decisions may be different from the locus of cost accountability. It is not always the cost-sensitive and cost-responsible administrator who makes the choice in cost-fraught matters.

II. POLICIES, PRACTICE PATTERNS, AND QUALITY OF CARE*

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Precis

The purposes of this paper are to describe the way in which the Kaiser-Permanente (K-P) system's policies regarding physician's assistants have evolved, to analyze the physician's supervisory function, to examine past and present practice patterns of PAs, and to present some preliminary data on the quality of PA services. We begin with a background statement about the system, the institutional environment in which the PA practices, and the relation of this paper to ongoing studies of PAs.

1. The Setting

The Kaiser Health Plan in the metropolitan area of Portland, Oregon has about 200,000 members, more than 18% of the area's total population. Comprehensive, prepaid health care is provided in the system's two hospitals and in six outlying clinics. Medical services are under the direction of a physician partnership legally titled The Permanente Clinic. There are at present 151 partners, plus 37 physician employees of the partnership who will be eligible for membership after two years of employment. The 188 physicians represent most of the medical specialties. The

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partnership contracts with the Health Plan to provide services for Health Plan members at a negotiated capitation rate.

Twelve PAs presently practice in the system--3 in Surgery, 3 in Orthopedics, 1 in Pathology, and 5 in Medicine. Although physicians determine PA numbers and modes of practice, the PAs are employees of the Health Plan rather than of the partnership. This paper is concerned only with the 5 Medical PAs, the first of whom entered the Department of Medicine in September, 1970, as the first PA employed anywhere in the system. The last Medical PA was added in 1974. All 5 are graduates of the Duke University PA program.

Adult primary medical care is provided in the Department of Medicine by 49 internists, 4 general practitioners, the 5 PAs, and, added just recently, 5 primary care nurse practitioners who do health-appraisal exams. Two family practitioners spend about half time on adult medicine but are now considered a separate administrative unit.

Staff at the Kaiser Foundation Health Services Research Center have collected data on the PA program since its inception.[1] The study from which this paper issues was begun in July, 1974, after the Project was funded by a Health Manpower Education Initiative Award (HMEIA) from the Bureau of Health Resources Development within the Department of Health, Education, and Welfare. Although the primary purpose of the proposed research was to assess the cost effectiveness of PAs,[2] an important secondary purpose was to analyze changes in PA policies and practices during the system's first five years of experience with PAs.

2. Evolution of Policies Concerning PAs

In 1970, PAs were new not only to Kaiser-Permanente but to the rest of the medical-care world as well. Policy had to be developed with respect to the kind of supervision PAs would have, the services PAs would provide, the access of PAs to system resources, the relation of PAs to other staff, and the manner of presenting PAs to patients. Because physician supervision is the single most important policy issue, the supervisory function is discussed in a separate Section, beginning at page 86. The present discussion concerns other aspects of policy.

Since the beginning, the Medical PAs have been assigned almost exclusively to outpatient services. The one significant exception was nursing-home visits, which PAs handled by special arrangement with state agencies until 1974. Although each PA is based in a single clinic, the PAs rotate through one hospital's outpatient walk-in services on Sunday, when the regular clinics are closed. Because the MDs also rotate through the Sunday outpatient services, every physician eventually is almost certain to have some experience in working with a PA.

When the first PA arrived in 1970, he was assigned to the Vancouver, Washington Clinic. The centralized appointments staff, who are trained in triage techniques but have no medical-care background, were instructed to schedule for the PA about 15 appointments per day--3 to 6 routine physical examinations for patients under 40 and the rest "routine follow-up" office visits (OVs). In addition, the PA was expected to see about 10 "walk-in" patients for noncomplex, acute illnesses or symptoms, such as upper respiratory infections, minor trauma, lacerations, skin rashes, and cystitis.

Both the appointment clerks and the receptionists were directed to tell patients that they were being offered the services of a nonphysician and to give patients a physician option;[3] few patients, however, declined to see the PA. Moreover, returning patients asked with increasing frequency to be triaged to him.[4]

When additional PAs were employed a year later, physicians at one of the Oregon clinics which had a particularly heavy walk-in load requested PA help. Two new PAs were assigned to that clinic and given essentially walk-in practices. Not more than 6 to 8 appointments per day were to be scheduled for each PA, and then only for immediate follow-up of conditions seen previously by the PA on a walk-in basis. Receptionists were instructed to sort to the PAs only those patients who appeared to have routine, minor medical problems.

Instructions to triage personnel were no more specific than that for several reasons. First, there had been insufficient experience with PAs, in the K-P system or elsewhere, to inspire confidence that PA competence could be described with precision. Then, too, the development of an exhaustive or even comprehensive triage protocol would have required a great deal of time from busy physicians. Neither the Oregon nor the Washington PA law, when passed in 1971, concerned itself with that kind of job-content specificity. Finally, and perhaps more importantly, the more general approach seemed to be working well, as attested by a review of the cases being triaged to PAs. The consensus seemed to be that more emphasis should be put upon adequate supervision at the clinical level than upon guidance from the system's center.

Decentralization, however, is pursued only at the expense of uniformity, and by 1975 the 5 Medical PAs and their supervisors had settled into somewhat variant practices, shaped by personalities and professional preferences as well as by legal and situational differences. This is not to suggest that variance per se is undesirable, or that individual practices contravene either law or acceptable standards of quality. The point is that the system's "PA policy" could not be readily and uniformly described in terms of specific morbidities, symptoms, types of visit, supervisory patterns, and so on.

That fact became obvious in 1975 when the HMEIA study of PA cost effectiveness required that the existing policy be defined with respect to the particular kinds of outpatient services--symptoms, morbidities, procedures, et cetera--which PAs were handling. The Research Center maintains on computer tape a continual utilization file for 5% of the Health Plan subscriber units. The file contains, for each contact with the system, information about symptoms, diagnoses, medical and supportive procedures, patient characteristics, type of contact, the service provider, and similar items. Data were withdrawn to show, for a two-year study period beginning July 1, 1971, diseases which had been triaged to PAs and diseases which had been handled only by MDs. Those two lists were further divided into initial office visits and follow-up or continuing OVs. Each of the present PAs and each physician supervisor--5 teams-- was asked to review the 4 lists in detail and to report whether they accorded with present policy as practiced by the teams.

Although the sample was only 5%, and therefore likely to omit some of the low-frequency morbidities, the lists summed to hundreds of morbidities (an expanded version of the International Classification of Diseases, Adapted is used by the Center) and thousands of OVs. The 5 PAs and 4 supervisors who reviewed the lists agreed on the whole that the morbidities which PAs were handling in 1971-73 were still being handled by PAs in 1975, but there was also general agreement that many of the "physician only" diseases on the 1971-73 lists were being seen by PAs in 1975. No doubt the PA "competence range" had expanded as PAs gained more experience and their supervisors (to say nothing of the system, including the triage personnel) gained more confidence in them.

Although there was general agreement that the "physician only" lists of 1971-73 were inaccurate descriptors of 1975 reality, there was substantial disparity among the reviewers about 1975 policy and practice with respect to specific morbidities. Again and again the reviewers disagreed about whether an illness was in fact being triaged to PAs, each reviewer speaking from his own experience; and the disagreement was not confined to low-frequency diseases. Yet the PA practices, though considerably variant in their specific content, were, in the judgment of the study's medical consultants, well within the accepted norms of legality and quality assurance.[5] There appears to be a growing conviction, among those in the system who make the policies which govern PAs, that quality of care is best protected--once a competent PA has been recruited--by selecting a competent, responsible supervisor.

Before discussing the supervisory function, we offer a few comments about other policy matters. From the beginning, PAs have been invited to Department and hospital staff meetings and to the system's educational activities, although PAs have served on very few of the professional committees which typify complex medical delivery systems. PAs are free to use the medical library and lounges and to sit at tables reserved for physicians in the hospital cafeteria. They have full access to charts, records, and most administrative services. They wear the same white jackets used in the clinics by MDs, but by law they are required to wear a badge labeling them as PAs. Their offices are also comparable to MD offices, and the door usually bears their name followed by "P. A."[6]

Before the first PA was employed, careful consideration was given to the kind of nurse he should have. The final decision was to assign to him an experienced RN. A year or so later, the system's administrators, in the interest of cutting costs, pushed for substituting less expensive nursing personnel for RNs wherever feasible throughout the system. PAs were given clinic assistants (graduates of community college programs), whose training is less and whose pay rates are lower than those for RNs or LPNs. Although some MDs accepted LPNs, no physician in the Department has been given a clinic assistant as yet.[7]

The first PA was employed at a salary of $13,000 plus fringe benefits of approximately $2,288--a total of $15,288. The present basic salary range (without fringes) is $16,800 to $21,000 in six annual steps. In 1975, salary and fringe benefits for the 5 Medical PAs averaged $19,265. The PAs get 3 weeks of vacation (4 weeks after three years tenure) and one week of educational leave. (Physician partners get 4 and 2 weeks, respectively, and physician employees 3 and one.)

Although the PA's productivity as measured per clinic day compares favorably with that of the MD (see Section 4), the PA's work week is only 33.5 hours, in contrast to an estimated 52.7 hours for the MD.[8] The PA's work week is shaped by clinic hours, because system policy confines the Medical PA to outpatient services, and the basic clinic day is between six and six-and-a-half hours. About 93.5% of the PA's work week is spent in the regular clinic and another 4% in the same kind of primary-care services at the hospital on Sundays. The other 2.5% of his work time is spent in meetings and in travel time between system facilities. The meetings, except for Department or general staff conferences, relate largely to PA business rather than to matters of more general system policy.

3. The Physician's Supervisory Function

One of the most elusive goals associated with PA programs is the definition and effectuation of a satisfactory supervisory arrangement--satisfactory in the sense that it adequately guards the consumer and public interests in quality maintenance, protects the employer from an elevated malpractice risk, permits the PA to grow in professional competence, and avoids a waste of scarce physician (and PA) resources in oversupervision.

Supervision policy must comprehend many questions. How many PAs may a physician supervise? Should a PA have a regular supervisor, as opposed to a rotation of physicians? Should the supervisor be physically proximate--immediately available? In a system employing more than one PA, should supervisory policy be centralized, or left largely to the individual supervisor?

Should the supervising physician see every PA patient? Should the supervisor review each chart before the patient leaves the clinic? If not, should the charts be reviewed later in that same day? Should every chart be reviewed, or is sampling adequate?

Should PAs be permitted to prescribe independently, except for narcotics and other drugs restricted by law to physicians? Or should PAs be permitted to prescribe only within a physician-determined protocol, where prescribing can be routinized? Or should all PA prescriptions require physician countersignature?

Should PAs be permitted to order laboratory tests and X rays without clearing with the supervisor? Should PAs make referrals to specialists in other departments, or to subspecialists within the Department of Medicine, without the supervisor's approval?

Should PAs practice within formalized diagnostic and treatment protocols, such as algorithms, or is it sufficient to develop an informal, modal interaction between PA and supervisor? When should a PA consult his supervisor? Should PA initiative govern here, or should the consultation decision be more structured?

How much physician time should be allotted for supervision? What compensatory-time arrangement should be made?

Answers to some of these questions are dictated by law. The Washington and Oregon PA laws were passed in the second year of the PA program at Kaiser-Permanente. The Washington law and administrative regulations have been somewhat more permissive than their Oregon counterparts, largely on the issue of physician supervision.

Both states limit an MD to one PA supervisee; but the states differ with respect to physical proximity of the supervisor. In Washington PAs can practice in satellite clinics, supervised from another locality. The Oregon bill originally contained a statement that the monitoring physician need not be personally present, but that sentence was deleted by amendment from the floor. Although the resulting law does not stipulate immediate supervision, the State Board of Medical Examiners, which administers the law, has required quick physical access to the supervisor. The K-P system has followed that criterion even in its Vancouver clinic. In all four clinics (including Vancouver) where PAs practice, each PA has a regularly assigned supervisor, who monitors the PA except when the supervisor is off duty, in which case a substitute MD is designated. In one clinic, where the PA has an essentially walk-in practice, whichever physician is on walk-in duty for the day assists the regular supervisor in prescription signatures and chart review (when the regular supervisor himself is not the walk-in doctor).

Although the Washington law did not require physician chart review until 1974, and then only within a week (the supervisor must be present in the PA's place of practice at least once a week), the K-P physician supervising the first PA at Vancouver was asked by the system to review and countersign all PA charts by the end of the clinic day. The first PAs in Oregon clinics were much more restricted, largely because of specific legal constraints or uncertainties. Physician monitors were asked to discuss each patient with the PA before the patient left the clinic, to re-examine the patient where necessary or advisable, and to sign patient charts. No patient was to be seen by a PA three times in the same illness episode without being seen also by a physician. About a fifth of all persons seen by a PA were also examined by an MD under these various rules. In the Oregon clinics the supervisory MDs were asked also to sign all prescriptions; and PAs were not to order lab or x-ray services, or make referrals to specialists, or make a diagnosis, without conferring with the supervisor.

As the system gained confidence in the PAs and as the legal environment relaxed somewhat, the K-P restrictions were softened. The Oregon supervisors no longer review charts routinely while the patient is still present, although until quite recently the PA or his nurse took prescriptions to the supervisor to be signed while the patient waited. Now the Board of Examiners has ruled that an Oregon PA can phone in or write a prescription without physician signature. On the other side of the Columbia River, the Washington Board already had reversed itself from the opposite direction. Until 1974 it had not required a physician signature for drug orders; since that time, countersigning by an MD has been necessary.

After observing the conservative use of lab and x-ray services by PAs during the first years, physicians in all clinics receded from the requirement that PAs secure an MD signature for such orders. The referral policy also changed. Initially, the chart carried a note saying that the supervisor had approved the referral. The first charts that reached some specialists without such a note evoked complaints, particularly from some of the ophthalmologists, urologists, and ear-nose-and-throat physicians, but the resistance soon subsided.

The PAs have not used formalized schemata for diagnosis and treatment; the system has depended, rather, upon close interaction between the PA and his supervisor. Perhaps the most important kind of knowledge that a PA has--the most important kind of judgment that he exercises--concerns when to consult the physician. In the K-P system the consultation decision is primarily the PA's initiative. How does one objectify the decision? Can one objectify the decision?

There is substantial variance among the PAs in frequency of consultation. Data from a 1974-75 clinical observation (see Section 4) show that the 5 PAs consult their supervisors, on the average, in about 12% of the office visits (see discussion below), but the individual rates differ: 5%, 6%, 12%, 15%, and 20%. The differential might be attributed to many variables: personality, case load, case mix, type of visit (walk-in versus appointment), tenure, regularity of supervision, and so on. The only objective factor which seems to correlate reasonably well, in the observation data, is physical distance between supervisor and supervisee. Adjoining offices appear to promote consultation, different corridors to discourage it. The PA who consults most frequently on the whole has a marked drop in consultations when he and his supervisor, who normally have adjacent offices, occasionally move to separate quarters for the day.

On the assumption that the answer to the consultation question must be less simple than mere physical arrangements, we decided to go to the charts themselves to seek clues. We had noticed that for a substantial number of OVs with the same presenting morbidity one PA might consult and another not consult; indeed, the same PA sometimes consulted and sometimes did not.

From the observation print-outs we selected a mixed set of morbidities for which there were at least 2 consultation visits. We selected 8 variables, other than the morbidity itself, which might affect the PA's decision to consult or not to consult: the particular PA (for interpersonal variation), the number of associated morbidities, the presence or absence of a chronic disease, whether the chart was available at the time of the visit (sometimes for walk-ins there is not enough time to retrieve the chart), the age and sex of the patient, whether the visit was initial or follow-up, and whether it was a walk-in or a scheduled appointment. We already had information on these variables for each OV observed.

Upper respiratory infection (URI) had the largest number of consultations, probably because it is a very high-frequency morbidity. To compare with the 9 URI consultations, we selected 23 URI visits for which there was no consultation, matching the 23 as closely as possible to the 9 consultation visits with respect to the 8 variables described above. We were able to locate 7 of the charts where consultation had occurred. In 4 cases the consultation appeared to be only for an MD signature on a prescription.[9] In the other 3, there were physical findings--e.g., a heart murmur--discovered by the PA during the examination, about which the PA wished to confer with the supervisor. In none of the 3 instances was the reason for the consultation "triagable"--that is, identifiable at the triage level as requiring a physician opinion.

With respect to the 23 URI visits handled by a PA alone, it was the opinion of the medical team reviewing the charts (the MD and PA co-authors of this paper) that the chart revealed no reason for consultation. In 17 cases where MDs handled URI visits alone--with cases chosen to match the consultation and PA-alone OVs in re the 8 variables insofar as matching was possible--the medical team saw nothing in the chart which a PA could not have handled.

A similar approach was made to consultations for 6 other morbidity categories: synovitis, strep throat, gonorrhea, abdominal pain, bronchitis, and physical exam. Here again, all consultation charts, plus matching charts for "PA alone" and "MD alone" visits, were reviewed. The numbers were smaller, but the pattern of findings was similar. In the case of synovitis, for example, there were 2 consultations about the appropriateness of an injection, one about an abnormal physical finding, and one to decide whether the patient should see a surgeon. For two physical exams the PA had to get the MD's signature on a form, and for a third there was an abnormal physical finding. In two cases of gonorrhea the PA was uncertain about the diagnosis, and in a third he wished to consult about a rash. In the one consultation about abdominal pain the PA wanted an opinion about a hernia. The only consultations about bronchitis had to do with the prescription of antibiotics.

The chart-review results may be summarized as follows: (a) None of the 8 variables listed as possible determinants of consultation decisions appeared to be particularly useful, alone or in combination with others, in predicting consultation; so it probably would not be helpful to try to employ those variables as triage guides.[10] (b) Consultation appears to be prompted primarily by factors discovered by the PA during the examination. (c) The PAs seem to practice conservatively in that the medical-team reviewers in some cases found consultations which probably were not necessary for quality assurance. (d) Of the 55 OVs handled by PAs alone, there was only one instance in which the medical team thought the PA (probably) should have consulted his supervisor. (e) With few exceptions, the cases handled by MDs could have been handled by PAs; but the morbidities under scrutiny here are, of course, within the PA competence range.[11] These findings seem to support, again, a policy of general rather than detailed instructions to triage personnel, with heavy reliance upon selecting adequately trained PAs and assigning them to competent, responsible supervisors.

Yet another aspect of supervision remains to be discussed; namely, the time allotment. What an adequate supervisory arrangement costs the system in other physician services, foregone, is difficult to measure, partly because supervision takes many forms, and supervisory events are dispersed irregularly through the clinic day. The observation of 1974-75 recorded the time spent by the MD in examining the PA's patient, in discussing specific cases with the PA, in signing prescriptions, and even in signing charts where the act was visible; but most of the supervisory activities were not so discretely measurable. Charts typically are reviewed in batches at ad hoc periods during the day. General instruction or education of the PA also occurs irregularly and, here also, mostly out of observable range.

The measurable--timable--supervisory activities averaged about an hour per week. How much should be allowed for the other duties? For the two Vancouver PAs and two of the Oregon PAs who practice similarly, the supervisors have their appointment schedules lightened by one hour per day, or 5 hours per week.[12] The 5 hours are about 9.5% of the average MD work week of 52.7 hours. In other words, it takes about 9.5% of a physician to provide supervision for one PA,[13] and 9.5% of $53,593--what it cost the system in basic income and fringe benefits for the average physician in the Department in 1975--is $5,091, which may be defined as the monetized "physician cost" of employing a PA.

But is the five-hour estimate accurate? Supervising physicians, when quizzed in 1975, said that it probably was. Recently we looked at the daily average office visits for supervising and nonsupervising physicians for the first 6 months of 1975 and found that the supervisory group was well above the average:

Month in 1975	Average Office Visits Per Day	Nonsupervisory MDs %	Nonsupervisory MDs Cum. %	Supervisors' Distribution
January	0-14.9	5.4	5.4	
	15-18.9	21.3	26.8	
	19-22.9	46.4	73.2	A, B
	23-26.9	23.2	96.4	C, D
	27 and over	3.6	100.0	E
February	0-14.9	3.6	3.6	
	15-18.9	15.8	19.4	
	19-22.9	31.6	51.0	A, B
	23-26.9	36.8	87.8	D
	27 and over	12.2	100.0	E, C
March	0-14.9	1.8	1.8	
	15-18.9	23.1	24.9	
	19-22.9	44.7	69.6	B
	23-26.9	25.0	94.6	A, D, C
	27 and over	5.4	100.0	E
April	0-14.9	0.0	0.0	
	15-18.9	21.2	21.2	
	19-22.9	48.1	69.3	B
	23-26.9	25.0	94.3	A, D, C
	27 and over	5.7	100.0	E
May	0-14.9	2.0	2.0	
	15-18.9	24.0	26.0	
	19-22.9	56.0	82.0	B, A
	23-26.9	10.0	92.0	D, E
	27 and over	8.0	100.0	C
June	0-14.9	0.0	0.0	
	15-18.9	21.3	21.3	
	19-22.9	63.9	85.2	A, B, C
	23-26.9	10.6	95.8	D, E
	27 and over	4.2	100.0	

The 5 regular PA supervisors are indicated by the letters A through E, and several comments need to be made about them. In three cases the PA and supervisor had the same day off and therefore worked together virtually all of the clinic hours. In the fourth case the regular supervisor had a substitute physician one or two days per week. In the fifth case the PA was monitored by rotating walk-in physicians on four days per week, although his designated supervisor was responsible for general supervision. The supervisors are not identified by letter in the above sentences because that information would also reveal individual productivity rates.

The nonsupervisory MDs varied somewhat in number over the months in response to vacation time and educational leave. It should be pointed out that many of them are substitute PA supervisors on occasion, sometimes as often as one day a week. Even with that and other contingencies taken into account, however, the regular supervisors seem clearly to be performing at a relatively high productivity level in daily "output" of OVs, despite their supervisory duties, which include admission and care of PA patients who have to be hospitalized, because the PAs provide no inpatient services.

Several conjectures are suggested by the comparative figures. First, the time spent in supervision may be less than the estimated five hours. The walk-in load for the clinic is almost always heavy, and MDs help with walk-ins when they are free. Because the supervisor keeps no log, he would not know exactly how much of the allotted supervision time is being filled up with walk-ins. If there were a clear pattern of supervisors' clinic hours protracting beyond those of nonsupervisors, the elongation might suggest that supervisory duties--in toto or in part--are an "add-on" rather than a substitute for non-supervisory duties, and therefore no physician cost is incurred in employing a PA; there is no evidence, however, of a disparity in clinic hours. Of course, even if there were, one might conjecture that if there were no PA to supervise, that same physician would stay long hours to see patients of his own.

Can it be that there is a nonconspicuous selective factor in the recruitment of supervisors? Are there personality traits--energy, ability to organize time, capacity for making a patient feel fully listened to and served in less face-to-face time than it takes other physicians--which permit the supervisor to give an hour a day to the PA and still see enough patients to keep his daily OV average relatively high? Data presently at our disposal do not permit us to answer these questions with confidence, but it should be stated that personality traits such as those described above are part of the overall criteria for selecting PA supervisors in the system.

4. Patterns of PA Practice

In describing present PA practice patterns and in tracing their development over time, we draw upon three primary sources of data: (1) the first PA study, covering the period from September, 1970 through June, 1971;[14]

(2) the Center's ongoing 5% Sample collections, from which two years (July 1, 1971 through June 30, 1973) of outpatient experience were retrieved for the HMEIA study; and (3) three months of clinic observation within the period from November, 1974 through June, 1975. It is to these sources that the column headings 1970-71, 1971-72, 1972-73, and 1974-75 refer in this Section of the paper.

Clinical practices can be described in several ways: relative complexity of the cases handled, personal characteristics of the patients, types of patient encounter and their settings, productivity measured in various ways, and so on. One index of case complexity is the number of associated morbidities which accompany the primary or presenting morbidity. Following is a comparison of PAs and MDs in the Department of Medicine with respect to the percentage of their office visits for which associated morbidities were recorded. Figures are for the average PA and the average MD except for 1970-71, for which the highest and lowest MD are given:

	1970-71			1971-72		1972-73		1974-75	
No. Assoc. Morb.	PA	Low MD	High MD	PA	MD	PA	MD	PA	MD
0	86	55	68	83	67	80	69	81	52
1	12	NA*	NA	14	19	17	19	16	29
2	1	NA	NA	3	8	3	8	3	12
3	1	NA	NA	0	3	1	3	1	4
4+	0	NA	NA	0	2	0	2	0	3
N				991	14,592	1316	15,187	960	1800

*Not available. In some cases columns add to 101 or 99 rather than 100 because of rounding.

The above table shows only a small change from 1970 to 1975 in the complexity of the average OV handled by PAs taken as a group, but the associated-morbidity rate is different for the Vancouver and Oregon PAs. Why? The Vancouver PAs have the longest PA tenure in the system; they practice in a somewhat different legal environment; moreover, their supervisors and clinic chief have been inclined to view PA practices as resembling MD practices in form. These factors might be sufficient to explain the fact that the two PAs in Vancouver see more cases with associated morbidities than do the three PAs in Oregon clinics. The most important reason, however, seems to be that the Vancouver clinic itself gets more patients with associated morbidities, as is evidenced in the rates for Vancouver and Oregon MDs. Here are some 1974-75 data, in percentages:

No. Assoc. Morb.	Vancouver PAs	Oregon PAs	Vancouver MDs	Oregon MDs
0	75	84	47	52
1	20	13	29	29
2	4	3	13	12
3+	2	0	11	6

Note: Observation frequencies for OVs were: Vancouver PAs 365, Oregon PAs 516, Vancouver MDs 137, and Oregon MDs 1663. (Sunday clinic excluded here and in other Vancouver-Oregon comparisons.)

(The ratio of walk-ins to scheduled appointments is probably an important factor. See discussion of appointment type, below.) The physicians' case load appears (in the first table) to have increased in complexity during the last year or two, perhaps because a higher ratio of PAs to physicians has drained off more of the simple cases.

Associated morbidities can be acute or chronic. Because the presence of a chronic disease is particularly apt to be complicating, we looked at chronic diseases separately in this connection. For 1974-75 the comparative percentages of OVs in which a chronic disease was present were:

All MDs	56
Vancouver MDs	61
Oregon MDs	55
All PAs	15
Vancouver PAs	17
Oregon PAs	14

What about patient characteristics? Comparative sex distributions are shown in the following figures, expressed as percentages of OVs:

	1970-71			1971-72		1972-73		1974-75	
	PA	Low MD*	High MD*	PA	MD	PA	MD	PA	MD
Male	52	28	51	50	39	46	39	42	40
Female	48	50	72	50	61	54	61	58	60

*These columns sum diagonally rather than vertically because the MD with the highest percent of males would be the MD with the lowest percent of females.

Age figures, again expressed as percentages of OVs, are as follows:

	1970-71		1971-72		1972-73		1974-75	
	PA	MD	PA	MD	PA	MD	PA	MD
0-18	30	5	31	5	17	5	9	2
19-44	46	47	48	46	68	45	75	38
45-64	18	33	18	30	14	31	14	37
65+	7	16	4	19	2	19	2	23

Here again, Vancouver PAs differ not only from MDs as a whole but from other PAs with respect to sex of patient, albeit the patient age distribution is similar for both PA groups. Note that the sex distribution for Vancouver PAs is closer to that of Vancouver MDs and Oregon MDs than to the distribution for Oregon PAs:

	Vancouver PAs	Oregon PAs	Vancouver MDs	Oregon MDs
Sex				
Male	37	45	40	40
Female	63	55	60	60
Age				
0-19	13	13	7	3
20-44	71	73	32	37
45-64	14	13	48	36
65+	3	1	16	24

In general, women use the system's outpatient services more heavily than men. The utilization figures for 1972 show that 58% of the OVs were for women and 42% for men. However, males are more apt than females to walk in when they do use the clinics. The male-female differential of 42%-58% of all OVs narrows to 46%-54% for walk-ins. Walk-ins are a smaller percentage of total OVs for physicians than for PAs as a whole, and for the Vancouver PAs than for the Oregon PAs. (See below.) These facts are important in explaining the sex breakdowns for MDs and PAs.

The fact that MDs see older patients on the average is related to physician management of more complicated illnesses, including chronic diseases. Virtually no children are seen in the Department; the 19-and-under group are largely late teens, for whom PAs have handled school physicals. The first PA did a great deal of minor surgery during his first year or so, partly because the Vancouver clinic had no full-time surgeon at that time and the PA had had extensive surgical experience. Wart removal, plus the gravitation of young patients to him for other problems, helped to lower his average patient age.

The patient age distributions for physicians and PAs appear to be somewhat less disparate now than in 1970-71, on the whole, although PA patients now are bunching in the two middle groups, and MD patients are shifting more toward the older groups. The fall in the percentage of 65-and-over patients in the PA services is largely explained by PAs having been removed from nursing-home visits, which now are handled by MDs. (See Section 2.)

We turn now to some variables which describe the setting of the PA's office visits. We present, first, the types of patient contact, shown as percentages of total OVs:

	1970-71		1971-72		1972-73		1974-75	
	PA	MD	PA	MD	PA	MD	PA	MD
Walk-ins	55	NA	72	40	73	41	77	35
Scheduled visits	45	NA	29	60	28	59	23	65

The breakdown of scheduled appointments for 1974-75 is as follows, with the figures showing percentages of total OVs:

	PA	MD
15-minute appointments	15	47
30-minute appointments		
physical exam	5	14
other	3	4
TOTAL SCHEDULED VISITS	23	65

The contrast between the Vancouver and Oregon PAs is striking here (1974-75 data), but so is the contrast between Vancouver and Oregon MDs, although less so. Of course, the Vancouver clinic has a higher ratio of PAs to MDs--2 to 8 for Vancouver and 3 to 44 for Oregon--and therefore more PA help with walk-ins, even though the Oregon clinics have more walk-ins per 100 OVs than is true at Vancouver.

	Vancouver PAs	Oregon PAs	Vancouver MDs	Oregon MDs
Walk-ins	56	89	26	36
15-minute appointments	29	6	45	47
30-minute appointments	15	5	29	18

Each of the two Vancouver PAs now has a considerable panel of patients who view him as their regular provider for primary care, under physician supervision. One of the PAs estimates that 60-70% of his OVs are from patients who are regularly scheduled or who walk in to see him specifically.

Within the Oregon clinics there is substantial variation in PA practice patterns, determined in large measure by the nature of the patient load, by physician preferences at the clinic level, and to a lesser degree by individual PA preferences. Thus the PA at one Oregon clinic handles walk-ins almost exclusively, whereas the PA at another Oregon clinic has a practice similar to those at Vancouver, with the third Oregon PA somewhere between the two patterns.

A related categorization of OVs separates initial from continuing (follow-up) visits. Here are the 1974-75 figures, expressed as percentages of total OVs:

	MDs	All PAs	Vancouver PAs	Oregon PAs
Initial visits	49	82	70	89
Continuing visits	51	18	30	11

What about the PA's productivity? Productivity--output or services per unit of time--can be estimated in several ways. For example, there is the average number of OVs per clinic day. From official system schedules the following comparisons were made, the figures being for calendar years:

	1971			1973			1975		
Month	MD	PA	No. PAs	MD	PA	No. PAs	MD	PA	No. PAs
Jan.	21.7	18.9	1	23.2	26.1	4	21.1	21.5	5
Feb.	23.7	22.5	1	22.9	26.2	5	23.0	20.0	5
March	25.2	28.1	1	21.3	22.8	5	21.7	21.2	5
April	22.8	26.3	1	23.3	24.2	5	21.9	21.8	5
May	21.8	27.8	1	23.0	25.5	4	21.0	19.3	5
June	22.9	26.0	1	21.8	22.5	4	21.1	20.6	5
July	21.1	26.7	1	21.8	23.3	5	21.4	19.1	5
August	23.6	29.1	1	19.6	20.7	5	21.1	20.6	5
Sept.	20.1	22.0	3	21.8	22.9	5	21.6	20.9	5
Oct.	19.1	22.6	3	19.0	20.6	5	22.1	21.4	5
Nov.	20.3	24.5	3	20.8	22.7	5	21.8	23.7	5
Dec.	19.8	24.2	3	21.6	23.6	5	21.1	21.8	5
Monthly Av. for year	21.8	24.9	1.7	21.7	23.4	4.8	21.6	21.0	5

Another way of looking at performance is to compare average minutes per OV category. The 1974-75 observation produced the following time data <u>in average minutes</u> for morbidities within the PA range of competence:[15]

	MDs		PAs	
	Initial Visit	Continuing Visit	Initial Visit	Continuing Visit
Walk-in	6.6	7.4	5.8	7.4
15-minute appointment	9.9	8.2	8.7	10.0
30-minute appointment	17.3	17:5	13.5	9.5

The PA appears to perform well, from data in both of the above tables, even taking into account, with respect to the second table, the probability that the MD sees more complex morbidity situations within what are nominally the same disease categories. (See discussion in Section 5.) Patently walk-ins are not given as much time as scheduled appointments, and the larger walk-in component of the PA's case load, as compared with the physician's, would be expected to result in higher daily OV averages. Yet the PA's productivity is impressive. The number of hours in the PA's average work week, on the other hand, is much smaller than the MD's largely because the PA is confined to the outpatient clinic, whose hours therefore set his work schedule, as discussed earlier.

An often-claimed advantage of using PAs in the delivery of primary care is their presumed tendency to "take more time with patients" than MDs so. The time data for observed OVs, as cited above, do not appear to support that assumption, even though patients within the K-P system sometimes give it as a reason for preferring PAs. It may be that what is at issue here is not quantity but "quality" of time, influenced by a less deferential setting, as perceived by the patient. We simply do not have any useful data on this question. Nor do we at this time have comparative data on differences between PA and MD patients with respect to income, education, race and other socioeconomic indices.

One final aspect of practice patterns is perhaps worth mentioning here: the comparative appointment-failure rate for PAs and for MDs. PAs have a 6.5% "no show" rate as compared with a 7% rate for MDs; the figures are 6.8% and 5.9%, respectively, for patients' late cancellations. Thus, the no-show and cancellation rates combined are 13.3% for PAs and 12.9% for MDs. The percentages are based on 589 scheduled appointments for the PAs and 11,876 for the MDs, drawn from the Center's 5% Sample for 1971-73, referred to earlier.

We do not know how to interpret these figures. One might suppose that patients would be more reluctant to cancel an appointment for a serious illness, such as physicians handle, than for simpler problems, especially when the MD appointment was more difficult to get. On the other hand, because appointments with MDs are made much further in advance, there is more time for the medical problem to disappear or to abate, or for unpredicted nonmedical events to intrude. But why would the patient not cancel the appointment? The nearly equal no-show rate for MDs and PAs would not support a common assumption that the patient is likely to be more deferential toward physicians. Factors underlying the variables are too complex and the data too gross, however, to make even tentative conclusions.

A large system must leave enough flexibility in its scheduling to be able to meet unpredictable peaks in demand for services; and if a rational system must risk underutilization of any resources, it will select the least costly ones. Hence, even at Vancouver, MD appointment time is opened up much further in advance, and filled, than is true for PA appointment time. Actually, the press of walk-ins is always sufficiently great to prevent a "down time" problem for any provider, MD or PA.

5. Quality of PA Performance

The unmarked trails and hazards of the quality landscape are widely respected by students of health care. Yet the very concept of substitutability assumes that a shifting of services from MDs to PAs does not result in quality deterioration. To test that assumption we developed some comparative data on processes, outcomes, and patient complaints, and we modestly present those data in this Section.

We shall discuss the process and outcome data first.* For selecting the morbidities to be studied, the following criteria were used: (1) having high frequency, (2) being within the PA competence range, (3) being sufficiently easy to define so that nonhomogeneity probably could be reduced to a satisfactory level, (4) having well-established diagnosis and treatment procedures, and (5) having measurable outcomes reasonably well related to the quality of diagnosis and treatment. Four morbidities which seemed to meet these criteria were chosen: strep throat, coryza-upper respiratory infection (URI),

*We are indebted to Arnold V. Hurtado, MD, and Merwyn R. Greenlick, PhD, for general counsel, and for particular assistance with the quality data. The process and outcome measures used here were chosen primarily by Dr. Hurtado, as preface to a much more comprehensive, long-term study of quality which Dr. Hurtado, Dr. Greenlick and J. David Bristow, MD, are developing at the Center.

bursitis, and bronchitis. Data in the 5% Sample include information about patient characteristics, the kind of patient encounter and its setting, the diagnosis and treatment procedures (process indices) used and certain kinds of outcomes. We retrieved data on age and sex of the patient; type of appointment--whether regularly scheduled, walk-in, or emergency room (ER); status of the provider--whether the patient's regular provider or not; status of the diagnosis on the first visit--whether unknown, tentative, or established; whether the episode started with a phone call or a visit; the number of associated morbidities; the number of laboratory tests and X rays ordered; whether a throat culture or urine culture was among the lab procedures used; whether chest X ray was among the X rays given; whether injections were given; whether there were adverse effects from antibiotics, analgesics or other medication; whether complications such as naso-sinusitis, otitis media, pneumonia, and bronchitis (bronchitis as a complication for the other three morbidities) occurred; and whether there was a hospital admission. These various kinds of information related to the first OV of the episode.

The two-year data were retrieved within the frame of episode of illness; that is to say, all of the contacts with the system by a patient for a given morbidity were treated as a unit. The great majority of cases were one-visit episodes. Unfortunately, although the criteria used to select the four morbidities to be studies were reasonable, given out purpose, there was a price. More complicated morbidities (e.g., some of the chronic diseases) would have permitted us to study management processes and outcomes for an illness over a longer period, with multiple visits.

The number of episodes in the 5% Sample for each of the four morbidities selected, together with the number of one- and two-visit episodes in each group, are:

	MD Episodes			PA Episodes		
	Total	One-visit	Two-visit	Total	One-visit	Two-visit
Strep throat	133	90%	8%	42	95%	5%
URI	529	89%	9%	131	95%	3%
Bursitis	93	60%	18%	19*	79%	10%
Bronchitis	236*	79%	11%	29	76%	17%

*Data missing for 3 bronchitis visits and 1 bursitis visit; the percentages are calculated for the totals shown.

For three of the four morbidities, a larger portion of the patients who saw an MD had at least one associated morbidity than was true for the patients of PAs. The PA-MD differential was greater in URI and bronchitis than in the other two. The figures below show the percentages of cases where <u>no</u> associated morbidity was recorded:

	MD	PA
Strep throat	89%	86%
URI	74%	88%
Bursitis	83%	90%
Bronchitis	74%	93%

The comparison suggests that the MDs' patients were sicker, perhaps because they tended to be somewhat older. Age distributions by provider and by morbidity are as follows:

	0-19	20-44	45-64	65+
Strep throat				
MD	19%	72%	8%	2%
PA	26%	71%	2%	0%
URI				
MD	9%	66%	21%	4%
PA	20%	66%	13%	1%
Bursitis				
MD	3%	48%	40%	9%
PA	5%	45%	45%	5%
Bronchitis				
MD	3%	49%	35%	13%
PA	10%	62%	24%	4%

Note: Where figures do not sum to 100%, the reason is rounding.

Both MDs and PAs produced an established or tentative diagnosis on the first visit in a high percentage of episodes except for strep throat, where it is the throat culture which usually fixes the diagnosis and the lab results are not always immediately available:

	MD	PA
Strep throat	65%	64%
URI	99%	100%
Bursitis	86%	90%
Bronchitis	97%	96%

There is very little distinction between MDs and PAs in the above comparison. The morbidities are relatively uncomplex by definition, and it should be remembered that a large percentage of the episodes are one-visit cases.

Figures concerning use of lab and x-ray services for these particular morbidities suggest that the PAs tend to practice more conservatively; that is, they rely somewhat more heavily upon supportive diagnostic services, especially lab tests:*

	Strep throat		URI		Bursitis		Bronchitis	
	MD	PA	MD	PA	MD	PA	MD	PA
X-rays of any kind								
0	99%	95%	93%	93%	80%	80%	69%	41%
1	1%	5%	6%	6%	16%	20%	30%	59%
2 or more	0%	0%	1%	1%	4%	0%	1%	0%
Chest x-ray	*	*	6%	7%	*	*	31%	59%
Lab tests of any kind								
0	15%	2%	66%	58%	82%	95%	84%	48%
1	77%	73%	31%	34%	6%	5%	13%	44%
2 or more	8%	24%	3%	8%	12%	0%	3%	8%
Throat culture	84%	98%	31%	41%	*	*	10%	24%
Urine culture (sugar)	*	*	1%	1%	*	*	**	0%

*Not included in inquiry
**Less than .5%

The outcome data, though far from conclusive, are useful and interesting. For all four morbidities, with a total of 1216 episodes, only

*Comparison of MDs and PAs with respect to use of supportive services over a wider range of morbidities showed little difference between the average MD and the average PA. See Appendix C of the HMEIA Project's Final Report, available from the Center.

7 instances of adverse drug effects were recorded. Moreover, the other complication rates were practically zero for all but URI, for which the following were reported.

	MD	PA
Naso-sinusitis	1%	0%
Otitis media	3%	2%
Pneumonia	1%	1%
Bronchitis	5%	1%

The force of the above figures as outcome indices is diminished by the fact that they do not distinguish between those episodes in which the complications were present on the first visit and those in which they developed later. This is especially important if sicker patients tend to be triaged to MDs (see comparative data, above, for age and number of associated morbidities). Moreover, the overwhelming percentage of URI cases were one-visit episodes (89% for MDs and 95% for PAs).

To improve the data's usefulness, we sorted out the URI episodes in which the complications were not presented on the first visit; specifically, we included only those episodes--390 (74%) for the MDs and 115 (88%) for the PAs--where there was no associated morbidity on the first visit. We then looked at adverse drug effects as well as the four complications listed above. The results, shown as a percentage of those episodes where the first visit had no associated morbidity are:

	MD	PA
Adverse drug reaction (antibiotic)	0%	0%
Adverse drug reaction (other)	.3%	0%
Naso-sinusitis	.5%	0%
Otitis media	1.0%	0%
Pneumonia	.3%	.9%
Bronchitis	1.3%	0%

The above figures show the percentage of cases where complications developed after the first visit. Even allowing for the fact that MDs still may have gotten sicker patients (as defined by factors other than associated morbidities) and for the fact that many of the above cases were one-visit episodes, the record is impressive. Because Kaiser-Permanente is a pre-paid system, with a fixed population to whom comprehensive care is given, most patients presumably would have come in again had complications occurred; the absence of a second visit suggests that the first was adequate.

Although quality cannot be read directly and conclusively from the data presented in this discussion, the findings strongly suggest that within the stated frame of reference PA performance compares quite favorably with that of physicians. Particularly with respect to URI, the total number of episodes is large enough for the low rate of complications to be taken seriously. Certainly there is no evidence that PAs provide inferior services.

Quality of service must be measured at least in part by patient reaction, and one index of patient dissatisfaction is the complaint rate.

The Health Plan not only investigates all complaints but keeps detailed records, and the complaints are sorted into categories: general attitude (including quality of communication), diagnosis and treatment proficiency, time spent with patient, patient waiting time in the clinic, return of telephone calls, and so on. Overall, for the calendar year of 1975 the average number of patient complaints against a PA was only 58% of the average number of patient complaints against an MD in the Department of Medicine. The percentage figure varied among the complaint categories. With respect to general attitude, for example, the PA complaint rate was only 47% of the MD complaint rate, whereas with respect to diagnosis and treatment the average PA rate was nearer (67%) that of physicians. The overall absolute numbers are small, and because of the MD's more complicated cases, he might be expected to have more complaints. Moreover, the physician's "exposure" rate is somewhat larger than the PA's because although the PA handles as many OVs as the MD does, the MD also provides inpatient night call, and other services not provided by the PA. Yet here again the PA performance appears to stand up well under comparison.

It should be pointed out in concluding this Section that some of the findings of the chart review discussed in Section 3 have quality implications. The data presented there suggest that the PA practices conservatively and that in deciding whether to consult the supervising physician the PA tends to err on the side of caution.

6. Reprise

PA practice patterns are likely to evolve over time not so much in response to formal policy statements and formal instructions to triage personnel as through the interaction of each PA and his or her supervisor in a particular clinic setting, where personalities, individual practice preferences, patient characteristics, the nature of the patients' demand for services, and other particulars of the clinical situation have a shaping force. In a large organization, it would not be feasible, even if it were desirable, to control policy from the administrative center except in terms of general principles. PA practices are certain to vary in content, and the best method to assure quality and legality appears to be to recruit PAs carefully, with respect to competence and attitude, and to place them under competent, responsible physician supervision.

Adequate supervision is perhaps the most challenging aspect of a satisfactory PA policy, and the issue of "when to consult" is probably the key question. The consultation decision in the final analysis must be placed in PA hands. Because that is true, the single most important test of the PA's competence is his ability to judge where it ends. Chart review and other probes on this issue produced data which suggest that, with respect to this criterion, PAs in the K-P system tend to err on the side of restraint rather than overconfidence.

Indeed, preliminary quality data on process, outcome, and patient complaints indicate that PA performance compares well with MD performance within the range of the noncomplex, routine cases which define the PA practice. The average PA also performs well, in comparison with the average MD, regarding "quantity" measures such as average daily office visits.

FOOTNOTES

1. The Center staff also has studied nurse practitioners in Obstetrics-Gynecology and Pediatrics. See J. C. Record and H. R. Cohen, "The Introduction of Midwifery in a Prepaid Group Practice," American Journal of Public Health, LXII, 3 (March 1972), 354-360; P. D. Lairson, J. C. Record, and J. C. James, "Physician Assistants at Kaiser: Distinctive Patterns of Practice," Inquiry, XI, 3 (September 1974), 207-219; and J. C. Record, and M. R. Greenlick, "New Health Professionals and Physician Role: An Hypothesis from Kaiser Experience," Public Health Reports, 90, 3 (May-June 1975), 241-247.

2. Record, J. C., J. E. O'Bannon, P. D. Lairson, and J. P. Mullooly, "Cost Effectiveness of Physician's Assistants: Kaiser-Permanente Experience," a paper presented to the Health Economics Research Organization of the American Economics Association, Dallas, December, 1976. A copy of the HMEIA Project's Final Report, including a revised version of the above paper, is available on request.

3. PA services are not offered to patients who do not belong to the Health Plan. A small percentage of the total K-P clientele elect to purchase services on a fee-for-service basis.

4. See Lairson, et al. for a description of early favorable reaction of patients, physicians, nurses, and others to the PA program.

5. The HMEIA Final Report contains the revised lists and related materials. Our confidence in the lists was increased by the fact that of the 881 OVs which PAs were observed handling, only 26 did not accord with the PA-appropriate lists.

6. For a comparison of the system's PA and nurse practitioner programs, with respect to physician acceptance, see Record and Greenlick, op. cit. That paper suggests that PA-MD relations have been influenced by the fact that most of the physicians in the Department were internists rather than general practitioners.

7. The system is now experimenting with nurse teams, headed by an RN, which will serve groups of providers, typically 4 nurses to 5 providers (MD and PA).

(Footnotes, cont'd)

8. The HEMIA Report contains a detailed description of the method of computation, with a breakdown of hours spent in various activities.

9. The observers had been told that if a PA or his nurse merely handed the prescription to the MD supervisor without discussion of the case, that event should not be recorded as a consultation because the prescription countersignature is pro forma in most cases. If, however, there was <u>any</u> dialogue about the patient, the exchange was to be recorded as a consultation. Apparently many brief exchanges got so recorded, although nothing in the chart indicates the nature of the exchange. To the extent that pro forma countersignatures may have been counted as consultations, the 12% consultation-rate estimate is high. A more extensive chart review is planned, and the results will be included in the published version of this paper.

10. For a statistical analysis of a larger sample, see Appendix F. These eight plus other variables proved in some combinations to be predictive of consultation, but translating the predictiveness into triage guides would be difficult.

11. The well-known limitations of the medical chart should be kept in mind here.

12. In the clinic where the supervising MDs typically are on walk-in duty for that day, there is no appointment schedule to lighten. We are assuming that the supervision time--and therefore the foregone medical services of the physicians--are the same for all clinics. (A more intensive study of supervisory time is planned for the early future.)

13. In 1972 it was estimated that the first PA had an OV consultation rate of 20%, and consumed altogether about 300 hours of physician supervision time per year--12 1/2% of an average physician's year calculated at 2400 hours. J. C. Record and P. D. Lairson, "Physician Assistants At Kaiser: The Question of Substitutability," a paper presented at the American Public Health Association's annual meeting, Minneapolis, November, 1972. Incidentally, the PA's supervisor generally takes over the PA's patients who have to be hospitalized, arranging the admission and giving the physical exam required by the system for all new inpatients.

14. Lairson, Record, and James, <u>op. cit.</u>

15. See Table 1 in the Cost-Effectiveness section of the HMEIA Project's Final Report.

APPENDIX A: OBSERVATION METHODS

The collection of time data needed to be done in such a way as to permit us to estimate time variances between PAs and MDs, on the average, in handling PA-appropriate visits, plus average time for physicians to handle physician-requisite visits. We also had to be able to link an observed visit to the medical record of the patient in order to relate the time data to morbidity categories.

Because many variables may influence the length of a visit, we dispersed the observations widely over clinics, providers and time periods. To capture possible seasonal variation in morbidity patterns and visit frequencies, we picked November, February, and June as the observation months. The observation covered all 5 PAs and 25 percent* of the doctors in the Department of Medicine who were engaged in primary outpatient care.

A sample of 14 was drawn from the 56 practicing physicians as of December 1973, stratified according to their productivity, with productivity measured by average number of patients seen per day. The 14 physicians, the 5 PAs, and their nurses were approached individually

*Actually, the number of physicians in the universe subsequently dropped from 56 to 50. For administrative (and perhaps other) reasons, the Department of Medicine includes psychiatrists, allergists, and dermatologists. Psychiatrists were eliminated from the study at the beginning because they are full-time specialists and therefore do not deliver primary care. Medical consultants first advised leaving the 3 dermatologists and 3 allergists in and then changed their advice after the sample was formed. Fortunately, no dermatologist or allergist was drawn, and the original sample (now 28% rather than 25%) was retained. The OVs retrieved from the computerized data do not include services performed by dermatologists and allergists.

by a senior member of the research team and asked to cooperate in the study; the project was discussed in general and the observation in particular, detailing what participation would entail. All of the documents about purpose and methodology were offered to the participant. It had been planned that if a physician declined, the second doctor in his stratum would be asked, then the third, then the fourth. However, in each stratum, the first MD approached agreed to participate in the study. (In one stratum the first physician was preparing to go on extended leave, so the second physician was approached.) All five of the PAs also agreed to cooperate.

We estimated an observer could monitor about 20 office visits per day. Therefore, two observers working 5 days per week for three months could monitor approximately 2500 contacts. The 130 observation days distributed among 19 providers would yield about 6 days -- or 12 half days -- per provider, spread over the three months and rotated within a 6-day week (plus the emergency room on Sunday).

An observer was posted outside the provider's examination rooms to record the time of entry and exit by physician, PA, and nurse* on a separate record sheet for each patient visit; the sheet also bore the patient's chart number. At the end of the observation day the Center's medical records technicians (who routinely record chart data for the

*Although inclusion of nurse inputs is not required for the project as designed, we recorded them, for possible elaboration of the inquiry, because the marginal cost of collecting nurse data is probably near zero.

5% Sample) reviewed each chart. Information about symptoms, morbidities, procedures, age, sex, and so on, was then recorded on the observation sheet. (See the Summary Sheet Sample.) If the provider saw the patient in his office, the time entailed was added to the time spent with the patient in the examination room. Other activities having to do with the interaction of PAs and their supervisors were also recorded. (See observation code sheet.)

One criterion governing the observation procedures was minimum interference in the delivery of health care. Another was protection of the rights of patients and providers. Patients were identified on the observation sheets only by chart number, and recorded information is being handled in strict accordance with the Center's tested procedures to preserve confidentiality. Providers are identified by code number only, and observation data on productivity will not be available except in summary form; the identity of individual providers will be strictly shielded even from medical members of the research team.

In effect we were examining alternative modes of producing out-patient services. (1) Some services, as defined by visits, are provided only by physicians. (2) PA - appropriate services are provided sometimes by PAs and sometimes by MDs. (3) A smaller group of services is provided by PAs and MDs in combinations. It is not possible to separate (2) from (3) cleanly in the 5% Sample data, which do not always indicate whether a visit was handled by a PA alone or in collaboration with a physician, especially when the doctor did not enter the exam room. Observation in the clinic permits more precise isolation of PA visits which have a physician input, and the nature of that input can be described qualitatively and quantitatively. In those instances where the doctor entered the PA exam room (or the rare reverse situation) the entrances and exits were clocked. More difficult to measure was PA consultation with a physician outside the immediate area. The observer asked the PA to report such trips to the doctor's office, and they were timed.

Preparing the Observation Manual and Forms

Professor Kenneth R. Smith, consultant to the project, visited the Center in October and counseled the staff with respect to construction of forms and instruction of observers. He offered several helpful suggestions based on his own recent observation experiences.

The observation instructions, captured in a manual, set forth the purpose of the observation, definitions of necessary terminology, ways to handle interruptions of the observation process, what to observe, instructions for filling out the observation form, and tasks the observer should undertake before and after the observation period. The manual serves several purposes: to instruct the observers, to be used as a consistency guide throughout the observation period, and to preserve the details of the methodology. A supplemental code list was devised for recording various activities included in the analytical model. Finally, a set of instructions was developed to enable the observers to fill out an intermediate data summary sheet.

The original data forms were developed after preliminary discussions with doctors, PAs and nurses who were cooperating in the study. Then the forms and instructions were pre-tested in the clinics and modified where desirable.

Training of Observers

Three observers began the week-long training session, but only two completed it. Another person was hired and trained in a subsequent week after our initial two observers had begun work in the clinics.

The training period included mastery of the detailed observation manual, intensive practice in recording simulated clinic situations, and supervised observation experience in the clinics during two test-run periods. A week of training was judged sufficient because the observers felt themselves to be ready, and staff checks of their accuracy confirmed the observers' readiness.

Training began with approximately a day and a half devoted to a thorough explanation of the origins and purposes of the study, the sources of funding, the Center's relation to the Kaiser medical care delivery system, the methodologies to be employed, and the significance of the findings. The staff stressed the importance of unobtrusiveness, confidentiality, and accuracy; the manner of achieving those goals was explored in detail.

The next training objective was to familiarize the trainees with the forms to be used and the manner of observing and recording data. A full day was spent going over the manual before the first simulated observations were made. For the simulation we created a clinic setting with exam rooms, nurse's station, and provider offices and engaged in alternate role playing. A series of clinic interactions representative of those which the trainees would encounter in the clinics was presented. After the simulation, the trainees record sheets were reviewed and discussed in detail. A staff member observed and recorded along with the observers so that the results could be compared with the trainees' results.

The next day we reviewed the forms and the manual during the morning, and the trainees got a trial-run observation experience in the clinics during the afternoon. For her first experience in the clinics, each trainee was accompanied by a staff member, who observed and recorded (without consultation) along with the trainee. Afterwards, the staff and trainee forms were compared and discussed.

The fourth day was spent at the Center, largely in intensive drill on recording and coding special situations, particularly the interaction of MDs and PAs in providing services to patients. Review of that section of the manual was followed by "chalk talk" simulations of clinical situations and practice in identifying, recording, and coding them. Trainees were taught to use the "comment" columns of the observation forms to make certain that enough information was recorded to permit confident coding at the end of an observation period. Trainees were instructed not to insert code symbols during the observation process because it would be too easy to use the wrong symbol under the time pressure.

The blackboard drills were followed by a final period of clinic simulation, with a different staff member observing and recording simultaneously with the trainees. Again the results were compared and discussed. The last activity that day entailed thorough instruction in the manner of obtaining from PAs and MDs in the observation sample certain additional information about time spent on rounds, in meetings, in nursing home visits and similar events during the 24 hours preceding the observation time. Again, practice in interviewing took the form of role-playing. The purpose of the information collection and the use to which the data would be put were discussed; thus the trainees developed a good sense of the essence of what we were after, so as to facilitate their thoroughness.

On the final day the trainees arrived at a clinic at 8:00 a.m. unaccompanied by staff, went through all the preliminaries to observation which are set forth in the manual, and then observed a PA and his supervisor, respectively, for an hour, at the end of which the trainees switched providers and observed for another hour. At that point two staff members arrived, to observe and record with them for an hour. All returned to the Center and reviewed the results.

The review included translating material in the comments column into the proper code symbols. After a brief recapitulation of the highlights of the training period, the staff and trainees discussed whether the latter were ready to start the observation or needed another day of preparation (the next day had been reserved for additional training if desirable). There was unanimous agreement that the trainees were ready.

Use of the intermediate data summary sheet was taught in a subsequent intensive four-hour training session conducted by a staff member with each observer independently, after the observation had begun. Actual observation sheets were used for recording onto the summary sheets.

The observers are intelligent, mature, sophisticated women who demonstrated a quickness to learn and great concern about getting the job done just right.

The First Round Observation

Under the supervision of the associate project director, observation in the clinics began on November 6, two days later than we had originally planned to start. To compensate for the late start and for Thanksgiving Day (when the clinics were closed), we scheduled this first observation period to end December 5, rather than on November 30 as our initial plan had provided.

A full day's work for an observer entailed the observation of two providers, each for a clinic half day. In trying to schedule observation of the 19 providers (5 PAs and 14 MDs) as randomly as possible over the month, days off, subspecialty time, hospital days, and leaves of absences had to be taken into account. Furthermore, it was necessary to include a set number of walk-in days and emergency-room days in the month, so that the number of emergency-room and walk-in periods would be represented in the sample in the same proportion as they occurred in toto for all participants over the month. Seventy-six observation periods were scheduled (each provider for four half days of observation over the month, rotated within the seven-day week), and 75 were completed.

Surprisingly few problems were encountered during the month-long observation. There was minor difficulty with crowded space in one or two clinics. Observers sat outside exam rooms to time the movements of providers and patients. In one instance we were able to observe a participating MD only when the doctor across from him was not in the clinic; that required some rescheduling, but we do not believe it distorted the data. On a few occasions we had to abandon a validity check when the observation space was too small for two persons. (The validity check required the supervisor to be present with the observer for spontaneously selected periods. See quality control section below). However, the overall accuracy was quite high.

Occasionally a provider's schedule changed unexpectedly because of sudden leave requests, illness, cancellation of a clinic day at the last minute to permit the provider to work at some other duty, or extension of a vacation beyond the original plan. In most instances we were able to schedule an alternate provider for the observer. Even with the changes, we came close to achieving the originally expected mix of 20 half-day observations of PAs and 56 half-day observations of MDs. The actual figures were 22 and 53, respectively.

Several problems developed with respect to the emergency room (ER) observation. We discovered that MDs often switch ER duty without informing the system until after the substitute is on duty. Moreover, ER services and staffing as they were arranged at the time did not permit the PA to substitute directly for the MD working with him. ER duty was divided among three providers -- the PA, who handled patients in a setting much like that of walk-in duty on a normal day in a regular clinic; one MD whose primary duty was handling phone calls and who saw patients only if the PA was exceedingly busy or needed help for a specific patient; and another MD whose primary responsibility was "true" emergencies, handled in an area physically separate from where the PA worked. The second doctor was also available to the PA for consultation if the need arose. PAs work in the ER only on Sundays. The rest of the week the ER services done by the PA on Sundays are performed by an "emergency internist" (a part-time employee of the system).

The first attempts to observe the ER encountered problems in physically tracking patients and in recording consultation time between the MD and PA accurately. Those problems resulted in our discarding the ER observations for November. For February and June we modified the original design for the ER to limit direct observation to the PA. The PA's use of physician time was estimated with the PA's help. We did, however, estimate the ratio of PA-appropriate visits to total visits for the hours the PAs worked in order to assess PA effectiveness in this setting.

Quality Control of the Data

To enhance accuracy, several quality-control methods were used. First of all, the observers were trained to go directly to their supervisor for clarification of all questions, no matter how small. Specifically, observers were not to ask about or discuss their work with one another unless the supervisor was present. The object was to make all decisions concerning problem situations uniform for the observers. The supervisor, after solving a particular problem, notified the other observers of the decision made.

The supervisor met with each observer to review policies and procedures a total of six times (averaging 1 hour and 40 minutes for each contact) in the first month's observation. In addition, there were numerous phone conversations with each observer concerning difficulties encountered.

Validation of the observer's recording of data was facilitated by the supervisor's joining the observer unexpectedly to observe her work. The supervisor did not record along with the observer for fear that she might influence the observer's recording and result in a nonindependent check. However, the supervisor did watch the observer's recording. On each of the five validity checks made in the first month (averaging 63 minutes) the work was satisfactory.

The observers were required to summarize their observations on intermediate data forms at the end of each observation period. The supervisor reviewed 100 percent of the summaries for the November observation. Careless errors or misunderstandings were soon discovered. At the end of the first month a meeting of the observers was held to review all of the procedures. A decision was made to let the third observer fill out most of the summary forms because there appear to be fewer errors when one observer fills out another's summary sheets. The observers were again cautioned to edit their observation forms (from which the summaries are made) carefully before leaving the clinic. Missing information or other errors are much less time-costly when discovered on the site.

A summary sheet was made for each observed office visit, and the summary sheet was subsequently linked to a Center form (modified Form A, attached) containing medical and demographic information, abstracted from the medical record of the patient involved. The medical chart abstraction was done by the Center's regular records technicians, who do this type of work routinely for the Center's ongoing 5% Sample of Health Plan subscriber units. As a cross-check for the two forms, certain common information was recorded both on the observation summary form and on the Form A. When we matched the two forms, we found that about 8 percent of the 808 visits recorded in the first month contained an error. Most of the errors were correctable from independent sources. Fewer than a dozen errors had to be corrected by arbitrary decision (which usually required using an average time for all the other visits to that provider on the day in question to calculate the time of an event, usually the arrival time for a patient). Less than 3 percent of the visits contained errors in the form of missing data. When starting time or ending time for a patient visit was inadvertently omitted, an average time for that day's observation was calculated and used. Only a very small number of errors were not correctable. Those applied primarily to whether the chart was available, a relatively unimportant matter.

Second-Round Observation

Observation forms, manual, and code sheets, with minor revisions, plus new observation schedules had been prepared in January and were ready for the second-round observation scheduled to start February 1, 1975, when word arrived that the Kaiser-Permanente unit of the Retail Clerks Union had gone out on strike, closing the system's pharmacies and x-ray sections. The observation was postponed because some PAs were used during the strike to take x-rays, because MD and PA practice patterns may have been affected by a need to restrict x-ray service or other contingencies, and because almost certainly some patients refused to cross picket lines, creating departures from the usual routine. The strike was over on February 14, but we decided to delay the second round until the 23rd in order to allow time for the system to return to normal. We missed the peak of the flu season, which occurred this year on the 20th of February.* However, office visits which are large in numbers in February are typically large in March as well.

For the second round we made some changes in our design. First we changed the scheduling such that one observer would be able to work in the same clinic for a whole day (although changing providers for the morning and afternoon clinic sessions). In this way the observer could collect additional information on a provider's work habits during the lunch break, which sometimes had been missed when the observer had to rush to another clinic for the afternoon. The new approach also saved some transportation costs.

*Another Center study has pinpointed the date.

Moreover, during the second and third months, we did a more intensive study of the work relationship of the PA and his MD supervisor. By observing the PA and his supervisor simultaneously, with one observer assigned to each, we picked up details of interaction that we otherwise would have missed; for example, data to make an estimate of what a PA costs the system in direct physician input time or physician interruptions. The PA's supervising doctors who were not in our original MD sample agreed to cooperate. We also increased the total number of observations for the PAs. Because the percentage of PA visits which required an MD consultation during the first month was less than we had supposed, our original design produced too few of those contacts, about which we were particularly curious.

During the second round of observations the quality-control measures instituted at the beginning of the observation were continued. Eight different validity checks (averaging 33 minutes each) were made, one separate conference with each of the three observers (averaging 77 minutes each) was held, and many phone inquiries answered. The error rate in collecting data, which was small to begin with, fell even lower as the observers became more careful and experienced in recording and editing.

Incidentally, we had to make a change of one doctor in the original sample. He was on leave for the final two observation rounds, and the next physician in his sample stratum agreed to substitute.

Third-Round Observation

The third round of observation originally scheduled for the month of June was rescheduled to start in mid-May and to end in mid-June. This permitted us to avoid some scheduling problems due to upcoming vacations and to give us some extra time for managing the data already produced. The months of May and June are not widely dissimilar in morbidity and visit patterns.

For this observation we continued the scheduling of observers to one clinic per day; also the extra observations of PAs, including special dual observation of PAs and their MD supervisors. More shifting of observation periods occurred in this month because of more frequent short-notice vacations. Four conferences (averaging 49 minutes) between the observers and their supervisor occurred, and six validation checks (averaging 48 minutes) were made. Phone contacts to discuss problems also continued. By the third month only 75 percent of all summary forms were carefully checked by the supervisor; the remaining 25 percent were lightly screened.

At no time during the second and third observations did we receive any complaint about observation activities. The observers' error rate was again small, and most of the errors were correctable.

For all three observations, covering a total of 2760 visits, there were only 31 visits -- 9 to MDs and 22 to PAs -- for which charts could not be located by the medical technicians and thus no morbidity data other than the code "Morbidity Unknown" (.1) was recoı ·led for these visits.

TABLE A-1

Observed Visits, by Clinic and Type of Provider

Clinic	Total Visits			M.D. Visits			P.A. Visits		
	No. Observed Half Days	No. Visits	%	No. Observed Half Days	No. Visits	%	No. Observed Half Days	No. Visits	%
A	8	63	2.3	8	63	3.5	- -	- -	- -
B	6	79	2.9	- -	- -	- -	6	79	8.2
C	10	97	3.5	10	97	5.4	- -	- -	- -
D	17	198	7.2	17	198	11.0	- -	- -	- -
E	47	502	18.2	14	137	7.6	33	365	38.0
F	38	512	18.6	23	341	18.9	15	171	17.8
G	64	594	21.5	47	473	26.3	17	121	12.6
H	57	715	25.9	41	491	27.3	16	224	23.3
TOTAL	247	2760	100.0	160	1800	100.0	87	960	100.0

TABLE A-2

Observed Visits by Individual Provider

M.D. Visits

Provider	No. Observed Half Days	No. Visits	%
A	11	88	4.9
B	12	96	5.3
C	12	99	5.5
D	10	103	5.7
E	9	104	5.8
F	11	110	6.1
G	12	113	6.3
H	12	128	7.1
I	12	134	7.4
J	12	138	7.7
K	12	142	7.9
L	11	154	8.6
M	13	172	9.6
N	11	219	12.2
TOTAL 14	160	1800	100.0

P.A. Visits

Provider	No. Observed Half Days	No. Visits	%
A	19	142	14.8
B	17	186	19.4
C	16	186	19.4
D	17	192	20.0
E	18	254	26.4
TOTAL 5	87	960	100.0

TABLE A-3

Observed Visits, by Day and Type of Provider

	Total Visits		M.D. Visits		P.A. Visits	
Day	No.	%	No.	%	No.	%
Monday	549	19.9	355	19.7	194	20.2
Tuesday	542	19.6	395	21.9	147	15.3
Wednesday	491	17.8	264	14.7	227	23.6
Thursday	376	13.6	263	14.6	113	11.8
Friday	467	16.9	319	17.7	148	15.4
Saturday	258	9.3	204	11.3	54	5.6
Sunday	79	2.9	- -	- -	79	8.2
TOTAL	2760	100.0	1800	100.0	960	100.0

TABLE A-4

Observed Visits, by Number of Associated Morbidities
and Type of Provider

Number of Associated Morbidities	M. D. Visits		P. A. Visits	
	No.	%	No.	%
0	936	52.0	774	80.6
1	524	29.1	150	15.6
2	219	12.2	28	2.9
3	72	4.0	5	.5
4	30	1.7	1	.1
5	10	.6	0	- -
6	7	.4	1	.1
7	1	.1	0	- -
8	1	.1	0	- -
9	- -	- -	1	.1
TOTAL	1800	100.0	960	100.0

TABLE A-5

Observed Visits, by Presence or Absence of Chronic Disease
and by Type of Provider

Chronic Disease	M. D. Visits No.	M. D. Visits %	P. A. Visits No.	P. A. Visits %
Absent	796	44. 2	813	84. 7
Present	1004	55. 8	147	15. 3
TOTAL	1800	100. 0	960	100. 0

TABLE A-6

Observed Visits, by Sex and by Type of Provider

Sex of Patient	Total Visits		M.D. Visits		P.A. Visits	
	No.	%	No.	%	No.	%
Males	1127	40.8	724	40.2	403	42.0
Females	1633	59.2	1076	59.8	557	58.0
TOTAL	2760	100.0	1800	100.0	960	100.0

TABLE A-7

Observed Visits, by Age and Type of Provider

Age of Patient	Total Visits No.	Total Visits %	M.D. Visits No.	M.D. Visits %	P.A. Visits No.	P.A. Visits %
0-19	180	6.5	59	3.3	121	12.6
20-44	1347	48.8	664	36.9	683	71.1
45-64	802	29.1	663	36.8	139	14.5
65+	431	15.6	414	23.0	17	1.8
TOTAL	2760	100.0	1800	100.0	960	100.0

TABLE A-8

Observed Visits, by Medical Chart Availability* and Type of Provider

	Total Visits		M. D. Visits		P. A. Visits	
Chart Availability	No.	%	No.	%	No.	%
Available	1828	66.2	1359	75.5	469	48.9
Not Available	903	32.7	417	23.2	486	50.6
Availability unknown	29	1.1	24	1.3	5	.5
TOTAL	2760	100.0	1800	100.0	960	100.0

TABLE A-9

Observed Visits, by Type of Appointment and Type of Provider

	Total Visits		MD Visits		PA Visits	
	No. Visits	%	No. Visits	%	No. Visits	%
Without Appointment	1371	49.7	629	34.9	742	77.3
15 Min. Regularly Scheduled	978	35.4	838	46.6	140	14.6
30 Min. and Regularly Scheduled, Non-Physical	113	4.1	80	4.4	33	3.4
30 Min. and Regularly Scheduled, Physical	298	10.8	253	14.1	45	4.7
TOTAL	2760	100.0	1800	100.0	960	100.0

NOTE: 79 (5.8%) of the 1371 WA visits were in the Emergency Room. The rest were in the outpatient clinics.

TABLE A-10

Placement of the Observed Visit Within the Episode, by Provider

	Total Visits		MD Visits		PA Visits	
	No. of Visits	%	No. of Visits	%	No. of Visits	%
Initial	1664	60.3	878	48.8	786	81.9
Continuing	1096	39.7	922	51.2	174	18.1
TOTAL	2760	100.0	1800	100.0	960	100.0

TABLE A-11

Minutes for Observed Clinic Activities, Summarized for All Visits by Provider

Type of Activity	Summary Sheet Code	MD Mean	MD Mode	MD Median	MD Std. Error	MD Frequency	PA Mean	PA Mode	PA Median	PA Std. Error	PA Frequency
Changes of provider activity related to given patient (PT)											
Provider leaves PT unprompted to make a call; returns to PT	B	3.2	2.5	3.4	0.6	13	0.8	0.5	0.8	0.2	2
Provider leaves PT, talks with NR about PT	C	0.7	0.5	0.6	0.0	541	0.7	0.5	0.6	0.0	325
MD consults another MD in room with PT	D	3.7	3.0	3.3	0.5	5					0
MD consults another MD outside PT's presence	E	3.5	1.0	1.8	0.9	12					0
Interruption of MD or PA activity related to another PT											
NR calls provider to phone about another PT	G	2.5	0.5	1.4	0.3	71	0.9	0.5	0.6	0.2	13
Any other interruption	H	1.6	0.5	0.6	0.4	48		1.1			24
Interaction of PA and MD when MD is being observed											
(Concerning the PA's PT):											
PA waits for MD who is not available	I	1.0	0.5	0.6	0.2	25					
PA gets MD's signature only	J	0.6	0.5	0.5	0.0	23					
PA consults MD who also may sign or examine chart	K	2.0	1.0	1.6	0.3	13					
PA's NR goes to MD to get signature for PA	Z	0.8	0.5	0.6	0.2	17	1.1	0.5	0.8	0.1	130
Provider confers with relative; PT not present	1	4.3	2.0	2.1	0.9	23	4.2	0.5	1.2	2.4	4
MD signs Rx for PA (not present)	2	0.5	0.5	0.5	0.0	8					
(Concerning the MD's PT):											
PA performs service for MD	L				(p. 196)	0	2.2	1.0	2.2	1.2	2
MD calls PA in for instruction	M	2.0	2.0	2.0	none given	1	2.0	0.5	2.0	1.5	2
Interaction of PA and MD when observing PA											
(PA goes to the MD)											
PA seeks MD for signature; no delay	N						0.7	0.5	0.6	0.0	130
PA seeks MD for signature; delay	O						2.1	1.0	1.5	0.4	14
PA seeks MD for signature; no signature; returns	P						0.6	0.5	0.5	0.0	71
PA seeks MD for consultation; no delay	Q						2.4	0.5	1.4	0.3	91
PA seeks MD for consultation; delay	R						4.6	1.0	3.2	1.1	12
PA seeks MD for consultation; unsuccessful	T						2.2	0.5	0.7	0.5	34
(MD comes to the PA)											
MD sees PA's PT	U						4.8	4.0	3.9	0.6	51
MD discusses case with PA outside PT's presence, (after seeing PT)	V						1.0	0.5	0.8	0.2	12
MD reviews PT's chart, written instructions; PA and PT not present	W						2.4	0.5	1.0	1.6	5
MD waits for PA	X						2.2	0.5	2.2	1.8	2
Triage error (minutes for total visit)	Y						26.7	1.0	26.2	4.4	12

NOTE: Total MD visits = 1800, PA visits = 960

List 1: Morbidities Seen by the PA Alone or With MD Consultation Highly Probable*
(Initial Visits)

Modified Morbidity Code	Name	Frequency**
.0	*No disease present (depends on procedures rendered	53
.1	*Morbidity unknown for which service was performed (depends on procedures rendered)	453
.5	*Abnormal lab or x-ray without apparent disease	5
006.1	*Positive tuberculin test with/without TB	4
006.2	*Conversion: neg. to pos. TB test	1
006.3	*Positive Tine test	1
028.3	*Positive serology - unknown significance	1
030.0	Acute, unspec. gonorrhea	54
039.0	Other and unspec. venereal diseases	4
045.2	*Bacillary dysentery - Shiga	1
045.9	*Bacillary dysentery - other	2
049.0	*Food poisoning - Staphylococcal	1
050.0	*Scarlet fever	1
051.0	Streptococcal sore throat	260
070.0	*Vincent's infection	2
085.0	Measles	1
086.0	Rubella	1
087.0	Chickenpox	3

*Indicates those diseases where consultation is highly probable
**Total contacts recorded in the 5% Health Plan Sample for two years

Modified Morbidity Code	Name	Frequency
088.9	Herpes Zoster, unspec.	19
089.0	Mumps	7
092.0	Infectious Hepatitis	12
093.0	Glandular fever	35
096.0	Diseases attribute viruses, Herpes Febrilis	39
096.6	*Foot and mouth disease	1
096.9	Viral gastroenteritis	277
130.1	Worm infestation - Oxyuriasis	11
131.0	Dermatophytosis	15
131.1	Dermatophytosis scalp and beard	1
131.9	Dermatophytosis unspecified sites	40
134.3	Moniliasis	77
134.9	Other fungus infection	2
136.0	Pediculosis	20
138.9	Other infective and parasitic disease	1
177.0	*Malignant neoplasm prostate	1
210.0	*Benign neopl. of buccal cavity and pharynx	1
211.4	*Benign neopl. of rectum	2
213.0	*Benign neopl. of breast	1
220.0	*Benign melanoma, skin	10
221.0	Pilonidal cyst	2
222.0	*Other benign neopl. of skin	3

Modified Morbidity Code	Name	Frequency
226. 1	Lipoma, subcutaneous tissue	3
226. 9	Lipoma - other	1
240. 0	Hayfever	3
240. 4	Hayfever - food	1
240. 6	Hayfever - drugs	1
240. 8	Hayfever due to multiple allergies	1
240. 9	Hayfever, other and unspecified	93
241. 0	*Asthma due to pollen	2
241. 9	*Asthma due to other and unspec.	18
242. 9	*Angioneurotic edema	2
243. 0	Urticaria	6
243. 1	Urticaria - dander or dandruff	1
243. 4	Urticaria - food	1
243. 9	Urticaria - other and unspec.	30
244. 6	Allergic eczema - drugs	1
244. 9	Allergic eczema - other and unspec.	8
245. 1	Other allergic disorders - dander	2
245. 3	Allergic disorders - dust	1
245. 6	Allergic disorders - drugs	1
245. 9	Allergic disorders, other and unspecified	8
247. 7	Allergic reaction to insect venom	6

Modified Morbidity Code	Name	Frequency
250.0	*Simple goiter (struma)	4
253.1	*Hypothyroidism - clinically present	3
253.3	Taking thyroid - surgical hypothyroidism	1
253.5	Taking thyroid - reputed hypothyroidism	2
253.7	Taking thyroid - unknown reasons	3
254.0	*Other diseases of thyroid gland	1
254.1	*Acute thyroiditis	1
260.0	*Diabetes mellitus	6
286.0	*Other avitaminoses and nutritional deficiency states	1
287.0	*Obesity - not specified as endocrine origin	20
288.0	Gout	12
290.9	*Other hyperchromic anemias	1
291.1	*Iron deficiency anemia secondary to menorrhagia	1
291.2	*Iron deficiency anemia secondary to G.I. bleeding	1
291.5	*Iron deficiency anemia secondary to other causes	1
291.6	*Iron deficiency anemia secondary to unknown cause	3
293.0	*Anemia of unspecified type	2
322.5	*Drug abuse - prescribed drugs	2
322.7	*Drug abuse - illegal	2
323.1	Musculoskeletal reaction	7

Modified Morbidity Code	Name	Frequency
323.2	Respiratory reaction	6
323.3	*Cardiovascular reaction	4
323.5	Gastrointestinal reaction	58
323.6	Genitourinary reaction	3
323.8	*Nervous system reaction	14
323.9	Spec. sense organs reaction	1
324.0	Anxiety reaction	114
324.2	*Psychoneurotic disorders - conversion reaction	6
324.5	*Psychoneurotic disorders - depressive reaction	34
324.6	Hyperventilation syndrome	14
324.7	Status for tranquilizers or sedatives prescribed - reason unstated	3
326.3	Alcohol addiction	4
327.8	Hypochondria	8
328.0	Transient situa. pers. disorders	2
328.1	Transient adult situa. pers. disorders reaction	5
328.4	Transient adjus. reaction, pers. disorders, adolescence	3
328.5	*Adjust. reaction of late life	1
354.0	*Migraine	17
360.0	*Facial paralysis	4
363.0	*Sciatica	1

Modified Morbidity Code	Name	Frequency
366.1	*Spinal neuralgia and neuritis	2
366.9	Neuralgia - neuritis - other unspecified	9
368.1	*Dis. peripheral nerves - median nerve	9
368.9	*Dis. peripheral nerves - other	11
370.0	Conjunctivitis, ophthalmia	4
370.1	*Conjunctivitis, unknown etiology with antibiotic	25
370.2	Conjunctivitis, unknown etiology, no antibiotic	13
370.4	Allergic conjunctivitis	6
370.6	*Unspec. blepharoconjunct with antibiotic	1
370.9	*Unspec. conjunctivitis with or without antibiotic	2
371.1	Allergic blepharitis	1
371.2	*Blepharitis unspec.	4
372.0	*Hordeolum	11
373.0	*Iritis	3
378.0	*Inflammation lacrimal gland - ducts	1
379.9	*Inflammatory disease, eye	3
381.0	*Dis. of eye - cornea ulcer	1
383.0	Dis. of eye - pterygium	1
385.9	*Dis. of eye - cataract unspec. and senile	1
388.0	*Other diseases of eye except retina, optic nerve	4
388.1	Other disease of eyelid	1

Modified Morbidity Code	Name	Frequency
388.3	*Conjunctive and lacrimal tract	3
388.6	*Other disease of iris	1
389.1	Amblyopia	1
390.0	Otitis externa	59
391.0	Otitis media - Acute	38
391.1	*Otitis media - chronic	1
391.2	Otitis media - Unspecified	6
391.3	Otitis media - spec. or Purulent Suppurative	2
391.9	Otitis media - Unspecified	99
394.0	Labyrinthitis	33
394.9	Inflamm. disease, ear, other	4
395.0	*Meniere's Disease	5
396.0	*Perforation tympanic membrane	4
396.9	*Other disease ear and mastoid process	97
398.3	One or two ears, impaired hearing	4
433.3	*Paroxysmal Tachycardia	7
433.5	*Heart murmur	1
447.0	*Other hypertensive disease	23
452.4	*Bruit of neck or head	1
453.3	*Intermittent claudication	1
460.0	Varicose veins, lower extremities	2

Modified Morbidity Code	Name	Frequency
460.2	*Varicose ulcer - lower extremities	1
460.9	Varicose veins, veins, lower extremities - without ulcer and unspec. ulceration	3
461.0	Hemorrhoids	36
462.0	Varicose veins, other spec. sites	2
463.0	*Phlebitis and thrombophlebitis of lower extremities	8
464.0	*Phlebitis and thrombophlebitis of other sites	3
467.1	*Dis. of capillaries	1
467.9	*Circulatory system - other circulatory diseases	8
468.2	Lymphadenitis	10
470.0	Acute nasopharyngitis	168
471.0	Acute sinusitis	2
471.4	Acute sinusitis, non-specified, no antibiotic	22
471.6	Acute sinusitis, bacterial	2
471.7	Acute sinusitis, non-spec. antibiotic given	70
471.9	Acute sinusitis, unspec. and pansinusitis	2
472.0	Acute pharyngitis	53
472.1	Acute pharyngitis - viral	54
472.2	Acute pharyngitis - bacterial	11
472.3	Acute pharyngitis - not spec. antibiotic given	83

Modified Morbidity Code	Name	Frequency
472.9	Acute Pharyngitis - other	1
473.0	Acute tonsillitis	2
473.1	Acute tonsillitis - viral	1
473.2	Acute tonsillitis - bacterial	2
473.3	Acute tonsillitis - not spec. antiobiotic given	45
474.0	Acute laryngitis, tracheitis	21
474.1	Acute laryngitis, tracheitis - viral	7
474.3	Acute laryngitis, tracheitis - not spec. antibiotic given	12
475.0	Acute upper respiratory infection - multiple, unspec. sites	813
476.0	Not spec. respiratory infection - upper and lower	36
476.1	Not spec. respiratory infection - upper and lower - viral	10
476.2	Not spec. respiratory infection - upper and lower - bacterial	1
476.3	Not spec. respiratory infection - upper and lower - not spec. antibiotic given	21
480.0	*Influenza with pneumonia	1
481.0	Influenza - respiratory manifes. unqualified	274
481.1	Flu, respiratory	17
481.2	Flu, respiratory - digestive system	4
482.0	Flu, digestive but not respiratory symptoms	2

Modified Morbidity Code	Name	Frequency
490.8	*Lobar pneumonia - other spec. organism or cause	1
490.9	*Lobar pneumonia - unspec. organism or cause	10
491.0	*Bronchopneumonia - Friedlander's B.	1
491.2	*Bronchopneumonia - pneumococcus	1
491.8	*Bronchopneumonia - other spec. organism or cause	1
491.9	*Bronchopneumonia - other unspec. organism or cause	16
492.0	*Primary atypical pneumonia	51
493.0	*Pneumonia - other and unspec. - Friedlander's B.	1
493.1	*Pneumonia - other and unspec. - pneumococcus	2
493.6	*Pneumonia - other and unspec. - antibiotic given	2
493.8	*Pneumonia - other and specified - organism or cause	2
493.9	*Pneumonia - other and unspecified - organism or cause	26
500.0	Bronchitis, unspec., no antibiotic	51
500.1	Bronchitis, viral	36
500.2	Bronchitis, bacterial	4
500.3	Bronchitis, unspec. with antibiotic	308
500.4	Bronchitis, recurrent	1

Modified Morbidity Code	Name	Frequency
501.0	Bronchitis, unqualified	3
502.0	*Bronchitis, with emphysema	6
502.9	Bronchitis, other - without emphysema	7
503.0	Bronchitis, not spec., antibiotic given	8
510.0	Hypertrophy tonsils and adenoids	1
511.0	*Peritonsillar abscess - quinsy	4
512.0	Chronic pharyngitis - nasopharyngitis	1
512.1	Chronic nasopharyngitis	46
513.0	*Chronic sinusitis - maxillary	3
513.9	*Unspec. chronic sinusitis and pansinusitis	7
514.0	Deflected nasal septum	3
516.0	*Chronic laryngitis	1
517.9	Other upper respiratory diseases	7
519.0	*Pleurisy without mention of effusion or TB	12
525.0	*Other chronic interstitial pneumonia	1
526.0	*Bronchiectasis - with or without bronchitis	1
527.1	*Emphysema without mention of bronchitis	7
527.9	*Other dis. of lung pleural cavity - other	3
530.2	Dental caries with periapical abscesses	1
531.9	*Abscesses of supporting structures of teeth - other and unspecified	11

Modified Morbidity Code	Name	Frequency
532.0	Gingivitis - except ulcerative	5
532.9	Other inflamm. disease supporting structures of teeth	4
533.2	Impacted teeth	1
534.0	Toothache, unspec. cause	3
536.0	Stomatitis	10
537.0	*Inflammatory dis. of salivary glands	6
537.1	Calculus of salivary gland	2
537.9	*Other dis. of salivary glands	2
538.0	Dis. of buccal cavity - inflammatory dis.	4
538.1	*Leukoplakia	1
538.9	Other disease - buccal cavity	6
539.1	*Dis. of esophagus - functional disorders	1
539.9	*Dis. of esophagus - other	1
540.0	*Ulcer of stomach without perforation and without hemorrhage	11
540.8	*Peptic ulcer without mention of stomach or duodenum	3
541.0	*Ulcer of duodenum without perforation and without hemorrhage	14
542.0	*Gastrojejunal ulcer without perforation - without hemorrhage	1
543.0	Gastritis and duodenitis	46
544.1	*Disorders of gastric motility	1

Modified Morbidity Code	Name	Frequency
544.9	*Disorders of function of stomach - other	11
545.9	*Other dis. of stomach and duodenum - other	16
550.0	*Acute appendicitis without mention of peritonitis	4
550.1	*Acute appendicitis with peritonitis	2
552.0	*Other appendicitis	4
560.0	Inguinal hernia	11
560.2	Umbilical hernia	2
560.3	Ventral hernia	2
560.4	*Hernia of abdominal cavity diaphragmatic	11
570.4	Impaction of intestine	2
570.9	*Intestinal obstruction - other	2
571.0	Gastroenteritis and colitis	170
572.0	*Regional enteritis or ileitis	7
572.1	*Diverticulitis	22
572.2	*Ulcerative colitis	3
573.0	Constipation	2
573.2	Irritability of colon	73
573.9	Functional disorders of intestines - other	15
574.0	Anal fissure and fistula	9
575.0	*Abscesses of anal rectal regions	1
578.6	*Proctitis	5

Modified Morbidity Code	Name	Frequency
581.1	*Cirrhosis of liver with alcoholism	2
583.0	*Other dis. of liver - inflammatory dis. NOS	3
584.0	*Cholelithiasis	15
587.9	*Dis. of pancreas - other	1
591.1	*Nephritis with edema - including nephrosis	15
591.4	Stasis edema	4
600.0	*Pyelitis, pyelocystitis and pyelonephritis	12
600.9	Other infection of kidney	2
602.0	*Calculi of kidney and ureter	11
603.0	Nephroptosis	1
605.0	Acute cystitis	174
605.1	Acute cystitis, 2nd attack in a year	28
605.2	Recurrent acute cystitis	17
605.3	*Chronic cystitis	6
607.0	Urethritis - non-venereal	30
608.0	*Stricture of urethra	3
609.0	*Urinary tract infections	107
609.3	*Recurrent urinary tract infections	1
610.0	Hyperplasia of prostate	7
611.0	Prostatitis	36
612.9	Other disease of prostata - other	1

Modified Morbidity Code	Name	Frequency
614.0	*Orchitis and epididymitis	13
617.0	Balanitis, infectional	3
617.2	Inflamm. disease of male genitals, unspec.	5
617.5	Atrophy of testicle	1
617.9	*Other dis. of male genital organs - other	4
620.0	*Chronic cystic dis. of breast	8
624.0	*Salpingitis and oophoritis	1
625.2	*Ovarian cyst retention	1
626.0	*Pelvic inflammatory disease	31
630.0	Cervicitis	6
630.2	Vaginitis and vulvitis	54
631.0	*Uterovaginal prolapse - Cystocele	2
634.0	*Disorders of menstruation - absence	2
634.3	Disorders of menstruation - painful	5
634.5	*Disorders of menstruation - irregular	2
634.6	*Disorders of menstruation - intermenstrual bleeding	2
634.9	*Disorders of menstruation - other	1
635.0	Menopausal symptoms	15
635.1	Post-menopausal symptoms on Premarin	1
637.6	Premenstrual tension or symptoms	3
637.9	Dis. of female genital organs - other	1

Modified Morbidity Code	Name	Frequency
640.0	*Pyelitis and pyelonephritis of pregnancy	2
642.5	Patient complains mild or simple nausea and vomiting of pg.	5
690.0	Boil on face	7
690.1	Boil on neck and scalp	2
690.2	Boil on trunk	2
690.3	Boil on upper arm and forearm	2
690.6	Boil on lower extremity	4
690.9	Boil on unspecified site	5
691.0	Cellulitis, finger and toe	12
692.0	Cellulitis and abscess - head and neck	4
692.1	Cellulitis and abscess - trunk	3
692.2	Cellulitis and abscess - upper arm and forearm	1
692.3	Cellulitis and abscess - hand, except finger	1
692.4	Cellulitis and abscess - leg	8
692.5	Cellulitis and abscess - foot, except toes	1
694.0	Acute lymphadenitis	1
695.0	Impetigo	10
696.0	Infectious warts	25
698.0	Pyoderma	8
698.9	Other and unspec. local infections of skin	2

Modified Morbidity Code	Name	Frequency
700.0	Seborrheic dermatitis	20
701.0	Eczema	22
703.0	Dermatitis due to plant	41
703.3	Dermatitis due to drugs contact skin	1
703.6	Dermatitis due to cosmetics	1
703.8	Dermatitis, other spec. agents	14
703.9	Dermatitis, unqualified	60
705.1	Toxic erythema	1
705.3	Rosacea	1
705.9	Other and unqualified erythematous conditions	1
706.0	Psoriasis	6
706.2	Pityriasis rosea	20
707.0	Lichen planus	1
708.0	Pruritis ani	13
708.1	Pruritis genital organs	5
708.3	Lichenification and lichen simplex chronicus	12
708.4	Dermatitis factitia	1
708.9	Other pruritic conditions	7
709.0	Corns and callosities	3
710.0	*Scleroderma and dermatomyositis	2
710.1	Keratoderma	1

Modified Morbidity Code	Name	Frequency
710.9	Other hypertrophic and atrophic condition of skin	3
712.0	Ingrowing nail	11
712.9	Other disease of nail	1
713.0	Alopecia	2
713.9	Other disease - hair and hair follicle	10
714.0	Disease of sweat gland	8
714.1	Acne	12
714.2	Sebaceous cyst	13
714.9	Other disease of sebaceous glands	5
716.0	Cicatrix or scar	3
716.9	Other disease of skin	20
722.0	*Rheumatoid arthritis and allied condition	5
722.1	Spondylitis ankylopoietica	2
723.0	Osteoarthritis	32
723.1	Spondylitis ostioarthritica	18
724.0	Arthritis due to direct trauma	1
725.0	*Arthritis (polyarthritis) - unspec.	22
726.0	Lumbago	7
726.1	Myofibrosis of humeroscapular region	1
726.2	Torticollis	10
726.9	Other muscular rheumatism, fibrositis, and myalgia	78

Modified Morbidity Code	Name	Frequency
727.0	Rheumatism, unspec.	2
732.7	Osteochondrosis head of metatarsal bone	1
733.1	*Localized bone cyst	1
733.3	Osteoporosis and atrophy	3
733.5	Costochondritis	14
733.9	Other diseased bone	2
734.0	Intern. derangement knee joint	2
735.1	*Lumbar and lumbosacral displ. vert. disc.	11
736.0	Affection of sacroiliac joint	1
738.1	Other dis., shoulder	8
738.3	Other dis., wrist	1
738.5	Other dis., hip	1
738.6	Other dis., knee	7
738.7	Other dis., ankle	2
738.9	Other dis. of joint - other and unspec.	4
739.1	*Temporal mandibular arthritis	2
740.0	Bunion	1
741.1	Synovitis, bursitis, etc. - spine	91
741.2	Synovitis, bursitis, etc. - elbow	35
741.3	Synovitis, bursitis, etc. - wrist	13
741.4	Synovitis, bursitis, etc. - finger and hand	12

Modified Morbidity Code	Name	Frequency
741. 5	Synovitis, bursitis, tenosynovitis of hip and buttock	34
741. 6	Synovitis, bursitis, etc. - knee	19
741. 7	Synovitis, bursitis, etc. - ankle	8
741. 8	Synovitis, bursitis, etc. - toe and foot	16
741. 9	Synovitis, bursitis, etc. - other and unspec.	16
743. 0	*Infective myositis and other	2
744. 9	Other dis. muscle, tendon, etc.	4
745. 0	Scoliolis	2
746. 0	Flat foot	1
747. 0	Hallux valgus and unspec.	1
748. 6	Talipes planovalgus	1
749. 7	Other deform. ankle and foot - except toes	1
758. 5	Congen. abnorm. lumbosacral	2
758. 9	Other congen. malform. bones and joints	1
759. 4	Other congen. malform. skin	1
780. 4	Abnorm. involuntary movement	28
780. 5	Disturbed coordination	1
781. 7	*Other disturbance of sensation	2
782. 2	*Tachycardia	1
782. 5	*Syncope or collapse	4
782. 6	*Edema and dropsy	1

Modified Morbidity Code	Name	Frequency
782.7	*Enlargement of lymph node not otherwise specified	5
783.0	Epistaxis	2
783.2	Dyspnea	7
783.7	*Pain in chest	98
784.2	Pyloraspasm	8
784.3	Heartburn	1
784.7	Hiccough	3
784.8	Eructation	1
786.0	*Pain referable to urinary system	2
786.1	*Retention of urine	2
787.3	Pain in joints	1
787.5	Pain in back	3
788.2	Rash	1
788.8	*Pyrexia of unknown origin	8
789.2	Pyuria and bacteriuria	3
789.4	*Hematuria	4
789.8	Other abnormal urinary constituents	2
790.1	Debility and Undue fatigue	3
790.2	Depressed functional ability	2
790.3	Sleeping R_x given for unspec. reason	1
791.0	Headache	115

Modified Morbidity Code	Name	Frequency
795.8	Other ill-defined conditions	43
798.5	*Hypoglycemia	9
799.0	*Hyperchloesterolemia	2
799.5	*Hyperglycemia	1
802.0	Fx nasal bones, closed	4
807.0	Fx rib, closed	12
810.0	Fx clavicle, closed	1
812.0	Fx humerus - upper, closed	2
812.4	Fx humerus - lower, closed	1
813.0	Fx radius ulna - upper extremity, closed	1
813.4	Fx radius ulna shaft, open	2
814.0	Fx carpal bones	1
816.0	Fx phlanges hand	7
817.0	Fx mult. bones hand	3
821.4	Femur - lower, closed	1
824.0	Fx ankle, closed	4
826.0	Fx phlanges foot, closed	2
831.0	Dislocated shoulder, simple	1
832.0	Dislocated elbow, simple	2
834.0	Dislocated finger, simple	1
836.0	Dislocated knee, simple	5

Modified Morbidity Code	Name	Frequency
840.0	Sprain and strain - shoulder and upper arm	15
841.0	Sprain and strain - elbow and forearm	2
842.0	Sprain and strain - wrist	5
842.2	Sprain and strain - hand	8
843.0	Sprain and strain - hip and thigh	3
844.0	Sprain and strain - knee and leg	25
845.0	Sprain and strain - ankle	20
845.2	Sprain and strain - foot	6
846.0	Sprain and strain - sacroiliac	161
847.0	Sprain and strain - neck	32
847.1	Sprain and strain - thoracic	2
847.6	Sprain and strain - other and unspec. back	35
848.0	Sprain and strain - other and ill-defined	51
850.0	Open wound - scalp	3
851.0	Contusion - hematoma scalp	7
852.0	Concussion	6
879.6	Multiple and unspec. open wounds - face, neck and trunk	1
881.0	Open wound - elbow, forearm, wrist - no complication	4
883.0	Open wound - hand, except fingers - no complication	10
884.0	Open wound - fingers - no complication	13

Modified Morbidity Code	Name	Frequency
884.1	Open wound - fingers - complicated	1
884.2	Open wound - fingers with tendon involved	1
885.0	Multiple and unspec. open wound - upper limb - no complication	3
891.0	Open wound - Knee, leg, ankle - no complication	3
893.0	Open wound - foot, except toes - no complication	2
910.0	Superficial injury - face, neck, scalp	26
910.1	Superficial injury - face, neck, scalp - infected	2
911.0	Superficial injury - trunk	4
912.0	Superficial injury - shoulder, upper arm	3
913.0	Superficial injury - elbow, forearm, wrist	4
913.1	Superficial injury - elbow, forearm, wrist - infected	1
914.0	Superficial injury - hands, except fingers	6
914.1	Superficial injury - hands, except fingers - infected	1
915.0	Superficial injury - fingers	15
915.1	Superficial injury - fingers - infected	3
916.0	Superficial injury - hip, thigh, leg, ankle	16
916.1	Superficial injury - hip, thigh, leg, ankle - infected	1
917.0	Superficial injury - foot and toes	19
917.1	Superficial injury - foot and toes - infected	3
918.0	Superficial injury - other, mult. and unspec.	8

Modified Morbidity Code	Name	Frequency
918.2	Mult. contusions and abrasions	2
920.0	Contusion - face, neck	11
922.0	Contusion - trunk	20
923.0	Contusion - shoulder, upper arm	2
924.0	Contusion - elbow, forearm, wrist	9
925.0	Contusion - hand	9
926.0	Contusion - fingers	7
927.0	Contusion - hip, thigh, leg, ankle	26
928.0	Contusion - foot and toes	16
929.0	Contusion - other mult. and unspec.	10
930.0	Foreign body in eye	6
931.0	Foreign body in ear	2
933.0	*Foreign body in pharynx and larynx	1
935.0	*Foreign body in digestive system	3
935.2	*Foreign body in digestive system - anus and rectum	1
937.0	Foreign body in skin	2
937.5	Foreign body in deep arm, hand	4
937.6	Foreign body in deep leg, foot	2
940.0	Burn - eye, unspec. degree	1
941.2	Burn - face, head, neck - 2nd degree	1
942.2	Burn - trunk - 2nd degree	1

Modified Morbidity Code	Name	Frequency
943. 1	Burn - upper limb - 1st degree	1
943. 2	Burn - upper limb - 2nd degree	1
944. 1	Burn - wrist, hand - 1st degree	1
944. 2	Burn - wrist, hand - 2nd degree	2
945. 2	Burn - lower limb - 2nd degree	1
960. 1	Toxic effect - non-medical - venom	2
960. 9	Bee sting	34
963. 0	Adverse effect, penicillin	11
963. 3	Adverse effect, erythromycin	5
963. 5	Adverse effect, tetracyclines	6
963. 9	Adverse effect, other antibiotics	7
964. 0	Adverse effect, sulfonamides	2
964. 9	Adverse effect, other anti-infectives	2
965. 0	Adverse effect, antihistamines	5
967. 2	Adverse effect, estrogens	6
967. 3	*Adverse effect, insulins and antidiabetic agents	3
967. 6	*Adverse effect, progestogens	1
967. 7	*Adverse effect, thyroid and thyroid derivatives	2
968. 5	Adverse effect, vitamins	1
970. 0	*Adverse effect, opiates and synthetic analogs	3

Modified Morbidity Code	Name	Frequency
970.1	Adverse effect, salicylates	4
970.9	Adverse effect, other analgesics	12
972.0	*Adverse effects - barbiturates	2
972.1	*Adverse effects - chloral hydrate	1
972.9	*Adverse effects - other sedatives and hypnotics	1
977.0	*Adverse effect, antidepressants	2
977.4	*Adverse effect, tranquilizers	9
978.2	*Adverse effect, parasympatholytics	2
978.7	Adverse effect, autonomic muscle relaxants	3
983.6	Adverse effect, other cathartics	2
988.9	*Adverse effects, - oral contraceptic	20
989.1	Adverse effect, other medicinals	2
989.6	Adverse effect, diagnostic agents	3
994.0	Frostbite	1
994.3	Sunburn	3
994.6	*Other effect of heat	2
995.5	Motion sickness	1
Y 00.0	General physical exam. (under 45 years only)	1813
Y 00.5	Well baby and child care	20
Y 00.8	Spec. exam - oral contraceptives or parenteral	36

Modified Morbidity Code	Name	Frequency
Y 02.0	Persons receiving prophylactic inoculation and vaccination	55
Y 02.1	Patient received medical or R_x for potential illness	1
Y 03.1	*Follow-up inactive pulmonary TB	1
Y 04.0	Contacts: TB	1
Y 04.9	Other infective and parasitic diseases	79
Y 09.2	Social problems	7
Y 09.3	Patient concerned re: a symptomatic disease present	29
Y 09.5	Other person without complaint - male	3
Y 09.6	Service for I.U.D. - (removal) - procedure #4584	1
Y 09.8	Service for pelvic exam only	64
T001	*Generalized pain - non-specific	17
T002	Generalized swelling	1
T005	Anorexia	3
T007	*Weight loss - non-specific	6
T008	Weight gain	4
T010	Fever	34
T016	Chill	5
T018	*Polydipsia - non-specific	1
T020	Lightheadedness	6
T025	*Hypersomnia (excessive sleep) - non-specific	1

Modified Morbidity Code	Name	Frequency
T026	Insomnia	38
T030	Fatigue	44
T035	Weakness	10
T036	*Syncope (fainting) - non-specific	26
T037	Excess sweating	2
T039	Crying	1
T040	Fussy	1
T048	Fluid retention	8
T058	Symptoms not otherwise described	3
T060	*Multiple complaints - non-specific	23
T066	Vague feeling - not well	8
T069	Other non-specific symptoms	4
T075	*Psychiatric - depression	7
T099	Marital problems	5
T100	Nervousness	34
T149	Other Psychiatric symptoms	2
T151	Headache	74
T166	Tremor	1
T180	*Neurologic - weekness of arm or leg	1
T187	*Anesthesia - numbness	15
T189	*Neurologic - paresthesia	4
T190	*Neurologic - other disturbance of sensation	1

Modified Morbidity Code	Name	Frequency
T196	*Neurologic - other disturbance of speech	1
T222	Eye - swelling or mass around	2
T224	Discharge from eye	2
T226	Blurred vision	2
T230	Inflammation of the eye	9
T231	*Eye - pain	2
T255	Inflammation of eyelid	2
T258	Eye - feeling of foreign body in	1
T259	Other eye symptoms	5
T261	Pain in ears	16
T264	Discharge from ear	1
T265	Diminished hearing	12
T266	Feeling of ears being blocked	12
T268	Tinnitus	5
T269	Extraneous noise - ear	2
T270	Vertigo	9
T276	Ulcer of ear	1
T277	Ears - dizziness	33
T278	Ears - itching	2
T279	Other ear symptoms	3
T281	Pain around nose and face	3

Modified Morbidity Code	Name	Frequency
T282	Swelling or mass - nose and face	1
T283	Epistaxis	10
T284	Nasal discharge	8
T290	Nasal congestion	57
T291	Pain of sinuses	3
T293	Bloody nasal discharge	1
T294	Post-nasal discharge	1
T301	Sore mouth or tongue	13
T302	Swelling, mouth, tongue	1
T303	Bleeding of mouth, tongue	2
T305	Dry mouth	1
T307	Ulcer of mouth	1
T308	Bad breath	2
T310	Recurrent sore throat	4
T311	Sore throat	165
T312	*Swelling or mass of tonsils or pharynx	1
T321	Pain of jaw or teeth	14
T322	Swelling or mass of jaw	1
T328	Neck limitation	1
T331	Soreness of neck	19
T332	*Swelling or mass of neck	1

Modified Morbidity Code	Name	Frequency
T335	Hoarseness	3
T339	Other mouth, jaw symptoms	5
T342	Enlarged nodes	19
T358	*Tachycardia	3
T359	*Irregular heart beat	2
T360	*Palpitations	8
T365	Circulatory blood pressure	3
T368	Other circulatory	1
T401	*Respiratory - chest pain	75
T403	*Respiratory - hemoptysis	4
T407	Sighing, respiration, wheezing	3
T409	Sneezing	1
T410	Cough	132
T411	Rib Pain	3
T414	Purulent sputum	2
T415	Cold	44
T417	Dyspnea	17
T418	Chest tightness, congestion	7
T451	Heartburn	3
T452	*G.I. - dysphagia	7
T455	Indigestion	5

Modified Morbidity Code	Name	Frequency
T456	Hiccoughs	1
T458	Nausea	42
T459	Vomiting	20
T460	Nausea and vomiting	25
T461	Abdominal pain	211
T462	*G. I. - Abdominal swelling or mass	1
T465	Bloating (gas)	16
T475	*G. I. - Jaundice	1
T481	Anal-rectal pain	3
T483	*G. I. - rectal bleeding	4
T484	Anal discharge	1
T485	Anal itching	6
T487	Dark stools	1
T489	Loose stools	6
T490	Diarrhea	76
T493	*G. I. - blood in stool	4
T496	Mucus in stools	1
T500	Constipation	32
T507	Excess flatus, gas	2
T511	*G. I. - inguinal pain	5
T513	*G. I. - melena	5

Modified Morbidity Code	Name	Frequency
T529	Other G.I. symptoms	5
T531	Breasts - pain	14
T532	*Breasts - swelling or mass	5
T549	*Breasts - other	1
T551	Dysuria	35
T554	Urethral discharge	1
T555	*Male - urinary retention	3
T556	Urinary incontinence	2
T557	Urinary frequency	12
T558	Urinary urgency	1
T559	Urinary hesitancy	1
T560	Slowing of urinary stream	1
T561	*Testicular pain	5
T568	*Male - infertility	5
T569	Premature ejaculation	2
T571	Pain - male genitalia	1
T583	*Hematuria	5
T585	Unusual odor urine	1
T587	Unusual color urine	2
T589	Nocturia	2
T599	Other urinary symptoms	2

Modified Morbidity Code	Name	Frequency
T601	*Gyn-pelvic pain	5
T604	Vaginal discharge	17
T606	*Gyn - bloody vaginal discharge	4
T610	Gyn - hot flashes - under 45 only	2
T611	*Gyn - dysmenorrhea	4
T613	*Gyn - menorrhagia - heavy/prolonged	6
T615	*Gyn - Irregular menstruation	5
Y616	*Gyn - absence of menstruation	12
T617	*Gyn - frequent menstruation	1
T618	*Gyn - blood clots in menstruation	1
T621	Gyn - Dyspareunia	1
T627	Gyn - patient feels she is pregnant	3
T628	*Gyn - decreased libido	1
T631	Vaginal, Vulvar, Perineal pain	6
T636	Vulvar itching	8
T657	Erythema	1
T658	Scaliness of skin	2
T659	Dryness of skin	2
T660	Rash	71
T662	Nodule in skin	3
T665	Itching	15
T668	*Dermatologic - hirsutism	1

Modified Morbidity Code	Name	Frequency
T669	Loss of hair	3
T670	Ulcer of skin	1
T671	Irritation of skin	1
T675	Rash of genitalia	1
T680	Blister	3
T690	Skin lesion	5
T699	Other symptoms of skin	5
T701	Myalgia	17
T710	Muscle spasm	19
T720	Leg cramps	10
T731	Suboccipital pain	1
T735	Stiff neck	1
T741	Posterior neck pain	5
T742	Posterior neck swelling or mass	2
T751	Thoracic vertebrae pain	4
T761	Lumbosacral vertebral pain	98
T771	Shoulder pain	33
T781	Arm and forearm pain	14
T791	Elbow pain	3
T801	Wrist or hand pain	2
T802	Wrist or hand swelling or mass	1

Modified Morbidity Code	Name	Frequency
T821	Hip pain - coccyxdynia	8
T831	Sciatic pain	1
T841	Thigh and leg pain	23
T842	Thigh and leg mass or swelling	2
T851	Knee pain	19
T852	Knee swelling or mass	2
T861	Ankle pain	5
T862	Ankle swelling or mass	4
T871	Foot pain (heel)	14
T872	Foot swelling or mass	3
T881	Toe pain	5
T891	Multiple joint pain	1
T895	Multiple joint pain, limitation of motion	1
T922	*Axillary swelling or mass	1
T931	Groin pain	3
T932	*Musculoskeletal - groin swelling or mass	1
T969	Other orthopedic symptoms	3

List 2: Morbidities Seen by the MD - Not appropriate for the PA
(Initial Visits)

Modified Morbidity Code	Name	Frequency
2.9	Pulmonary TB - Activity unspec.	1
3.0	Pleurisy spec. as TB	1
53.1	Septicemia and Pyemia - Staphylococcal	1
53.9	Septicemia and Pyemia - Other	1
82.1	Lymphocytic Choriomeningitis	1
108.0	Other rickettsial disease	1
153.8	Malig. Neoplasm of large intestine, part unspec.	1
158.0	Malig. Neoplasm - peritoneum	1
159.0	Malig. Neoplasm - unspec. digestive organ	1
162.1	Malig. Neoplasm - bronchus and lung	1
163.0	Malig. Neoplasm - lung, unspec.	2
170.0	Malig. Neoplasm - breast	2
171.0	Malig. Neoplasm - cervix uteri	2
174.0	Malig. Neoplasm - uterus, unspec.	1
175.0	Malig. Neoplasm - ovary, fallop. tube and broad ligament	1
191.4	Other malig. Neoplasm - skin, scalp and neck	1
194.0	Malig. Neoplasm - thyroid gland	1
196.2	Malig. Neoplasm - bone - vertebral column	1

Modified Morbidity Code	Name	Frequency
196.3	Malig. Neoplasm - ribs, sternum and clavicle	1
199.0	Malig. Neoplasm - unspec. primary site	2
199.9	Malig. Neoplasm - gen. or multiple secondary sites	2
211.3	Benign Neoplasm - large intestine, excluding rectum	1
214.0	Uterine fibromyoma	2
215.0	Other benign Neoplasm - uterus	1
215.1	Other benign Neoplasm - uterus, polyp, papilloma	2
215.9	Other benign Neoplasm - uterus, other unspec.	2
216.2	Benign Neoplasm - ovary, Cystadenoma	1
219.0	Benign Neoplasm - kidney and other urinary organs	1
223.1	Benign Neoplasm - brain, nervous system, acoustic nerve	1
228.0	Hemangioma and lymphangioma	1
229.0	Benign Neoplasm - other and unspec. organs and tissues	2
230.0	Neoplasm - unspec. nature of digestive	1
238.1	Neoplasm - unspec. bone and cartilege	2
239.0	Neoplasm - unspec., other and unspec. organs	1
239.9	Neoplasm - unspec., unspec. organs and tissues	2

Modified Morbidity Code	Name	Frequency
251.2	Thyrotoxicosis	1
252.0	Thyrotoxicosis - with/without goiter	3
260.4	Acidosis or coma - diabetic	2
270.0	Disorders - pancreatic internal secretion	1
272.9	Diseases of pituitary gland - other and unspec.	1
296.0	Thrombocytopenic purpura	1
301.1	Delirium tremens	2
301.2	Other alcoholic intoxication	5
301.9	Other drug or poison intoxication	1
315.0	Chronic brain syndrome - with disturbances of metabolism growth or nutrition	1
317.9	Chronic brain syndrom - unspec. cause	1
318.0	Involutional psychotic reaction	1
319.2	Manic depressive reaction, other	1
320.0	Schizophrenic reactions - simple type	1
320.3	Schizophrenic reactions - paranoid	1
320.9	Schizophrenic reactions - other and unspec.	2
324.3	Psychoneurotic disorders - phobic reaction	1
324.9	Psychoneurotic disorders - other unspec.	2
325.1	Schizoid personality	1
331.0	Cerebral hemorrhage - nontraumatic	7
332.1	Cerebral thrombosis	1

Modified Morbidity Code	Name	Frequency
332.4	Cerebellar	1
333.0	Spasm of cerebral arteries	1
334.0	Other and ill-defined vascular lesions - central nervous system	13
334.8	Apoplexy or stroke	1
334.9	Ill-defined vasc. lesions (central nervous system) - other	3
335.1	Stroke of unknown type, new (up to 3 mos.)	2
340.9	Meningitis - with no organism specified as cause	1
344.0	Late effects of intracranial abscess or pyogenic infection	1
344.9	Late effects of intracranial abscess - other	1
345.0	Demyelinating disease	1
350.9	Paralysis agitans - other	1
353.1	Epilepsy - grand mal	8
355.9	Dis. of brain - other	2
368.0	Dis. peripheral nerves - spinal	1
369.9	Dis. peripheral automatic nervous system - other	1
379.0	Dis. of eye - abscess or cellulitis of orbit	2
388.2	Other dis. of eyeball, ocular muscles and orbit	1

Modified Morbidity Code	Name	Frequency
393.1	Mastoiditis - chronic	1
398.0	Deafness - both ears, complete	3
398.2	Deafness - one ear, complete	2
410.1	Dis. mitral valve - insufficiency	1
411.0	Dis. aortic valve - spec. rheumatic	1
417.0	RHD with multiple valve involvement	1
420.0	Arteriosclerotic heart dis. with coronary dis.	10
420.1	Acute coronary occlusion	29
420.2	Healed coronary occlusion	3
420.3	Other heart dis. involving coronary arteries	15
420.4	Angina pectoris without mention coronary dis.	14
420.6	Arteriosclerotic heart dis. with atrial fibrillation	4
420.9	Arteriosclerotic heart dis. with angina pectoris	12
430.0	Acute and subacute bacterial endocarditis	2
432.0	Acute pericarditis specified as non-rheumatic	1
433.0	Heart block	1
433.1	Cardiac arrest	1
433.2	Auricular fibrillation or flutter	5
433.7	Other disorder of heart rhythm	11

Modified Morbidity Code	Name	Frequency
434.1	Congestive heart failure	13
434.2	Left ventricular failure	1
434.3	Other dis. of heart	1
434.5	Cardiac enlargement of hypertrophy	1
436.0	Hypertensive heart dis. - arteriosclerotic heart dis.	1
443.0	Other hypertensive heart dis.	1
450.0	Arteriosclerosis	2
450.1	Arteriosclerosis of lower extremity	1
453.0	Rayauds Dis.	1
453.9	Other - peripheral vascular dis.	1
454.0	Arterial embolism and thrombosis - lower extremity	1
456.9	Dis. of arteries - other and unspecified	3
462.1	Varicose veins of esophagus	1
466.0	Other - venous embolism and thrombosis	1
467.0	Hypotension	4
467.2	Vascular dis. or deficiency of lower extremities	1
468.3	Noninfective dis. of lymphatic channels	1
515.0	Nasal polyp	1
517.0	Paralysis of vocal chords or larynx	1

Modified Morbidity Code	Name	Frequency
517.3	Other dis. of vocal chords includes Singers' node	1
519.2	Pleurisy effusion of unknown etiology	1
520.0	Spontaneous pneumothorax	1
522.0	Pulmonary congestion and hypostasis	1
539.0	Dis. of esophagus - inflammatory dis.	7
539.3	Dis. of esophagus - obstruction	1
540.1	Ulcer of stomach without perforation but with hemorrhage	3
541.1	Ulcer of duodenum without perforation and with hemorrhage	1
542.1	Gastrojejunal ulcer without perforation but with hemorrhage	1
545.0	Fistula	1
553.0	Dis. of appendix	1
578.2	Other dis. of intestines and peritoneum - hemorrhage NOS	12
578.5	Other dis. of intestines and peritoneum - incl. rectum and anus	3
585.0	Cholecystitis - cholangitis without calculi	6
586.9	Dis. of gallbladder - biliary ducts - other	3
603.6	Obstruction of ureter NEC	2
606.2	Contracture - dis. of bladder	1
606.4	Hypertonicity - dis. of bladder	1

Modified Morbidity Code	Name	Frequency
606.9	Other - dis. of bladder	2
621.1	Hypertrophy of breast	4
621.9	Dis. of breast - other	1
625.0	Prolapse of ovary	1
625.9	Dis. of ovary and fallopian tube - other	2
630.1	Infective dis. of uterus - other	2
631.9	Uterovaginal prolapse - other	2
633.9	Dis. of uterus - other	1
634.7	Disorders of menstruation - postmenopausal bleeding	1
642.4	Hyperemesis gravidarum	2
650.0	Abortion - spontaneous or unspecif.	1
681.1	Endometritis of puerperium	1
704.0	Pemphigus	1
735.0	Displacement of intervertebral disc.	5
735.9	Displacement of intervertebral disc - other	2
754.3	Interauricular septal defect	1
756.5	Congenital megacolon	1
788.0	Symptom of senility and ill-defined cond. - other general symptoms	2
792.0	Uremia	2
793.1	Suspected malig. Neoplasm	1

Modified Morbidity Code	Name	Frequency
801.9	Fracture of base skull - late effect	1
805.4	Fracture of vert. column - lumbar, closed	2
805.9	Fracture of vert. column - late effect	1
870.0	Open wound of eye and orbit	3
872.1	Open wound of ear - complicated	1
873.6	Other laceration of face without mention of complication	11
936.0	Foreign body in G.I. tract	3
954.0	Injury to nerves in wrist and hand	1
960.3	Toxic effect (nonmedical) - petroleum products	1
960.4	Toxic effect (nonmedical) - industrial solvents	1
961.2	Toxic effect of metals - arsenic	1
962.7	Toxic effect - carbon monoxide	1
962.8	Toxic effect - other, gas, fumes, or vapor	2
962.9	Toxic effect - other substances, nonmedical	2
967.9	Adverse effects - other hormones	2
968.8	Adverse effects - immunological agents	3
969.5	Adverse effects - anticoagulants	2
971.9	Adverse effects - other anticonvulsants	1
975.0	Adverse effects - other central nervous system stimulants	1

Modified Morbidity Code	Name	Frequency
978.5	Adverse effects - sympathomimetics	1
980.3	Adverse effects - cardiac tonics	18
980.4	Adverse effects - cholesterol lowering agents	1
980.6	Adverse effects - vasodilators	1
980.7	Adverse effects - other hypotensive agents	4
985.9	Adverse effects - other diuretic agents	8
987.2	Adverse effects - spasmolytics	3
988.1	Adverse effects - IUD	1
989.7	Adverse effects - multiple compound medication	6
989.8	Adverse effects - other specif. drugs NEC	4
998.3	Disruption of operation wound	1
998.5	Complications (surgical) postoperative wound infection	3
998.9	Other complications of surgical procedures	3
Y 00.0	(Over 45 years) General Medical Exam	1410
Y 01.6	Refraction	1
Y 03.2	Follow-up - other cases of TB	1
Y 06.0	Prenatal care	37
Y 07.0	Postpartum observation	1
Y 09.6	Service for IUD (insertion)	4

Modified Morbidity Code	Name	Frequency
Y 09.7	Service for diaphram	2
Y 19.0	Dead on arrival - nonspecific	2
T155	Neurologic - confusion	3
T156	Neurologic - stupor	1
T158	Neurologic - coma	1
T159	Neurologic - convulsion	1
T170	Neurologic - disturbance of coordination	1
T176	Neurologic - amnesia	2
T232	Eye - swelling or mass	1
T453	G.I. - hematemesses	1
T603	Gyn - metrorrhagia	3
T623	Gyn - vaginal bleeding	4
T647	Gyn - infertility (female)	1

List 3: Morbidities Seen by the PA Alone or With MD Consultation Highly Probable*
(Continuing Visits)

Modified Morbidity Code	Name	Frequency
.0	No morbidity present (depends on procedures rendered)	22
.1	Morbidity unknown for which service was performed (depends on procedures rendered)	57
.5	*Abnormal lab or x-ray test without apparent dis.	57
6.1	*Positive TB test without other TB symptoms	20
6.2	Conversion from negative to positive TB test	7
6.3	Positive tine test	7
30.0	Acute or unspec. gonorrhea	49
39.0	Other unspec. venereal dis.	2
45.2	Bacillary dysentery - Shiga	1
45.9	Bacillary dysentery - other	1
47.0	Other protozoal dysentery	2
51.0	Strep throat	207
87.0	Chickenpox	4
88.9	Other and unspec. Herpes Zoster	8
89.0	Mumps	5
92.0	Infectious hepatitis	81
93.0	Glandular Fever (inf. mono.)	120

*Indicates those diseases where consultation is highly probable.

Modified Morbidity Code	Name	Frequency
96.0	Herpes febrilis	14
96.9	Other dis. attributable to viruses	122
130.1	Oxyuriasis	1
131.0	Dermatophytosis - foot	12
131.1	Dermatophytosis - scalp and beard	2
131.9	Dermatophytosis - other unspec. sites	21
134.3	Moniliasis	25
136.0	Pediculosis	2
221.0	Pilonidal Cyst	1
222.0	Other benign neoplasms of skin	1
226.1	Lipoma, skin and subcut. tissue	3
226.9	Lipoma - other	1
227.0	Other benign neoplasm of muscular and connective tissue	5
229.0	Benign neoplasm of other and unspec. organs and tissue	1
240.0	Hayfever - pollen	7
240.8	Hayfever due to multiple allergies	11
240.9	Hayfever - other and unspec.	150
241.0	Asthma - pollen	7
241.8	Asthma - due to multiple allergies	14
241.9	Asthma - other and unspec.	200

Modified Morbidity Code	Name	Frequency
243.0	Urticaria - pollen	3
243.1	Urticaria - dander or dandruff	1
243.9	Urticaria - other and unspec.	17
244.9	Allergic eczema or dermatitis due to internal agent - other and unspec.	4
245.1	Other allergic disorders, dander or dandruff	2
245.9	Other allergic disorders - other and unspec.	5
247.7	Allergic reaction to insect venom	6
250.0	*Simple goiter	23
251.0	*Nontoxic nodular goiter	27
253.2	Taking thyroid for post spont. hypothy.	10
253.3	Taking thyroid for post surg. hypothy.	16
253.5	Taking thyroid for reputed hypothy.	16
253.7	Taking thyroid for unknown reason	12
260.0	*Diabetes mellitus - without complications	538
287.0	Obesity not spec. as of endocrine disorder	329
288.0	Gout	99
291.1	*Iron deficiency anemia second. to menorr.	26
291.2	*Iron deficiency anemia second. to other causes	14
301.2	Other alcoholic intoxication	3
323.0	Psychophysiologic autonomic and visceral disorders, skin reactions	1

Modified Morbidity Code	Name	Frequency
323.1	Psychophysiologic autonomic and visceral disorders, musculoskeletal reactions	31
323.5	Psychophysiologic autonomic and visceral disorders, G.I. reactions	116
323.6	*Psychophysiologic autonomic and visceral disorders, genitourinary reaction	8
323.8	Psychophysiologic autonomic and visceral disorders, nervous system reaction	27
324.0	Psychroneurotic disorders, anxiety reaction	601
324.3	Psychroneurotic disorder, phobic reaction	1
324.5	*Psychroneurotic disorder, depressive	167
324.6	Hyperventilation syndrome	3
324.7	Status for R_x of tranquilizers or sedatives	2
324.9	Psychoneurotic disorders, other and unspec.	14
325.0	Inadequate personality	1
325.4	Other personality pattern disturbance	2
325.9	Other and unspec. personality trait disturbance	1
327.8	Transient anxiety provoking R_x of tranq. or sed.	6
328.0	Transient situational personality disorders, gross stress reaction	1
328.1	Transient situational personality disorders, adult situation reaction	3
328.4	Transient situational personality disorders, adj. reaction of adoles.	3

Modified Morbidity Code	Name	Frequency
328.9	Transient situational personality disorders, other and unspec.	4
352.1	*Hemiplegia	5
352.2	*Paraplegia	3
354.0	*Migraine	83
357.5	*Spinal cord - compression, old	5
360.0	*Facial paralysis	17
363.0	*Sciatica	1
366.1	Other and unspec. forms of neuralgia and neuritis, spinal	6
366.9	Other and unspec. forms of neuralgia and neuritis, other and unspec.	17
370.1	Conjunctivitis and opthalmia	2
370.2	*Conjunctivitis of unknown etiology	4
370.4	Allergic conjunctivitis	1
371.1	Blepharitis	1
371.2	Blepharitis - unspec.	4
372.0	Hordeolum - stye	2
379.9	*Other inflammatory dis. of eye	4
381.0	*Corneal ulcer	1
388.1	*Other eyelid dis.	1
390.0	Otitis externa	30

Modified Morbidity Code	Name	Frequency
391.0	Otitis media, acute	6
391.1	*Chronic otitis media	8
391.2	Otitis media - unspec.	3
391.3	Otitis media - suppurative	1
391.9	Otitis media - unspec.	54
393.1	*Chronic mastoiditis	2
394.0	*Labyrinthitis - inflammation of ear	25
394.9	*Other inflammation dis. of ear	1
395.0	*Meniere's dis.	18
396.0	*Perforation of tympanic membrane	1
396.9	*Other ear dis.	18
398.3	*Impairment of hearing - one or both ears	3
420.6	*Arteriosclerotic heart dis. with fibrill.	79
433.4	*Benign heart murmur	6
443.0	*Other hypertensive heart disease	50
447.0	Other hypertensive dis.	1208
450.1	*Arteriosclerosis of lower extremity	2
460.0	Varicose ulcer - lower extremity	4
460.2	Statis dermatitis	1
460.9	Statis dermatitis without ulcer - lower extremity	5

Modified Morbidity Code	Name	Frequency
461.0	Hemorrhoids	24
463.0	*Phlebitis and thrombosis of lower extremity	19
470.0	Acute nasopharyngitis	35
470.6	Sinusitis - unspec., no antibiotics	1
471.0	Acute sinusitis, maxillary	1
471.4	Sinusitis unspec., no antibiotic	12
471.7	Sinusitis unspec., antibiotic given	32
471.9	Acute sinusitis, unspec. and pansinusitis	1
472.0	Acute pharyngitis unspec., no antibiotic	25
472.1	Acute pharyngitis, viral	28
472.2	Acute pharyngitis, bact.	1
472.3	Acute pharyngitis, unspec., antibiotic given	48
473.0	Acute tonsillitis, unspec., no antibiotic	1
473.1	Acute tonsillitis, viral	3
473.3	Acute tonsillitis, unspec., antibiotic given	12
474.0	Acute laryngitis and tracheitis, unspec., no antibiotic	4
474.1	Acute laryngitis and tracheitis, viral	2
474.3	Acute laryngitis and tracheitis, unspec., antibiotic given	2
475.0	Acute upper resp. infection of mult. sites	185

Modified Morbidity Code	Name	Frequency
476.0	Unspec. resp. infection - no antibiotic	12
476.1	Resp. infection - viral	2
476.3	Resp. infection, unspec. - antibiotics given	6
481.0	Influenza	103
481.1	Flu respiratory	7
481.2	Flu respiratory and digestive system	2
482.0	Flu with digestive manifestations	1
490.8	Lobar pneu., other spec. org. or cause	5
490.9	Lobar pneu., unspec. org. or cause	17
491.2	*Staphylococcus	3
491.8	Bronchopneumonia, other spec. org. or cause	10
491.9	Bronchopneumonia, unspec. org. or cause	37
492.0	Primary atypical pneumonia	99
493.1	Pneumococcus	13
493.6	Pneumonia, unspec. - antibiotic given	4
493.8	Pneumonia, other spec. org. or cause	4
493.9	Pneumonia, unspec. org. or cause	54
500.0	Bronchitis, unspec. - no antibiotic	29
500.1	Bronchitis - viral	23
500.3	Bronchitis, unspec. - antibiotic given	194
502.0	Chronic bronchitis with emphysema	88

Modified Morbidity Code	Name	Frequency
502.9	Other chronic bronchitis	37
503.0	Respiratory inflam. second to smoking	10
510.0	*Hypertrophy of tonsils and adenoids	3
512.1	Chronic nasopharyngitis	32
527.1	Emphysema - without bronchitis	116
532.9	*Other inflam. dis. of supp. teeth structure	1
536.0	Stomatitis	9
537.0	*Inflam. dis. of salivary gland	3
538.0	Inflam. dis. of buccal cavity	2
540.0	*Stomach ulcer without perforation or hemor.	51
540.8	*Peptic ulcer without stomach or duod. mention	7
541.0	*Duod. ulcer without perforation or hemor.	97
543.0	Gastritis and duodenitis	52
544.1	*Disorder of gastric motility	3
544.2	Heartburn	1
544.9	Disorder of function of stomach - other	29
545.9	*Other dis. of stomach and duod.	26
560.2	Hernia without mention of obs., umbilical	3
560.3	Hernia without mention of obs., ventral	3
571.0	Gastroenteritis and colitis except ulcerative	90
572.0	*Regional enteritis or ileitis	27

Modified Morbidity Code	Name	Frequency
572.1	Diverticulitis	66
572.2	*Ulcerative colitis	97
573.0	Constipation	5
573.2	Irritability of colon	125
573.9	*Other functional disorder of intestines	9
574.0	*Anal fissure and fistula	8
578.1	Colostomy status	1
581.0	*Cirrhosis of liver without mention of alcohol	77
581.1	*Cirrhosis of liver with alcohol	39
591.1	Functional edema	15
591.4	Stasis edema	13
600.0	Pyelitis, pyelocystitis, pyelonephritis	38
605.0	Cystitis	142
605.1	Acute cystitis - 2nd attack	27
605.2	Recurrent cystitis	18
605.3	*Chronic cystitis	15
607.0	Urethritis - nonvenereal	14
609.0	Urinary tract infections NEC (depends on procedures rendered)	167
609.9	*Other dis. of urethra and urinary tract	1
611.0	Prostatitis	28

Modified Morbidity Code	Name	Frequency
614. 0	Orchitis and epididymitis	8
617. 0	Dis. of male genitals - balanitis, infectional	3
617. 2	Dis. of male genitals - inflammatory dis. NOS	1
617. 9	Dis. of male genitals - other	2
622. 0	Acute salpingitis and oophoritis	2
626. 0	Pelvic inflammatory dis.	30
630. 0	Cervicitis	4
630. 2	Vaginitis and vulvitis	23
630. 3	Atrophic vaginitis	3
634. 0	*Absence of menstruation	4
634. 3	Painful menstruation	3
634. 5	*Irregular menstruation	2
634. 6	*Intermenstrual bleeding	1
634. 9	*Other menstrual disorders	1
635. 0	Menopausal Sx.	100
635. 1	Post-menopausal sx. on premarin	24
635. 2	Status post-menopausal without estrogen	4
637. 6	Post-menstrual tension or sx.	14
642. 5	Patient complains of nausea of preg.	2
690. 0	Boil and carbuncle - face	4
690. 1	Boil and carbuncle - neck and scalp	3

Modified Morbidity Code	Name	Frequency
690.2	Boil and carbuncle, trunk	2
690.3	Boil and carbuncle, upper arm and forearm	8
690.6	Boil and carbuncle, lower extremity	2
691.0	Cellulitis of finger and toe	7
692.0	Other cellulitis and abcesses without mention of lymphangitis, head and neck	2
692.1	Other cellulitis and abcesses without mention of lymphangitis, trunk	2
692.2	Other cellulitis and abcesses without mention of lymphangitis, upper arm and forearm	1
692.4	Other cellulitis and abcesses without mention of lymphangitis, leg	12
693.3	Other cellulitis and abcesses with lymphangitis, hand except fingers	1
694.0	Acute lymphadenitis	1
695.0	Impetigo	1
696.0	Infectious warts	30
698.0	Pyoderma	6
698.1	Granuloma pyogenicum	1
700.0	Seborrheic dermatitis	12
701.0	Eczema	24
703.0	Other dermatitis due to plants	14
703.2	Other dermatitis due to solvents	1
703.4	Other dermatitis due to chemicals	2
703.8	Other dermatitis due to other spec. agents	4

Modified Morbidity Code	Name	Frequency
703.9	Other dermatitis unqualified	33
705.2	*Erythema nodosum	1
705.3	Rosacea	5
706.0	Psoriasis	4
706.2	Pityriasis rosea	5
708.0	Pruritis ani	7
708.3	Lichenification - pruritis	14
708.4	Dermatitis factitia - pruritis	2
708.9	Other pruritic conditions	1
710 1	Keratoderma	1
710.4	Keloid scar	2
710.9	Other hypertrophic and atrophic condition of skin	2
712.0	Ingrowing nail	1
713.9	Dis. of hair and follicles - other	2
714.0	Dis. of sweat glands	5
714.1	Acne	12
714.2	Sebaceous cyst	6
714.9	Other dis. of sebaceous glands	1
716.0	Cicatrix or scar	1
716.9	Other dis. of skin	7
722.1	*Rheumatic arthritis spondylitis ankylopoietica	24

Modified Morbidity Code	Name	Frequency
723.0	Osteoarthritis	167
723.1	Spondylitis osteoarthritica	90
726.0	Lumbago	2
726.2	Torticollis	2
726.9	Other muscular rheumatism	45
727.0	Rheumatism, unspec.	9
732.9	Osteochrondrosis - other and unspec.	1
733.5	Costochondritis	7
736.0	Affection of sacroiliac joint	4
738.0	Other dis. of joint - spine	1
738.1	Other dis. of joint - shoulder	20
738.6	Other dis. of joint - knee	13
738.7	Other dis. of joint - ankle	1
738.9	Other dis. of joint - other and unspec.	4
740.0	Bunion	2
741.1	Synovitis, bursitis and tenosyn. - shoulder	109
741.2	Synovitis, bursitis and tenosyn. - elbow	22
741.3	Synovitis, bursitis and tenosyn. - wrist	14
741.4	Synovitis, bursitis and tenosyn. - finger and hand	9
741.5	Synovitis, bursitis and tenosyn. - hip and buttock	55

Modified Morbidity Code	Name	Frequency
741.6	Synovitis, bursitis and tenosyn. - knee	12
741.7	Synovitis, bursitis and tenosyn. - ankle	2
741.8	Synovitis, bursitis and tenosyn. - toe and foot	19
741.9	Synovitis, bursitis and tenosyn. - other and unspec.	13
743.0	*Infective myositis and other inflam. dis. of tendon and fascia	3
744.9	*Other dis. of muscle, tendon, fascia	9
745.0	Scoliosis	2
746.0	Flat feet	2
758.5	Congenital abnor. of lumbosacral region	5
768.8	Pyuria found on lab test - no action	1
780.4	*Nervous system - abnor. invol. movement	17
780.7	Nervous system - disturbance of sleep	2
782.6	*Sx of cardiovascular and lymphatic system - edema and dropsy	4
782.7	*Sx of cardiovascular and lymphatic system - Enlarged lymph node NOS	9
783.0	Epistaxis	2
783.3	Cough NOS	2
783.7	*Pain in chest	46
784.1	Nausea and vomiting	1
784.2	Pylorospasm	17

Modified Morbidity Code	Name	Frequency
784. 6	Excessive salivation	1
784. 7	Hiccough	4
784. 8	Eructation	2
785. 8	*Melena	1
786. 0	Pain of urinary system	3
786. 4	Polyuria	2
787. 5	Pain in back NEC	1
788. 9	Other general symptoms - excl. chills	16
789. 2	Pyuria	108
789. 4	Hematuria	39
789. 6	*Glycosuria	3
789. 8	Pyuria and Hematuria	21
789. 9	Other abnor. urinary constituents	19
790. 1	Debility and undue fatigue	7
791. 0	Headache	229
794. 0	*Senility without psychosis	1
795. 8	Other ill-defined condition	59
798. 4	*Hypokalemia	12
798. 5	*Hypoglycemia	6
799. 0	Hypercholesterolemia	161
799. 1	*Hyperuricemia	2
799. 5	*Hyperglycemia	33

Modified Morbidity Code	Name	Frequency
802.0	Fx - nasal bones closed	2
806.6	Fx. - sacrum and coccyx, closed	1
807.0	Fx. - rib, closed	9
810.0	Fx. - clavicle, closed	3
815.0	Fx. - metacarpal bone, closed	1
816.0	Fx. - one or more phalanges of hand, closed	8
825.0	Fx. - one or more tarsal and metatarsal, closed	2
840.0	Sprains and strains of shoulder and upper arm	4
841.0	Sprains and strains of elbow and forearm	1
842.0	Sprains and strains of wrist	1
842.2	Sprains and strains of hand	1
844.0	Sprains and strains of knee and leg	14
845.0	Sprains and strains of ankle	21
845.2	Sprains and strains of foot	1
846.0	Sprains and strains of sacroiliac region	144
847.0	Sprains and strains of neck	23
847.1	Sprains and strains of thoracic	3
847.6	Sprains and strains of other	15
848.0	Sprains and strains ill-defined	23
850.0	Open wound of scalp without complication	4
851.0	Contusion and hematoma of scalp	1

Modified Morbidity Code	Name	Frequency
852.0	Concussion, current or NOS	2
852.9	Concussion, late effect	1
873.6	Other and unspec. laceration of face without complication	18
876.0	Open wound of back	1
879.0	Other open wound of trunk without complication	1
881.0	Open wound of elbow, forearm, wrist without complication	6
883.0	Open wound of hand - except fingers	7
884.0	Open wound of fingers	24
885.0	Multiple and unspec. open wound of upper limb	2
890.0	Open wound of hip and thigh without complication	3
891.0	Open wound of knew, leg and ankle, without complication	13
891.1	Open wound of knee, leg and ankle - complicated	3
893.0	Open wound of foot except toes without complication	2
894.0	Open wound of toe without complication	1
910.0	Superficial injury of face, neck, scalp - without infection	4
910.1	Superficial injury of face, neck, scalp - infected	1
914.0	Superficial injury of hand, except fingers - without infection	2
915.0	Superficial injury of fingers without infection	16

Modified Morbidity Code	Name	Frequency
915.1	Superficial injury of fingers - infected	1
916.0	Superficial injury of hip, thigh, leg, ankle - without infection	4
916.1	Superficial injury of hip, thigh, leg, ankle - infected	1
917.0	Superficial injury of foot and toes - without infection	2
918.0	Superficial injury of other multiple sites - without infection	5
918.2	Mult. contusions and abrasions	3
920.0	Contusion of face and neck - except eye	4
922.0	Contusion of trunk	10
924.0	Contusion of elbow, forearm, wrist	2
925.0	Contusion of hand - except fingers	1
926.0	Contusion of fingers	1
927.0	Contusion of hip, thigh, leg, ankle	10
928.0	Contusion of feet and toes	7
929.0	Contusion - other mult. sites	3
930.0	Foreign body in eye and adnexa	2
937.0	Foreign body in skin	2
942.2	Burn confined to trunk without complication - 2nd degree	22
943.1	Burn confined to upper limb without complication - 1st degree	3

Modified Morbidity Code	Name	Frequency
943.2	Burn confined to upper limb without complication - 2nd degree	2
944.2	Burn confined to wrist and hand without complication - 2nd degree	5
945.0	Burn confined to lower limb without complication - degree unspec.	1
945.2	Burn confined to lower limb without complication - 2nd degree	8
960.4	*Toxic effect - industrial solvents	2
960.9	Bee sting	1
962.7	*Toxic effect - carbon monoxide	1
962.8	*Toxic effect - gas, fumes	2
962.9	*Toxic effect - other nonmedicinal	1
963.0	Adverse effects of penicillin	9
963.5	Adverse effects of tetracyclines	2
963.9	Adverse effects of other antibiotics	5
964.0	Adverse effects of sulfonamides	3
967.2	Adverse effects of estrogens	4
970.9	Adverse effects of analgesics and antipyretics	3
977.0	Adverse effects of anti-depressants	1
977.4	Adverse effects of tranquilizers	10
983.6	Adverse effects of other carthartics	2
985.9	*Adverse effects of other diuretic agents	2

Modified Morbidity Code	Name	Frequency
988.0	Adverse effects of oral contrac.	14
989.7	*Adverse effects of mult. comp. med.	3
997.5	*Postmastectomy lymphedema of arm	1
999.1	Serum jaundice or hepatitis	8
Y 00.0	(under 45 only) General Medical Exam.	618
Y 00.8	Oral or parenteral contraception	99
Y 02.0	Prophylactic inoculation and vaccination	12
Y 02.1	Patient got R_x for potential illness no longer present	2
Y 04.9	Other infective and parasitic dis.	15
Y 09.2	Social problems	3
Y 09.3	Concern over possible future diseases	21
Y 09.4	Sterilization concern - female	3
Y 09.5	Sterilization concern - male	1
Y 09.8	Service for pelvic exam	8
T001	Generalized pain	16
T002	*Generalized swelling	1
T005	Anorexia	4
T008	Weight Gain	1
T010	*Fever	6

Modified Morbidity Code	Name	Frequency
T025	Hypersomnia	1
T026	Insomnia	93
T030	Fatigue	25
T035	Weakness	8
T036	*Syncope	19
T037	Excess sweating	1
T048	Fluid retention	11
T050	Excessive smoking	1
T058	Sx. not otherwise described	1
T060	Multiple complaints	12
T066	Vague feeling of not feeling well	3
T069	Other non-specific sx.	1
T076	*Depression	3
T099	Marital problems	4
T100	Nervousness	65
T149	Other physical sx.	5
T151	Headache	65
T166	Tremor	1
T187	*Anesthesia numbness	9
T189	*Parasthesia	2
T224	*Discharge from eye - matted eye	1
T226	*Blurred vision	1

Modified Morbidity Code	Name	Frequency
T258	Feeling of foreign body in eye	1
T261	Pain in ears	4
T265	Diminished hearing	1
T266	Feeling of ears being blocked	5
T268	Tinnitus	6
T270	Vertigo	22
T277	Dizziness	14
T281	Pain in and around nose and face	1
T283	Epistaxis	5
T284	Nasal discharge - non-specific	1
T290	Nasal congestion	17
T291	Pain of sinuses	1
T293	Bloody nasal discharge	2
T299	Other sx. of nose	1
T301	Sore mouth or tongue	1
T305	Dry mouth	1
T311	Sore throat	61
T321	Pain of jaw or teeth	5
T331	Soreness of neck	3
T335	*Hoarseness	1
T339	Other mouth or jaw sx	1
T352	Ankle swelling bilateral	3

Modified Morbidity Code	Name	Frequency
T359	*Irregular heart beat	2
T360	*Palpitations	13
T365	Concern over blood pressure	1
T401	*Chest pain	48
T403	*Hemoptysis	5
T407	Sighing respiration, wheezing	3
T410	Chronic cough	35
T411	Rib pain	1
T415	Cold	7
T416	*Abnormal chest film	1
T417	*Dyspnea	4
T418	Chest tightness, congestion	1
T451	Heartburn	4
T452	*Dysphagia	3
T455	Indigestion	8
T458	Nausea	20
T459	Vomiting	5
T460	Nausea and vomiting	20
T461	*Abdominal pain	169
T462	*Abnormal swelling or mass	1
T465	Bloating (gas)	7

Modified Morbidity Code	Name	Frequency
T481	Anal-rectal pain	2
T483	*Rectal bleeding	7
T489	Loose stool	5
T490	Diarrhea	45
T493	*Blood in stool	6
T500	Constipation	19
T507	Excess flatus, gas, pain	1
T511	Inguinal pain	3
T513	*Melena	1
T529	Other G.I. sx.	6
T531	Breast pain	2
T551	Dysuria	14
T555	*Urinary retention	1
T557	Urinary frequency	9
T558	Urinary urgency	2
T559	*Urinary hesitance	1
T565	*Impotency	2
T568	*Infertility - male	11
T580	Pyuria	6
T583	Hematuria	4
T587	Unusual color of urine	1
T589	Nocturia	1

Modified Morbidity Code	Name	Frequency
T601	*Pelvic pain	2
T603	*Metrorrhagia	1
T604	Vaginal discharge	6
T610	Hot flashes	1
T611	Dysmenorrhea	13
T615	*Irregular menstruation	7
T616	*Absence of menstruation	16
T619	*Scanty menstruation	1
T627	Patient feels pregnant	2
T631	Vaginal vulvar or perineal pain	2
T636	Vulvar itching	1
T659	Dryness of skin	1
T660	Rash	18
T665	Itching	2
T670	Ulcer of skin	1
T675	Rash of genitalia	1
T699	Other sx. of skin	1
T701	Myalgia	14
T710	Muscle spasm	10
T720	Leg cramps	24
T721	Nocturnal leg cramps	3

Modified Morbidity Code	Name	Frequency
T741	Posterior neck pain	2
T751	Thoracic vertebrae pain	3
T761	Lumbosacral vertebrae pain	49
T771	Shoulder pain	5
T791	Elbow pain	3
T801	Wrist or hand pain	1
T802	Wrist or hand swelling or mass	1
T811	Finger pain	1
T821	Hip pain coccyxdynia	5
T841	Thigh and leg pain	7
T842	*Thigh and leg mass or swelling	2
T851	Knee pain	6
T861	Ankle pain	4
T871	Foot pain	7
T881	Toe pain	2
T891	Multiple joint pain	1

List 4: Morbidities Seen by the MD -- Not Appropriate for the PA
(Continuing Visits)

Modified Morbidity Code	Name	Frequency
2.3	Pulmonary TB, active	4
2.9	Pulmonary TB, activity unspec.	5
3.0	Pleurisy specified as TB	1
15.0	TB of lymphatic systems	6
23.0	Other cardiovascular syphilis	12
37.0	Lymphogranuloma venereum	2
53.0	Septicemia and Pyemia - strep.	1
53.9	Septicemia and Pyemia - unspec.	1
108.0	Other rickettsial disease	1
122.0	Coccidiosis	1
134.9	Other fungus infection	1
138.0	Sarcoid of Boeck	10
151.0	Malignant neoplasm of stomach	1
153.0	Malignant neoplasm of large intestine - Cecum, appendix and ascending colon	1
153.1	Malignant neoplasm of trans. colon	5
153.3	Malignant neoplasm of sigmoid	1

Modified Morbidity Code	Name	Frequency
153.8	Malignant neoplasm of large intestine, unspec.	22
154.0	Malignant neoplasm of rectum	10
156.0	Malignant neoplasm of liver	3
157.0	Malignant neoplasm of pancreas	6
158.0	Malignant neoplasm of peritoneum	2
159.0	Malignant neoplasm of unspec. digestive organs	2
162.1	Malignant neoplasm of bronchus and lung	32
163.0	Malignant neoplasm of lung, unspec.	29
165.0	Malignant neoplasm of thoracic organ	13
170.0	Malignant neoplasm of breast	13
171.0	Malignant neoplasm of cervix uteri	8
172.0	Malignant neoplasm of corpus uteri	1
174.0	Malignant neoplasm of uterus, unspec.	2
175.0	Malignant neoplasm of ovary, etc.	2
177.0	Malignant neoplasm of prostate	20
180.0	Malignant neoplasm of kidney and ureter	7
181.0	Malignant neoplasm of bladder	2
191.2	Malignant neoplasm of ear	1
192.0	Malignant neoplasm of eye	2
194.0	Malignant neoplasm of thyroid gland	14

Modified Morbidity Code	Name	Frequency
195.3	Malignant neoplasm of pituitary gland	10
196.2	Malignant neoplasm of vertebral column	12
197.3	Malignant neoplasm of con. tissue, lower limb	2
198.0	Secondary and unspec. malignant neoplasm of lymph nodes	1
199.0	Malignant neoplasm of unspec. primary site	7
199.7	Malignant neoplasm of bone, secondary	1
199.9	Malignant neoplasm of mult. or generalized secondary sites	57
200.0	Reticulum cell sarcoma	1
200.1	Lymphosarcoma	18
200.9	Other primary malignant neoplasm of lymphoid tissue	27
203.0	Multiple myeloma	8
211.1	Benign neoplasm of stomach	3
211.3	Benign neoplasm of large intestine	7
211.4	Benign neoplasm of rectum	8
211.9	Benign neoplasm of unspec. digestive site	1
212.0	Benign neoplasm of nose, middle ear	1
212.3	Benign neoplasm of bronchus and lung	2
214.0	Uterine fibromyoma	6
215.9	Other and unspec. benign neoplasms of uterus	1

Modified Morbidity Code	Name	Frequency
216.0	Endometriosis, endometrioma	1
216.9	Benign neoplasm of ovary, unspec.	1
217.9	Other and unspec. benign neoplasms of other female genital organs	1
223.1	Benign neoplasm, acoustic nerve	9
231.3	Neoplasm, unspec. nature - bronchus and lung	1
232.0	Neoplasm, unspec. nature - breast	1
237.2	Neoplasm, unspec. nature - brain	1
239.0	Neoplasm, unspec. nature - thyroid gland	2
239.9	Neoplasm, unspec. nature - unspec. organ	3
242.4	Angioneurotic edema - food	1
242.9	Angioneurotic edema - other and unspec.	7
252.0	Toxic diffuse goiter	87
252.1	Toxic nodular goiter	1
253.1	Hypothyroidism, clinically present	74
253.4	Taking thyroid for past irradiation hypothyroid	1
254.0	Chronic thyroiditis	1
270.0	Disorders of pancreatic int. secretion	2
271.0	Hyperparathyroidism	11
272.9	Other disease of pituitary gland	1
274.1	Adrenal cortical hypofunction	15

Modified Morbidity Code	Name	Frequency
277.9	Other disease of endocrine gland	2
289.5	Renal glycosuria	2
290.0	Pernicious anemia	4
290.9	Other hyperchronic anemias	1
291.5	Iron dif. anemia secondary to other causes	6
291.6	Iron dif. anemia secondary to unknown cause	85
291.9	Other iron dif. - anemia	20
293.0	Anemia of unspec. type	40
294.0	Polycythemia	10
296.0	Thrombocytopenic purpura	28
296.9	Other purpura	3
297.0	Agranulocytosis	5
299.0	Other blood and blood forming organs - dis.	3
301.1	Delirium tremens (alcoholic)	3
301.9	Other drug or poison intox.	1
307.0	Acute brain syndrome, unspec. cause	1
313.0	Cerebral arteriosclerosis	16
313.9	Other cerebral arteriosclerosis	4
315.0	Senile brain disease	6
317.9	Chronic brain syndrome, unspec. cause	3
318.0	Involutional psychotic reaction	3

Modified Morbidity Code	Name	Frequency
320.0	Schizophrenic reactions - simple	13
320.3	Schizophrenic reactions - paranoid	1
320.5	Schizophrenic reactions - undiff. - chronic	1
320.9	Schizophrenic reactions - other unspec.	1
322.5	Drug abuse of prescribed drug	2
323.3	Psychophysiologic and visceral disorders - cardiovascular reaction	6
324.2	Psychoneurotic disorder - conversion reaction	6
324.4	Psychoneurotic disorder - obsessive complication	4
325.1	Schizoid personality	20
325.6	Passive-aggressive personality	1
326.3	Sociopathic personality disturbance - alcohol addict	54
326.4	Sociopathic personality disturbance - opium addict	1
326.9	Sociopathic personality disturbance - other addict	2
331.0	Cerebral hemorrhage, nontrau.	25
332.1	Cerebral thrombosis	48
332.4	Cerebellar embolism and thrombosis	22
334.0	Cerebral arteriosclerosis	78
334.8	Apoplexy or stroke	4

Modified Morbidity Code	Name	Frequency
334.9	Other ill-defined vascular lesions	3
335.1	Stroke of unknown type, new	3
340.9	Meningitis - unspec. cause	1
343.1	Myelitis	15
344.0	Hydrocephalus not spec. as congenital	1
345.0	Multiple sclerosis	11
350.9	Other paralysis agitans	46
352.9	Other cerebral and spinal paralysis	2
353.1	Epilepsy - grand mal.	113
353.3	Epilepsy - focal seizures	3
353.9	Epilepsy - other	1
355.2	Hereditary chorea	10
355.5	Cataplexy and narcolepsy	17
355.9	Other brain disease	7
361.0	Trigeminal neuralgia	3
368.0	Other disease of peripheral nerve - spinal	4
368.1	Other disease of peripheral nerve, median nerve	17
368.9	Other disease of peripheral nerve - other	10
373.0	Iritis	6
376.0	Uveitis	1
377.0	Inflammation of optic nerve and retina	1

Modified Morbidity Code	Name	Frequency
384.3	Paralysis or degeneration of cranial nerve	2
385.9	Cataract - unspec. and senile	3
387.0	Glaucoma	6
388.2	Other eyeball disease	1
389.0	Vascular lesions of retina	2
398.0	Deafness of both ears - complete	1
398.2	Deafness of one ear - complete	3
400.0	Rheumatic fever	2
410.0	Disease of mitral valve - inactive rheu.	1
410.1	Mitral valve insuff.	10
410.2	Mitral valve - stenosis	125
410.3	Mitral valve - stenosis and insuff.	1
411.0	Disease of aortic valve spec. as rheu.	21
411.1	Aortic valve insuff.	1
411.2	Aortic valve - stenosis	4
411.3	Aortic valve - insuff. and stenosis	5
414.0	Other endocarditis spec. as rheu.	1
416.0	Other heart disease spec. rheu.	8
417.0	RHD with multiple valve invol.	4
420.0	Arteriosclerotic heart disease	120
420.1	Acute coronary occlusion	134

Modified Morbidity Code	Name	Frequency
420.2	Healed coronary occlusion	66
420.3	Other heart disease - invol. coronary arteries	68
420.4	Angina pectoris	111
420.5	Aneurysm of coronary artery and heart	1
420.9	Arteriosclerotic heart disease with angina pectoris	285
421.1	Chronic endocarditis of aortic valve	3
421.3	Chronic endocarditis of pulmonary valve	1
422.1	Other myocardial deg. with arteriosclerosis	1
430.0	Acute and subacute bacterial endocarditis	5
432.0	Acute pericarditis spec. nonrheu.	5
433.0	Heart block	12
433.1	Cardiac arrest	1
433.2	Auricular flutter	62
433.3	Paroxysmal tachycardia	37
433.5	Heart murmur	3
433.7	Other spec. disorders of heart rhythm	49
433.8	Unspec. cardiac arrhythmia	1
434.0	Kyphoscoliotic heart dis.	9
434.1	Congestive heart failure	170
434.2	Left ventrical failure	3
434.3	Other dis. of heart	19

Modified Morbidity Code	Name	Frequency
434. 5	Cardiac enlargement or hypertrophy	2
434. 7	Cor pulmonale	4
434. 8	Past congestive heart failure	20
434. 9	Unspec. heart disease	2
436. 0	Hypertensive heart disease and arter. heart disease	22
436. 6	Hypertensive heart disease and arter. heart disease with fibrill.	3
436. 9	Hypertensive heart disease and arter. heart disease with angina pectoris	11
446. 0	Hypertension with arteriolar nephrosclerosis	4
447. 1	Hypertension second. to renal dis.	18
447. 6	Hypertension heart dis. with arter. fibrill.	1
450. 0	Arteriosclerosis not spec.	3
450. 9	Other general arteriosclerosis	5
451. 9	Other aortic aneurysm	4
452. 4	Bruit of neck or head	2
453. 4	Spasm of artery	1
453. 9	Other peripheral vascular disease	1
456. 0	Disseminated lupus erythematosus	3
456. 2	Collagen disease NEC	1
456. 9	Other disease of artery	22
462. 1	Varicose veins of esophagus	2

Modified Morbidity Code	Name	Frequency
464.0	Phlebitis and thrombosis of other sites	14
467.0	Hypotension	4
467.2	Vascular disease of lower extremities NEC	5
467.9	Other circulatory disease	6
468.1	Unspec. mesenteric lymphadenitis	1
468.2	Lymphadenitis - unqual.	12
468.3	Noninfective disease of lymph. channels	2
511.0	Peritonsillar abscess	2
513.0	Chronic sinusitis - maxillary	2
513.9	Unspec. and pansinusitis	5
515.0	Nasal polyp	4
516.0	Chronic laryngitis	2
517.0	Paralysis of vocal cords	4
517.9	Other upper respiratory disease	4
518.0	Empyema	7
519.0	Pleurisy	8
520.0	Spontaneous pneumothorax	2
522.0	Pulmonary cong. and hypostasis	2
525.0	Other chronic interstitial pneu.	21
526.0	Bronchiectasis	12
527.0	Pulmonary collapse	1

Modified Morbidity Code	Name	Frequency
527.9	Other lung and pleural cavity disease	6
538.1	Leukoplakia	3
539.0	Inflammation disease of esophagus	5
539.1	Func. disorder of esophagus	4
539.9	Other dis. of esophagus	2
540.1	Stomach ulcer without perforation but with hemorrhage	2
541.1	Duod. ulcer without perforation, with hem.	5
541.2	Duod. ulcer with perforation, without hem.	2
542.1	Gastrojejunal ulcer without perforation, with hemorrhage	3
550.0	Acute appendicitis without perit.	3
550.1	Acute appendicitis with perit.	3
553.0	Other dis. of appendix	3
560.0	Hernia - inguinal without obst.	7
560.4	Hernia - diaphr. without obst.	39
561.4	Hernia - diaphr. with obst.	1
570.2	Misenteric infarction	3
570.5	Intest. or perit. adhesions with obst.	4
570.9	Other unspec. intestinal obstruction	6
576.0	Peritonitis	1
577.0	Peritoneal adhesion	1
578.0	Fistula NOS excl. rectum and anal.	3

Modified Morbidity Code	Name	Frequency
578.2	Hemorrhage NOS	17
578.5	Other dis. of intestine and perit. excluding rectum and anus	30
578.6	Proctitis	8
581.1	Cirrhosis of the liver - with alcohol	2
583.0	Inflammation dis. of liver NOS	22
583.9	Other dis. of liver	4
584.0	Cholelithiasis	105
585.0	Cholecystitis and cholangitis without calculi	15
586.1	Obst. of gallbladder and biliary ducts	1
586.9	Other dis. of gallbladder and biliary ducts	3
587.9	Other dis. of pancreas	6
591.0	Nephritis with edema incl. nephrosis	22
591.6	Edema second to liver dis.	5
592.0	Chronic nephritis	23
593.0	Nephritis unspec. as acute or chronic	18
601.0	Hydronephrosis	4
602.0	Calculi of kidney and ureter	24
603.1	Renal insuff. or non func. NEC	2
603.5	Other dis. of kidney	1

Modified Morbidity Code	Name	Frequency
603.6	Obst. of ureter NEC	3
606.1	Diverticulum of bladder	1
606.2	Contracture of bladder	2
606.4	Hypertonicity of bladder	2
606.5	Atony of bladder	1
606.6	Neurogenic NOS of bladder	3
608.0	Stricture of urethra	7
609.0	Urinary tract infections NEC (depends on the procedures performed)	1
610.0	Hyperplasia of prostate	11
612.0	Calculus - disease of prostate	2
616.0	Sterility - male	1
620.0	Chronic cystic disease of breast	19
621.0	Acute mastitis	1
621.1	Hypertrophy of breast	10
630.1	Other infectious disease of uterus	3
631.0	Cystocele	1
631.9	Other uterovag. prolapse	4
633.9	Other disease of uterus	8
636.0	Sterility - female	2
637.9	Other disease of female genital organs	4
640.0	Pyelitis and pyelonephritis of preg.	1

Modified Morbidity Code	Name	Frequency
642.4	Toxemias of preg. - hyperemesis gravidarum	2
642.9	Other toxemia of preg.	1
645.0	Ectopic preg. without sepsis	1
646.0	Anemia of preg.	1
650.0	Spontaneous or unspec. abortion	1
650.3	Abortion for social or psy. reasons	1
704.0	Dermititis herpetiformis	3
705.4	Lupus erythematosus	19
707.0	Lichen planus	1
710.0	Scleroderma and dermatomyositis	14
710.2	Hereditary edema of legs	1
713.1	Hair disease - hirsutism	3
715.9	Other chronic ulcer of skin	12
722.0	Acute arthritis	183
724.9	Other spec. forms of arthritis	1
725.0	Arthritis unspec.	30
730.2	Unspec. osteomyelitis	2
731.0	Osteitis deformans	1
733.1	Bone cyst localized	1
733.3	Osteoporosis and atrophy	18
733.9	Other bone disease	3

Modified Morbidity Code	Name	Frequency
734.0	Internal derang. of knee joint	4
735.0	Displacement of intervert. disc - cervical	16
735.1	Displacement of intervert. disc - lumbar and lumbosacral	28
735.9	Displacement of intervert. disc - unspec.	2
738.5	Joint disease - hip	6
748.4	Talipes equinovarus	1
753.4	Other congenital malform. of eye and optic nerve	1
754.1	Patent ductus arteriosus (Botalli)	1
754.3	Interauricular septal defect	7
754.5	Other spec. malform. of heart	2
756.5	Congenital megacolon	1
757.1	Polycystic kidney disease	68
757.3	Congenital atresia or strict. of uret. and bladder neck	2
759.9	Other and unspec. congenital malform.	1
780.2	Convulsions	2
781.0	Disturb. of vision except defect. sight	2
781.7	Other distrub. of sensation	4
782.5	Syncope of collapse	3
782.8	Splenomegaly NOS	1

Modified Morbidity Code	Name	Frequency
785.1	Hepatomegaly	3
786.8	Priapism	13
787.8	Hypercholestrolemia	5
788.8	Pyrexia of unknown origin	8
789.0	Albuminuria, unqual.	3
792.0	Uremia	14
793.1	Susp. malig. neoplasm	23
793.9	Unspec. observation	1
795.9	Undiagnosed disease	2
800.0	Fx of vault of skull	1
801.0	Fx of base of skull - closed	1
802.4	Other - closed fx of face bones	1
805.2	Fx vert. col., dorsal or thor. - closed	5
805.4	Fx vert. col., lumbar - closed	6
806.2	Fx. vert. col., dorsal or thor. - closed with spinal lesion	1
812.0	Fx. humerus, upper extr. - closed	5
813.0	Fx. radius and ulna, upper extr. - closed	1
813.2	Fx. radius and ulna - shaft closed	1
813.4	Fx. radius and ulna, lower extr. - closed	5
817.0	Multiple fx of hand bones - closed	6
820.0	Fx of neck of femur	4

Modified Morbidity Code	Name	Frequency
822.0	Fx of patella - closed	1
823.0	Fx of tibia and fibula - upper extr., closed	1
824.0	Fx of ankle	10
836.0	Dislocation, knee - simple	3
865.0	Injury to spleen without open wound	1
870.0	Open wound of eye and orbit without compli.	1
936.0	Foreign body in genitourinary tract	2
946.3	Burn - face, head, neck without complication, 3rd degree	1
953.1	Injury to nerve with open wound	1
968.8	Adverse effects of immunological agents	1
969.5	Anticoagulant affecting blood constituent	4
980.3	Cardiac tonics affecting cardiovascular system	12
980.7	Other hypertensive agents affecting cardiovascular system	2
987.2	Spasmolytics upon muscular system	2
Y 00.0	(45 and over only) General Medical Exam.	380
Y 00.5	Well baby and child care	2
Y 03.1	Follow-up exam. TB - not active	1
Y 03.2	Follow-up exam. TB - other cases	4
Y 05.9	Carrier of other inf. org.	1
Y 06.0	Prenatal care	57

Modified Morbidity Code	Name	Frequency
Y 09.6	Service for IUD (insertion)	1
T007	Weight loss	4
T170	Disturb. of coordination	3
T176	Amnesia	1
T230	Inflammation of eye	2
T231	Pain of eye	1
T259	Other eye sx.	4
T613	Menorrhagia, heavy or prolonged	2
T668	Hirsutism	3
T711	Intermittent claudication	7
T932	Groin swelling or mass	1

OBSERVED MORBIDITY VISITS BY MD and PA FREQUENCIES

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
.0	No disease present	1	2	1	4
.1	Morbidity unknown for which service performed	9	18	4	31
.5	Abnormal lab or x-ray test without apparent dis.	1	-	-	1
2.3	Pulmonary TB - active, stage unspec.	1	-	-	1
6.1	Positive TB without manifestations of T.B.	1	1	1	3
6.2	Conversion: neg. to pos. TB test	1	-	-	1
13.0	Late effects of TB of bones & joints	-	-	1	1
15.0	TB of lymphatic system	-	1	-	1
22.0	Aneurysm of aorta	1	-	-	1
30.0	Acute or unspec. gonorrhea	4	3	3	10
30.1	Gonorrhea - culture negative - treated with antibiotics	-	1	-	1
39.0	Other and unspec. venereal diseases	1	2	-	3
45.0	Bacillary dysentery	-	2	-	2
51.0	Streptococcal sore throat	13	15	2	30
53.1	Staphylococcus	-	1	-	1
64.9	Bacterial diseases - other	1	-	-	1

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
81.0	Late effects of acute poliomyelitis	1	-	-	1
86.0	Rubella	-	2	-	2
88.9	Herpes zoster - other and unspec.	-	1	-	1
89.0	Mumps - any site	-	1	2	3
92.0	Infectious hepatitis	1	1	-	2
93.0	Glandular fever (inf. mono.)	1	-	1	2
96.0	Herpes febrilis	1	3	2	6
96.9	Viruses - other	14	36	-	50
104.0	Tick-borne typhus	1	-	-	1
131.0	Dermatophytosis (athlete's foot)	1	-	-	1
131.9	Dermatophytosis - other and unspec.	2	2	-	4
134.3	Moniliasis	1	6	-	7
135.0	Scabies	2	1	1	4
136.0	Pediculosis	2	2	-	4
138.0	Other inf. and parasitic dis.	1	-	-	1
138.9	Other inf. and parasitic dis. - other	-	-	1	1
153.1	Malig. neopl. - transverse colon	1	-	-	1
153.8	Malig. neopl. - large intestine	1	-	-	1
154.0	Malig. neopl. - rectum	1	-	-	1
191.2	Malig. neopl. of skin - ear and external auditory canal	-	-	1	1
198.0	Secondary and unspec. malig. neopl. of lymph nodes - head, neck, face	2	-	-	2

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
200.1	Lymphosarcoma	2	-	-	2
200.9	Other primary malig. neopl. of lymphoid tissue	4	-	-	4
201.0	Hodgkin's dis.	2	-	-	2
203.0	Multiple myeloma	3	-	-	3
204.0	Lymphatic leukemia	2	-	-	2
204.3	Acute leukemia	1	-	-	1
210.0	Benign neopl. of buccal cavity and pharynx	-	2	-	2
211.0	Benign neopl. of digestive system - esophagus	1	-	-	1
211.1	Benign neopl. of digestive system - stomach	1	-	-	1
211.4	Benign neopl. of digestive system - rectum	1	-	-	1
211.9	Benign neopl. of digestive system - unspec. site	1	-	-	1
216.2	Benign neopl. of ovary - cystadenoma	-	1	-	1
218.0	Benign neopl. of male genital organs	1	-	-	1
229.0	Benign neopl. of other and unspec. organs and tissues	2	-	-	2
230.0	Benign neopl. of unspec. nature - buccal cavity and pharynx	1	-	-	1
230.2	Benign neopl. of unspec. nature - stomach	1	-	-	1
240.0	Hayfever - pollen	3	14	1	18
240.3	Hayfever - dust	-	1	-	1

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
240.9	Hayfever - other and unspec.	8	27	1	36
241.8	Asthma - multiple allergies	1	-	1	2
241.9	Asthma - other and unspec.	8	1	2	11
243.4	Urticaria - food	-	-	1	1
243.9	Urticaria - other and unspec.	2	1	-	3
245.9	Other allergic disorders - other and unspec.	-	3	1	4
250.0	Simple goiter - struma	1	-	2	3
251.0	Nontoxic nodular goiter (struma)	2	-	-	2
252.0	Toxic diffuse goiter (struma)	5	-	-	5
253.1	Hypothyroidism - clinically present	3	-	-	3
254.0	Chronic thyroiditis	1	-	-	1
260.0	Diabetes mellitus - no spec. compl.	32	-	-	32
260.2	Diabetes mellitus - nervous system compl.	1	-	-	1
260.4	Diabetes Mellitus - acidosis or coma, diabetic	1	-	-	1
286.0	Steatorrhea and sprue	1	-	-	1
287.0	Obesity not spec. as of endocrine origin	17	12	1	30
288.0	Gout	4	-	1	5
289.7	Metabollic dis. - disaccharidase deficiency	1	-	-	1
290.0	Pernicious anemia	1	-	-	1

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
291.6	Iron deficiency anemia secondary to unknown cause	4	-	-	4
292.1	Acute hemolytic anemia (Lederer's)	1	-	-	1
292.6	Nonregenerative anemia	3	-	-	3
293.0	Anemia of unspec. type	4	-	-	4
294.0	Polycythemia	4	-	-	4
296.0	Thrombocytopenic purpura	2	-	-	2
296.9	Purpura - other	1	-	-	1
299.0	Other dis. of blood and blood forming organs	2	-	-	2
301.1	Delirium tremens (alcoholic)	1	-	-	1
307.0	Acute brain syndrome of other or unspec. cause	1	-	-	1
315.1	Presenile brain dis.	1	-	-	1
320.9	Schizophrenic reactions - other and unspec.	1	-	-	1
323.1	Psychophysiologic autonomic and visceral disorders - musculoskeletal	3	2	-	5
323.2	Psychophysiologic autonomic and visceral disorders - respiratory reaction	1	-	-	1
323.5	Psychophysiologic autonomic and visceral disorders - G.I. reaction	10	6	-	16
323.8	Psychophysiologic autonomic and visceral disorders - nervous sys.	5	-	-	5
324.0	Psychoneurotic disorders - anxiety reaction	19	20	1	40

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
324.5	Psychoneurotic disorders - depressive reaction	9	7	-	16
324.6	Psychoneurotic disorders - hyperventilation syndrome	1	-	-	1
325.1	Personality pattern - schizoid personality	-	2	-	2
326.3	Personality pattern - alcoholic addiction	3	-	-	3
328.1	Transient situational personality disorders - adult situation reaction	-	1	-	1
328.4	Transient situational personality disorders - adj. of adolescence	1	-	-	1
332.0	Cerebral embolism	1	-	-	1
332.1	Cerebral thrombosis	1	-	-	1
334.0	Cerebral arteriosclerosis	3	-	-	3
334.9	Ill-defined vasc. lesions affecting central nervous sys. - other	1	-	-	1
345.0	Multiple sclerosis	2	-	1	3
350.9	Paralysis agitans - other	3	-	-	3
352.1	Cerebral and sponal paralysis - hemiplegia	1	-	-	1
353.0	Epilepsy - petit mal	-	1	-	1
353.1	Epilepsy - grand mal	2	-	-	2
353.3	Epilepsy - focal seizures	1	-	-	1
354.0	Migraine	5	1	-	6
355.9	Diseases of brain - other	2	-	-	2

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
360.0	Facial paralysis	2	-	-	2
366.1	Neuralgia and neuritis - spinal	1	-	-	1
368.0	Dis. of peripheral nerves except autonomic - spinal	2	-	-	2
368.1	Dis. of peripheral nerves except autonomic - median nerve	3	-	-	3
369.9	Dis. of peripheral nerves except autonomic - autonomic nervous system - other	1	1	-	2
370.0	Infective conjunctivitis	1	-	-	1
370.1	Conjunctivitis of unknown etiology with antibiotic	2	1	-	3
370.2	Conjunctivitis of unknown etiology without antibiotic given	1	2	-	3
370.4	Conjunctivitis - allergic	1	-	-	1
378.0	Inflammation of lacrimal glands and ducts	-	1	-	1
389.3	Dis. of retina and optic nerve - other retina	1	-	-	1
390.0	Otitis externa	4	12	-	16
391.0	Otitis media - acute	3	1	-	4
391.2	Otitis media - not spec. and no antibiotic given	2	2	-	4
391.9	Otitis media - unspec.	12	24	2	38
394.0	Dis. of ear - labyrinthitis	7	2	1	10
394.9	Dis. of ear - other	1	-	-	1

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
395.0	Meniere's disease	4	-	-	4
396.9	Dis. of ear and mastoid process - other	14	26	-	40
398.3	Impairment of hearing of one or both ears	-	1	-	1
410.0	Mitral valve dis. - non-spec.	2	-	-	2
410.1	Mitral valve dis. - insufficiency	2	-	-	2
411.0	Aortic valve dis. - non-spec.	1	-	-	1
411.2	Aortic valve dis. - stenosis	1	-	-	1
411.3	Aortic valve dis. - stenosis and insufficiency	1	-	-	1
414.0	Other endocarditis spec. as rheumatic	1	-	-	1
417.0	R.H.O. with multiple valve involvement	1	-	-	1
420.0	Arteriosclerotic heart dis. without other notation	14	-	-	14
420.1	Myocardial infarction	11	-	-	11
420.2	Healed coronary occlusion	3	-	-	3
420.3	Other heart dis. spec. as involving coronary arteries	15	-	-	15
420.4	Angina pectoris without mention of coronary dis.	31	-	-	31
420.6	Arteriosclerotic heart dis. with atrial fibrillation	4	-	-	4
420.9	Arteriosclerotic heart dis. with angina pectoris	6	-	-	6

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
421.0	Chronic endocarditis - of mitral valve, nonrheumatic	2	-	-	2
421.1	Chronic endocarditis - of aortic valve, not spec. as rheumatic	4	-	-	4
421.6	Arteriosclerotic heart dis. with myocardial infarction and angina pectoris	2	-	-	2
422.9	Myocardial degeneration - other	1	-	-	1
430.0	Acute and subacute bacterial endocarditis	2	-	-	2
433.2	Auricular fibrillation or flutter	6	-	-	6
433.3	Paroxysmal tachycardia	6	-	-	6
433.7	Other spec. disorders of heart rhythm	3	-	-	3
433.8	Unspec. cardiac arrhythmia	1	-	-	1
434.1	Congestive heart failure	14	-	1	15
434.2	Left ventricular failure	1	-	-	1
434.7	Cor pulmonale (right vent. failure)	1	-	-	1
434.9	Other unspec. dis. of heart	1	-	-	1
436.0	Hypertensive heart dis. and arteriosclerotic heart dis.	6	-	-	6
436.6	Hypertensive heart dis. and arter. heart dis. with atrial fibrill.	1	-	-	1
436.9	Hypertensive heart dis. and arter. heart dis. with angina pectoris	1	-	-	1
443.0	Other hypertensive heart dis.	8	1	-	9
447.0	Other hypertensive disease	197	11	-	208

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
450.0	Arteriosclerosis not further spec.	2	-	-	2
450.1	Arteriosclerosis of lower extremity	1	-	-	1
454.9	Arterial embolism and thrombosis - other	1	-	-	1
456.2	Collagen disease NEC	1	-	-	1
456.9	Disease of arteries - other	1	-	-	1
460.9	Varicose veins of lower extremities - without ulcer	1	-	-	1
461.0	Hemorrhoids	3	3	-	6
462.1	Varicose veins of esophagus	1	-	-	1
463.0	Phlebitis and thrombophlebitis of lower extremities	12	-	-	12
465.0	Pulmonary embolism and infarction	1	-	-	1
467.0	Dis. of circulatory system - hypotension	1	-	-	1
467.2	Vascular dis. or def. of lower extremities NEC	3	-	-	3
467.9	Other circulatory dis.	-	1	-	1
468.2	Lyphadenitis, unqualified	1	-	-	1
470.0	Acute nasopharyngitis (common cold)	5	1	-	6
470.2	Sinusitis, other site, organ unspec. - no antibiotic given	-	2	1	3
470.5	Sinusitis, other site, organ unspec. - antibiotic given	1	3	-	4
470.6	Sinusitis, unspec. site or pansinusitis - viral	1	2	-	3

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
470.9	Sinusitis, unspec. site or pansinusitis - organism unspec. antibiotic given	1	-	1	2
471.4	Sinusitis - nonspec., no antibiotic given	1	1	-	2
471.7	Sinusitis - nonspec., antibiotic given	1	1	-	2
472.0	Pharyngitis - nonspec., no antibiotic given	5	8	-	13
472.1	Pharyngitis - viral	4	-	-	4
472.2	Pharyngitis - bacterial	2	-	-	2
472.3	Pharyngitis - nonspec. antibiotic given	3	-	-	3
472.6	Pharyngitis - antibiotic given but throat culture neg.	1	-	-	1
472.9	Pharyngitis - other	3	1	-	4
473.2	Tonsillitis - bacterial	1	-	-	1
473.3	Tonsillitis - nonspec., antibiotic given	3	4	-	7
474.0	Laryngitis and tracheitis - nonspec., no antibiotic given	1	1	-	2
474.3	Laryngitis and tracheitis - nonspec., antibiotic given	2	-	-	2
475.0	Upper respiratory infection	64	157	9	230
476.0	Nonspec. respiratory inf., upper and lower - no antibiotics given	3	10	-	13
476.1	Nonspec. respiratory inf., upper and lower - viral	2	-	-	2
476.2	Nonspec. respiratory inf., upper and lower - bacterial	-	1	-	1
476.3	Nonspec. respiratory inf., upper and lower - not spec., antibiotics given	5	-	-	5

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
481.0	Flu - unqualified	14	10	2	26
481.1	Flu - respiratory	2	-	-	2
481.2	Flu - respiratory and digestive sys.	1	-	-	1
482.0	Flu - with digestive manifestation	-	2	1	3
490.9	Lobar pneumonia - Unspec. organisms or cause	1	1	-	2
491.9	Bronchopneumonia - Unspec. organisms or cause	3	-	1	4
492.0	Primary atypical pneumonia	4	-	-	4
493.6	Pneumonia - unspec., antibiotic given	3	3	1	7
493.8	Pneumonia - other spec. organism or cause	-	1	-	1
493.9	Pneumonia - unspec. organism or cause	2	-	-	2
500.0	Bronchitis - not spec., no antibiotic given	12	5	-	17
500.1	Bronchitis - viral	3	2	1	6
500.2	Bronchitis - bacterial	2	-	-	2
500.3	Bronchitis - non spec., antibiotic given	27	13	3	43
502.0	Bronchitis - with emphysema	4	-	1	5
502.9	Chronic bronchitis - other	1	-	-	1
511.0	Dis. of respiratory system - peritonsillar abscess (quinsy)	-	1	1	2
512.1	Chronic nasopharyngitis	6	1	-	7

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
513.9	Chronic sinusitis - unspec. and pansinusitis	1	-	-	1
517.9	Other upper respiratory dis.	2	5	1	8
519.0	Pleurisy - without mention of effusion or TB	2	-	-	2
520.0	Spontaneous pneumothorax	-	-	1	1
524.0	Other spec. pneumoconiosis and pulmonary fibrosis of occupational origin	-	-	1	1
525.0	Other chronic interstital pneumonia	1	1	-	2
527.1	Emphysema without mention of bronchitis	5	3	-	8
533.2	Impacted teeth	-	1	-	1
534.0	Toothache from unspec. cause	-	1	-	1
535.0	Other dis. of teeth and supporting structures	-	1	-	1
536.0	Stomatitis	1	1	-	2
537.0	Dis. of salivary glands - inflam. dis.	-	1	1	2
538.0	Dis. of buccal cavity - inflam. dis.	1	-	-	1
538.9	Dis. of buccal cavity - other dis.	1	-	-	1
539.0	Dis. of esophagus - inflam. dis.	5	-	-	5
539.1	Dis. of esophagus - functional disorders	2	-	-	2
539.3	Dis. of esophagus - obstruction	1	-	-	1
539.9	Dis. of esophagus - other	2	-	-	2

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
540.0	Ulcer of stomach	-	1	-	1
540.8	Ulcer - peptic without mention of stomach or duodenum	2	1	1	4
541.0	Ulcer of duodenum without perforation and without hemorrhage	6	-	-	6
541.1	Ulcer of duodenum without perforation but with hemorrhage	1	-	-	1
542.0	Gastrojejunal ulcer without perforation and without hemorrhage	1	-	-	1
543.0	Gastritis and duodenitis	3	4	-	7
544.0	Disorders of gastric secretion of stomach	2	-	-	2
544.9	Disorders of stomach - other	11	-	-	11
545.9	Dis. of stomach and duodenum - other	6	1	-	7
552.0	Other appendicitis	-	-	2	2
560.2	Hernia of abdominal cavity - umbilical	1	-	-	1
560.4	Hernia of abdominal cavity - diaphragmatic	2	-	-	2
570.1	Gastroenteritis and colitis, except ulcerative	16	19	1	36
572.0	Chronic enteritis and ulcerative colitis	7	-	-	7
572.1	Diverticulitis	7	-	-	7
572.2	Ulcerative colitis	5	-	-	5
573.0	Functional disorders of intestines - constipation	-	1	-	1

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
573.2	Irritability of colon	6	3	-	9
573.9	Functional disorders of intestines - other	7	-	-	7
574.0	Anal fissure and fistula	1	-	-	1
575.0	Abscess of anal and rectal regions	1	-	-	1
578.6	Proctitis	3	-	-	3
578.9	Other rectal and anal diseases	2	-	-	2
581.0	Cirrhosis of liver - without alcoholism	1	-	-	1
581.1	Cirrhosis of liver - with alcoholism	4	-	-	4
583.0	Liver - inflam. dis. NOS	-	1	1	2
583.9	Liver - other and unspec.	1	-	-	1
584.0	Cholelithiasis	4	-	-	4
585.0	Cholecystitis and cholangitis without mention of calculi	1	-	-	1
587.0	Acute pancreatitis	2	-	-	2
591.0	Nephritis with edema	1	-	-	1
591.1	Functional edema (idiopathic)	1	1	-	2
591.4	Stasis edema	2	-	-	2
593.0	Nephritis not spec. as acute or chronic	4	-	-	4
600.0	Infections of kidney	3	-	1	4
602.0	Calculi of kidney and ureter	1	-	-	1
605.0	Acute cystitis	15	11	-	26
605.2	Recurrent cystitis	1	2	-	3

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
606.9	Bladder diseases - other	1	-	-	1
607.0	Urethritis, nonvenereal	1	5	1	7
609.0	Urinary tract infections NEC	7	6	-	13
611.0	Prostatitis	4	4	-	8
614.0	Orchitis and epididymitis	1	1	1	3
620.0	Chronic cystic dis. of breast	1	1	-	2
621.0	Other diseases of breast	2	-	-	2
626.0	Pelvic inflam. disease	1	-	2	3
626.4	Chronic pelvic inflam. dis.	-	-	1	1
630.0	Cervicitis	1	-	-	1
630.2	Vaginitis and vulvitis	5	3	1	9
631.1	Uterovaginal Prolapse - Rectocele	1	-	-	1
633.9	Other dis. of uterus	2	1	-	3
634.0	Menstruation disorders - absence	1	-	-	1
634.2	Menstruation disorders - excessive	1	-	-	1
634.3	Menstruation disorders - painful	1	1	-	2
634.9	Menstruation disorders - other	1	-	-	1
635.0	Menopausal symptoms	2	-	-	2
637.7	Vaginal bleeding secondary hormone withdrawal	2	-	-	2
690.2	Boil and carbuncle - trunk	-	-	1	1
691.0	Cellulitis of finger and toe	-	-	1	1

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
692.2	Other cellulitis and abscess - upper arm and forearm without lymphangitis	1	-	-	1
693.2	Other cellulitis and abscess - upper arm and forearm with lymphangitis	1	-	-	1
696.0	Infectious warts	2	-	-	2
700.0	Seborrheic dermatitis	1	1	1	3
701.0	Eczema	1	4	2	7
703.0	Other dermatitis - due to plants	2	3	1	6
703.8	Other dermatitis - due to other special agents in contact with skin	-	3	-	3
703.9	Other dermatitis - unqual. (agent unspec.) in contact with skin	3	2	2	7
705.2	Erythema Nodosum	-	-	1	1
705.4	Lupus erythematosus	3	-	-	3
706.2	Pityriasis rosea	-	1	-	1
708.0	Pruritis ani	1	-	-	1
708.3	Lichenification and lichen simplex chronicus	2	1	-	3
713.9	Dis. of hair and hair follicles - other	-	1	-	1
714.0	Dis. of sweat glands	1	1	-	2
714.1	Acne	1	3	-	4
714.2	Sebaceous cyst	1	1	-	2
714.9	Other dis. of sebaceous glands	-	-	1	1
716.9	Other dis. of skin	1	1	1	3
720.0	Acute arthritis due to pyogenic organism	2	1	-	3

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
722.0	Rheumatoid arthritis	14	2	-	16
722.1	Spondylitis ankylopoietica	1	-	-	1
722.2	Chronic rheumatoid nodular fibrositis	1	-	-	1
723.0	Osteoarthritis	13	2	-	15
723.1	Spondylitis osteoarthritica	4	-	-	4
725.0	Arthritis - unspec.	-	1	-	1
726.2	Torticollis	1	-	-	1
726.9	Other muscular rheumatism, fibrositis and myalgia	10	1	-	11
727.0	Rheumatism - unspec.	5	-	-	5
733.1	Dis. of bone - cyst, localized (solitary)	1	-	-	1
733.5	Costochondritis	4	1	-	5
733.9	Dis. of bone - other	-	-	1	1
735.1	Displacement of intervertebral disc - lumbar and lumbosacral	2	1	-	3
735.3	Back pain secondary to old injury	1	-	-	1
736.0	Affection of sacroiliac joint	1	-	-	1
738.4	Other dis. of joint - finger	1	-	-	1
738.6	Other dis. of joint - knee	1	-	1	2
741.0	Synovitis, bursitis and tenosynovitis	1	1	-	2
741.1	Synovitis, bursitis and tenosynovitis - shoulder	8	5	1	14

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
741.2	Synovitis, bursitis and tenosynovitis - elbow	8	3	2	13
741.3	Synovitis, bursitis and tenosynovitis - wrist	1	4	-	5
741.4	Synovitis, bursitis and tenosynovitis - finger and hand	1	-	1	2
741.5	Synovitis, bursitis and tenosynovitis - hip and buttock	6	2	1	9
741.6	Synovitis, bursitis and tensynovitis - knee	4	2	1	7
741.8	Synovitis, bursitis and tenosynovitis - toe and foot	1	1	-	2
741.9	Synovitis, bursitis and tenosynovitis - other and unspec.	-	1	-	1
744.6	Other dis. of muscle, tendon and fascia - other muscular atrophy	1	-	-	1
745.3	Curvature of spine - lordosis	1	-	-	1
754.2	Interventricular septal defect (circulatory system)	1	-	-	1
754.7	Coarctation of aorta	1	-	-	1
780.4	Nervous system - abnormal involuntary movement	-	3	-	3
780.5	Nervous system - disturbance of coordination	1	-	-	1
780.6	Nervous system - vertigo	1	-	-	1
781.3	Nervous system - disturbance of hearing except deafness	1	-	-	1
781.7	Nervous system - other disturbance of sensation	1	-	-	1

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
782.5	Cardiovascular and lymphatic sys. - syncope or collapse	1	-	-	1
782.6	Cardiovascular and lymphatic sys. - edema and dropsy	1	-	-	1
782.7	Cardiovascular and lymphatic sys. - enlargement of lymph node NOS	1	-	1	2
783.7	Respiratory sys. - pain in chest	12	2	-	14
785.6	Upper GI sys. - diarrhea NOS	1	-	-	1
786.2	Genitourinary sys. - incontinence of urine	1	-	-	1
787.5	Pain in back NEC	1	-	-	1
788.8	Pyrexia of unknown origin	1	1	-	2
788.9	Other spec. symptoms not classifiable elsewhere	1	-	-	1
789.4	Hematuria	1	1	-	2
791.0	Debility and undue fatigue	18	4	-	22
792.0	Depression of functional activity	1	-	-	1
793.1	Suspected malignant neoplasm	1	-	-	1
795.8	Other ill-defined conditions of morbidity and mortality - no dis. found	3	1	-	4
798.5	Hypoglycemia	1	-	-	1
799.0	Hypercholesterolemia	9	-	-	9
799.1	Hyperuricemia	1	-	-	1
836.0	Dislocation of knee - simple	1	-	-	1

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
840.0	Sprains and strains - shoulder and upper arm	-	3	-	3
841.0	Sprains and strains - elbow and forearm	1	-	-	1
843.0	Sprains and strains - hip and thigh	1	-	-	1
844.0	Sprains and strains - knee and leg	3	1	-	4
845.0	Sprains and strains - ankle	1	1	-	2
845.2	Sprains and strains - foot	1	-	-	1
846.0	Sprains and strains - sacroiliac reg.	12	2	1	15
847.0	Sprains and strains - neck	5	1	-	6
847.1	Sprains and strains - thoracic	1	-	-	1
847.6	Sprains and strains - other and unspec. parts of back	2	-	-	2
848.0	Other and ill-defined sprains and strains	3	2	-	5
910.0	Superficial inj. - face, neck, scalp	-	2	-	2
911.0	Superficial inj. - trunk	-	1	-	1
913.0	Superficial inj. - elbow, forearm and wrist	-	-	1	1
922.0	Contusion of trunk	2	-	-	2
924.0	Contusion of elbow, forearm and wrist	2	-	-	2
960.1	Toxic effects - venom	1	2	-	3
962.8	Toxic effects - other gas, fumes or vapor	1	1	-	2

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
963.9	Adv. eff. of antibiotics - other	-	1	-	1
964.0	Adv. eff. of other anti-infectives - sulfonamides	-	-	1	1
965.0	Adv. eff. of certain primarily systemic agents - antihistaminic and anti-emetic	-	1	-	1
968.8	Adv. eff. of other primarily systemic agents - immunological	1	-	-	1
969.5	Adv. eff. of agents primarily affecting blood - anticoagulants	1	-	-	1
969.9	Adv. eff. of agents primarily affecting blood - other	-	1	-	1
970.9	Adv. eff. of analgesics and antipyretics - other	1	-	-	1
980.0	Adv. eff. of agents - cardiac depressants	1	-	-	1
988.0	Adv. eff. of oral contraceptives	1	3	-	4
989.1	Adv. eff.of an unknown medication	2	-	-	2
989.6	Adv. eff. of diagnostic agents	1	-	-	1
989.9	Adv. eff. of other unclass. chemical substances	2	-	-	2
993.0	Adv. eff. of other drugs, chemicals, or injections	1	-	-	1
994.9	Adv. eff. of certain external causes - other	-	1	-	1
997.3	Postgastrectomy dumping syndrome	1	-	-	1
Y 00.0	General medical examination	291	58	4	353
Y 00.5	Well baby and child care	-	2	-	2

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
Y 00.8	Oral contraceptives or parenteral contraception	1	4	1	6
Y 02.0	Immunization	1	-	-	1
Y 04.9	Other inf. and parasitic dis.	-	1	-	1
Y 06.0	Prenatal care	-	3	-	3
Y 09.2	Social problems (marital)	1	4	-	5
Y 09.3	Sterilization (genetic counseling)	2	1	-	3
Y 09.8	Service for pelvic exam only	4	7	-	11
T007	Weight loss	1	-	-	1
T010	Fever	2	-	-	2
T030	Fatigue	3	3	-	6
T036	Syncope (fainting)	3	-	-	3
T037	Excess sweating	1	-	-	1
T060	Multiple complaints	1	-	-	1
T069	Other non-specific symptoms	1	-	-	1
T076	Depression	1	-	-	1
T099	Marital problems	-	1	-	1
T151	Headache	5	-	-	5
T187	Anesthesia (numbness)	1	-	-	1
T221	Pain around eye	1	-	-	1
T230	Inflammation of eye	1	1	-	2
T241	Photophobia	-	1	-	1
T248	Spots in field of vision	1	-	-	1

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
T256	Swelling or mass of eyelid	1	-	-	1
T261	Pain in ears (pulling)	2	3	-	5
T265	Diminished hearing	1	1	1	3
T268	Tinnitus	2	-	-	2
T270	Vertigo	2	-	-	2
T277	Dizziness	5	-	-	5
T279	Other ear symptoms	-	1	-	1
T281	Pain in and around nose and face	1	-	-	1
T282	Swelling or mass in and around nose and face	-	1	-	1
T283	Epistaxis	1	-	-	1
T290	Nasal congestion	3	7	1	11
T311	Sore throat	5	10	-	15
T321	Pain of jaw or teeth	1	-	-	1
T331	Soreness of neck (pain)	2	1	-	3
T337	Voice change	-	1	-	1
T342	Enlarged nodes	1	1	-	2
T358	Tachycardia	2	-	-	2
T401	Chest pain	12	1	-	13
T403	Hemoptysis	1	-	-	1
T404	Excess sputum	-	1	-	1
T410	Cough - chronic	2	1	-	3

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
T415	Cold	-	1	1	2
T417	Dyspnea	1	-	-	1
T418	Chest tightness, congestion	-	1	-	1
T451	Heartburn	1	-	-	1
T455	Indigestation - nervous stomach	1	-	-	1
T458	Nausea - upset stomach	2	-	-	2
T460	Nausea and vomiting	1	-	-	1
T461	Abdominal pain (colic)	27	6	3	36
T469	Eructation (belching)	-	1	-	1
T481	Anal - rectal pain	1	-	-	1
T483	Rectal bleeding	3	-	-	3
T487	Dark stools	1	-	-	1
T489	Loose stools, thinning of bowel movements	1	-	-	1
T490	Diarrhea	5	1	2	8
T493	Blood in stool	2	-	-	2
T500	Constipation	1	1	1	3
T531	Breast pain	2	-	-	2
T532	Breat pain - swelling or mass	2	-	-	2
T551	Dysuria	3	3	-	6
T554	Urethral discharge	2	1	1	4
T557	Urinary frequency	3	-	-	3

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
T580	Pyuria	-	1	-	1
T601	Pelvic pain	1	-	-	1
T604	Vaginal discharge	1	3	-	4
T606	Bloody - vaginal discharge	1	-	-	1
T611	Dysmenorrhea	-	1	-	1
T616	Absence of menstruation	2	1	-	3
T621	Dyspareunia	1	-	-	1
T627	Patient feels she is pregnant	2	-	-	2
T659	Dryness of the skin	1	-	-	1
T660	Rash	1	1	-	2
T665	Itching	1	-	-	1
T669	Loss of hair	-	1	-	1
T690	Skin lesion	1	-	-	1
T701	Myalgia	6	-	-	6
T710	Muscle spasm	3	8	-	11
T751	Thoracic vertebrae pain	1	-	-	1
T761	Lumbosacral vertebrae pain	9	1	-	10
T771	Shoulder pain	1	-	1	2
T781	Arm or forearm pain	2	-	-	2
T802	Wrist or hand swelling or mass	-	-	1	1
T811	Finger pain	1	-	-	1
T821	Hip pain - coccyxdynia	2	1	-	3

Modified Morbidity Code	Name	M.D.	P.A.	P.A. and M.D.	Total
T841	Thigh and leg pain	3	1	-	4
T842	Thigh and leg mass or swelling	1	-	-	1
T851	Knee pain	2	3	-	5
T871	Foot pain (heel)	1	2	-	3
T891	Multiple joint pain	-	-	1	1
T892	Multiple joint swelling or mass	-	1	-	1
Valid Cases		1,800	844	116	2,760

APPENDIX C: USE OF LABORATORY AND X-RAY SERVICES BY PHYSICIANS AND PHYSICIANS' ASSISTANTS

To try to determine whether MDs and PAs use the system's lab and x-ray resources differently, with resulting differential-cost implications, we asked a physician consultant to make separate lists of lab-sensitive and x-ray-sensitive morbidities. We then used data from the 5% Sample to make comparisons between MDs and PAs for initial and continuing (follow-up) visits in each of the two study years.

The physician consultant chose only morbidities which appeared to have a satisfactory level of homogeneity, and we eliminated those which turned out not to have been seen at least once each by an MD and a PA during the year. Because the system's services are prepaid, there is no dollar base for comparing the value of one lab or x-ray procedure with another. We therefore used California Relative Value Studies (RVS) comparisons. The RVS values are shown on the tables attached. Comparing MDs and PAs for two separate years (mid-1971 to mid-1972 and mid-1972 to mid-1973), for two kinds of OVs (initial and continuing), for the lab and the x-ray procedures resulted in eight comparisons. Using a t-test to determine significance of differential usage, we found that in three of the eight comparisons the t-value was significant. MDs appear to have used significantly more lab procedures for initial visits in both years, and more x-ray services for initial visits in the second year.

However, the differences are too small to affect costs differentially to any very substantial degree.

We had hypothesized that PAs generally used lab and x-ray services more heavily than MDs, and that conjecture is borne out somewhat in the data drawn for quality comparisons (see p. 108). We wonder whether the ICDA categories used here are sufficiently homogeneous to permit fine comparison. Supporting evidence for the skepticism is presented in the O'Bannon-Mullooly-McCabe inquiry (see Appendix F.) concerning OV time data collected during the observation.

In view of (a) the smallness of the differential use of lab and x-ray procedures and (b) our uncertainty about the homogeneity of the morbidity categories, we did not include, in the calculus of MD and PA costs to the system, a cost differential for lab and x-ray use.

TABLE C-1

Analysis of Laboratory Use for Sensitive ICDAs by Year

YEAR 1

Initial Visit

		MD		PA	
Code	Disease	Mean RVS Value	N	Mean RVS Value	N
030.0	Gonorrhea	1.41	22	1.60	3
051.0	Strep throat	.86	122	1.24	31
096.9	Other viral disease	.73	132	1.17	15
324.0	Anxiety reaction	.74	41	.0	2
472.0	Pharyngitis, no antibiotics	.68	25	1.40	1
472.1	Pharyngitis, viral	.64	24	1.00	1
472.3	Pharyngitis, antibiotics	.67	32	2.00	1
473.3	Acute tonsillitis, unsp., anti	1.08	26	.50	2
475.0	Upper respiratory infection	.28	346	.57	48
492.0	Primary atypical pneumonia	.60	35	1.00	1
571.0	Gastroenteritis	.31	82	.54	5
605.0	Acute cystitis	1.10	78	1.08	5
607.0	Non-VD urethritis	1.24	14	2.80	1
609.0	Other urinary infections	1.21	43	1.33	4
611.0	Prostatitis	.93	16	1.50	1
783.7	Chest pain	1.45	39	.0	2
791.0	Headache	.39	45	.0	3
Y00.0	General physical exam	3.14	1692	1.95	17
T151	Headache	.61	32	.60	1
T311	Sore throat	.81	72	1.00	3
T401	Chest pain	.87	36	3.00	1
T461	Abdominal pain	.71	87	.0	1

Summary Values	Mean RVS Value	Variance	N	Mean RVS Value	Variance	N
t = 10.52*	2.04	5.29	3041	1.02	1.15	149

Table C-1, Continued

YEAR 1

Continuing Visit

Code	Disease	MD Mean RVS Value	MD N	PA Mean RVS Value	PA N
030.0	Gonorrhea	.24	17	.0	1
051.0	Strep throat	.07	97	.45	13
096.9	Other viral disease	.23	57	.54	8
324.0	Anxiety reaction	.17	309	.0	5
324.5	Depressive reaction	.38	71	.0	3
472.3	Pharyngitis, antibiotics	.06	17	.0	1
473.3	Acute tonsillitis unspec., anti.	.00	5	.50	2
475.0	Upper respiratory infection	.12	87	.20	10
605.0	Acute cystitis	.38	63	.55	4
609.0	Other urinary infections	.30	69	.40	5
611.0	Prostatitis	.67	14	.0	1
T401	Chest pain	.63	29	.0	1
T461	Abdominal pain	.46	84	2.85	2

Summary Values	MD RVS Value	MD Variance	MD N	PA RVS Value	PA Variance	PA N
t = -1.03	.25	.80	919	.41	1.36	56

Table C-1, Continued

YEAR 2

Initial Visit

Code	Disease	MD Mean RVS Value	MD N	PA Mean RVS Value	PA N
030.0	Gonorrhea	1.44	23	2.00	6
051.0	Strep throat	.90	76	1.13	31
096.9	Other viral disease	.61	105	1.41	25
324.0	Anxiety reaction	.46	61	.62	10
324.5	Depressive reaction	.55	20	2.60	2
324.6	Hyperventilation system	1.30	8	.0	1
471.4	Sinusitis, no antibiotics	.04	9	.33	3
471.7	Sinusitis, viral	.14	35	.20	5
472.0	Pharyngitis, no antibiotics	1.16	21	1.40	6
472.1	Pharyngitis, viral	.89	24	.96	5
472.2	Acute pharyngitis	1.00	4	1.00	2
472.3	Pharyngitis, antibiotic	1.02	35	1.17	15
473.0	Acute tonsillitis	.0	1	.90	1
473.3	Acute tonsillitis, unspec. anti.	1.00	13	1.00	4
475.0	Upper respiratory infections	.41	306	.44	113
492.0	Primary atypical pneumonia	.59	13	4.40	2
571.0	Gastroenteritis	.42	75	.83	8
605.0	Acute cystitis	1.52	73	1.57	18
605.1	Acute cystitis, 2nd time	.86	8	2.33	3
605.2	Recurrent cystitis	1.35	11	.0	1
607.0	Non-VD urethritis	1.83	13	.85	2
609.0	Other urinary infection	1.54	54	3.17	6
611.0	Prostatitis	.72	17	2.10	2
626.0	Pelvic inflammation	1.68	23	2.80	1
630.2	Vaginitis	.75	24	2.70	3
783.7	Chest pain	1.65	55	3.00	2
791.0	Headache	.33	57	.14	10
Y000	General physical exam	3.53	1451	2.61	63
T010	Fever	.26	14	5.85	2
T151	Headache	.13	39	.20	2
T311	Sore throat	.77	86	1.58	4
T401	Chest pain	1.15	37	.0	1
T461	Abdominal pain	.91	118	1.58	5
T490	Diarrhea	.05	38	.80	1

Summary Values	MD Mean RVS Value	MD Variance	MD N	PA Mean RVS Value	PA Variance	PA N
t = 8.57*	2.12	6.14	2947	1.28	2.74	365

Table C-1, Continued

YEAR 2

Continuing Visit

Code	Disease	MD Mean RVS Value	MD N	PA Mean RVS Value	PA N
030.0	Gonorrhea	.0	19	.63	12
051.0	Strep throat	.10	70	.07	27
096.9	Other viral disease	.65	55	.20	2
324.0	Anxiety reaction	.12	275	.25	12
324.5	Depressive reaction	.09	89	.0	4
471.7	Sinus viral	.0	14	.0	2
472.0	Pharyngitis, no antibiotics	.0	6	.50	4
472.1	Pharyngitis, viral	.14	9	.0	2
472.3	Pharyngitis, antibiotics	.29	22	.18	8
475.0	Upper respiratory infection	.20	76	.25	12
492.0	Primary atypical pneumonia	.25	35	.88	9
571.0	Gastroenteritis	.43	47	1.00	5
605.0	Acute cystitis	.69	62	.69	13
605.1	Acute cystitis, 2nd time	.85	13	1.30	2
605.2	Recurrent cystitis	.66	12	.0	1
607.0	Non-VD cystitis	.14	7	2.10	1
609.0	Other urinary infection	.61	91	1.60	3
611.0	Prostatitis	.49	9	.83	4
626.0	Pelvic Inflammation	.40	25	1.60	2
783.7	Chest pain	.46	26	1.50	2
791.0	Headache	.17	109	.0	6
Y000	General physical exam	1.16	527	.12	15
T151	Headache	.0	44	.0	3
T311	Sore throat	.24	23	.0	4
T461	Abdominal pain	.18	82	.0	1

Summary Values	MD Mean RVS Value	MD Variance	MD N	PA Mean RVS Value	PA Variance	PA N
t = 1.59	.53	2.29	1747	.40	.90	156

*Significant at less than 1% level

Source: 5% Health Plan Sample data, July 1971 - July 1973

TABLE C-2

Analysis of X-Ray Use for Sensitive ICDAs by Year

YEAR 1

Initial Visit

Code	Disease	MD Mean RVS Value	MD N	PA Mean RVS Value	PA N
324.0	Anxiety reaction	.20	41	.0	2
324.6	Hyperventilation syndrome	.0	4	9.00	1
471.4	Sinusitis, no antibiotics	1.75	8	.0	2
475.0	Upper respiratory infection	.15	346	.19	48
481.0	Influenza, unspecified	.17	100	.0	4
492.0	Primary atypical pneumonia	2.11	35	2.00	1
500.0	Bronchitis, unspec., no antibio.	.78	27	3.00	1
500.1	Bronchitis, Viral	.61	18	.67	3
500.3	Bronchitis, unspec., antibio.	.54	149	1.25	12
726.9	Other musc. rheumatism, fibrositis, myalgia	.42	41	3.00	1
741.1	Synovitis, bursitis	.35	41	.29	7
783.7	Chest pain	1.54	39	1.50	2
791.0	Headache	.78	45	.0	3
840.0	Sprain, strain of shoulder	.0	6	2.25	4
846.0	Sprain, strain of sacroiliac	1.44	62	2.75	8
848.0	Other sprain & strain	1.14	21	.43	7
851.0	Contusion scalp	4.75	4	7.00	1
873.6	Laceration face	.0	1	.0	7
881.0	Wound elbow, arm	.0	1	.0	2
884.0	Wound fingers	.0	1	.89	9
910.0	Injury face, neck	.0	14	1.40	5
913.0	Injury elbow, arm	3.00	2	.0	1
914.0	Injury hand	.0	2	.0	1
916.0	Injury hip, leg	.0	6	.29	7
917.0	Injury foot, toes	.0	2	.0	8
918.0	Other multiple injury	.0	2	.0	1
920.0	Contusion face, neck	1.67	3	5.25	4
922.0	Contusion trunk	1.60	5	3.50	7
924.0	Contusion elbow, arm	1.00	2	3.00	4
925.0	Contusion hand	2.00	1	2.00	5
926.0	Contusion fingers	1.75	2	1.60	5
927.0	Contusion hip, leg	.80	5	1.27	15
928.0	Contusion foot, toes	2.80	5	2.20	10
929.0	Other multiple contusions	1.25	4	4.00	5

Table C-2, Continued

YEAR 1

Initial Visit

Code	Disease	MD Mean RVS Value	MD N	PA Mean RVS Value	PA N
Y00.0	General physical exam	1.44	1692	2.12	17
T151	Headache	.22	32	.0	1
T401	Chest pain	.89	36	.0	1
T461	Abdominal pain	1.91	87	6.00	1
T761	Lumbosacral pain	1.49	37	.0	1
T771	Shoulder pain	1.00	12	.0	1

Summary Values	MD Mean RVS Value	MD Variance	MD N	PA Mean RVS Value	PA Variance	PA N
t = -1.02	1.12	2.17	2941	1.26	4.52	225

Table C-2, Continued

YEAR 1

Continuing Visit

Code	Disease	MD Mean RVS Value	MD N	PA Mean RVS Value	PA N
324.0	Anxiety reaction	.02	309	.0	5
324.5	Depressive reaction	.0	71	.0	3
475.0	Upper respiratory infection	.28	87	.0	10
481.0	Influenza, unspec.	.22	41	3.00	1
500.0	Bronchitis, unspec. no antibio.	.13	15	.0	1
500.1	Bronchitis, viral	.64	11	.0	1
500.3	Bronchitis, unspec. antibio.	.44	82	1.00	6
726.9	Other muscular rheumatism	.95	20	.0	3
741.0	Synovitis, bursitis	.04	46	.22	9
846.0	Sprain, strain sacroiliac	.0	56	1.00	4
848.0	Other sprain, strain	.25	16	.0	1
852.0	Contussion	.0	1	.0	1
873.6	Laceration face	.0	1	.0	13
883.0	Wound hand	.0	1	.0	4
884.0	Wound fingers	.0	3	.11	18
891.0	Wound knee, leg	.0	4	.0	6
910.0	Injury face, neck	.0	3	.0	1
915.0	Injury finger	.0	4	.0	6
917.0	Injury foot, toes	.0	1	.0	1
924.0	Contusion elbow, arm	.0	1	.0	1
927.0	Contusion hip, leg	.0	2	.0	3
929.0	Other multiple contusion	.0	1	.0	2
T401	Chest pain	.28	29	.0	1
T461	Abdominal pain	.79	84	.0	2

Summary Values	MD Mean RVS Value	MD Variance	MD N	PA Mean RVS Value	PA Variance	PA N
t = .29	.21	.90	889	.18	.53	103

Table C-2, Continued

Analysis of X-Ray Use for Sensitive ICDAs by Year

YEAR 2

Initial Visit

		MD		PA	
Code	Disease	Mean RVS Value	N	Mean RVS Value	N
324.0	Anxiety reaction	.18	61	.30	10
324.5	Depressive reaction	.20	20	.0	2
324.6	Hyperventilation syndrome	.75	8	.0	1
471.4	Sinusitis, no antibiotics	1.33	9	.0	3
471.7	Sinusitis, viral	1.31	35	.0	5
475.0	Upper respiratory infection	.15	306	.12	113
476.0	Unspec. respiratory infection	.28	18	.0	2
481.0	Influenza, unspec.	.09	144	.23	26
490.9	Lobar pneumonia, unspec.	2.00	3	2.00	1
492.0	Primary atypical pneumonia	1.69	13	2.50	2
500.0	Bronchitis, unspec., no anti	.81	21	.0	2
500.1	Bronchitis viral	1.36	14	3.00	1
500.3	Bronchitis, unspec. anti	.74	119	1.68	28
573.2	Irritable colon	1.38	33	.0	1
723.0	Osteoarthritis	2.36	14	.0	1
741.1	Synovitis, bursitis	.34	35	.63	8
783.7	Chest pain	1.46	55	1.00	2
791.0	Headache	.46	57	.0	10
840.0	Sprain, strain, shoulder	.50	4	.0	1
846.0	Sprain, strain, sacroiliac	1.34	83	2.00	8
848.0	Other sprain, strain	.25	20	2.67	3
851.0	Contusion scalp	.0	1	5.00	1
873.6	Laceration, face	.0	1	.0	2
884.0	Wound, fingers	.0	2	.0	1
910.0	Injury face, neck	.0	4	.0	3
910.1	Injury face, neck, infected	.0	1	.0	1
911.0	Injury trunk	.0	2	.0	1
914.0	Injury hand	.0	2	.0	1
915.0	Injury fingers	.67	3	.0	2
917.0	Injury foot, toes	.0	6	.50	3
918.0	Other multiple injuries	1.00	4	.0	1
920.0	Contusion face, neck	.0	3	.0	1
925.0	Contusion hand	1.00	2	6.00	1
927.0	Contusion hip, leg	1.75	4	4.00	2
Y000	General physical exam	1.42	1451	1.44	63

Table C-2, Continued

YEAR 2

Initial Visit

Code	Disease	MD Mean RVS Value	MD N	PA Mean RVS Value	PA N
T010	Fever	.0	14	.0	2
T151	Headache	.56	39	3.50	2
T401	Chest pain	1.24	37	.0	1
T461	Abdominal pain	1.41	118	.0	5
T490	Diarrhea	.13	38	.0	1
T500	Constipation	.0	15	.0	2
T761	Lumbar pain	1.11	57	1.33	3

Summary Values	MD Mean RVS Value	MD Variance	MD N	PA Mean RVS Value	PA Variance	PA N
t = 4.78*	1.04	1.97	2876	.71	1.35	329

Table C-2, Continued

YEAR 2

Continuing Visit

Code	Disease	MD Mean RVS Value	MD N	PA Mean RVS Value	PA N
324.0	Anxiety reaction	.02	275	.42	12
324.5	Depressive reaction	.03	89	.0	4
471.7	Sinusitis viral	.0	14	.0	2
475.0	Upper respiratory infection	.09	76	.0	12
476.0	Unspec. respiratory inf.	.50	4	.0	2
481.0	Influenza, unspec.	.36	53	.0	8
492.0	Primary atypical pneumonia	1.23	35	1.11	9
500.3	Bronchitis, unspec. antibio	.45	91	.13	15
573.2	Irritable colon	.79	66	.0	1
723.0	Osteoarthritis	.17	94	.0	1
726.9	Other muscular rheumatism	.62	21	.0	1
741.1	Synovitis, bursitis	.28	47	.0	7
783.7	Chest pain	.27	26	1.50	2
791.0	Headache	.21	109	.0	6
846.0	Sprain, strain, sacroiliac	.29	78	.0	6
873.6	Laceration, face	.0	2	.0	2
884.0	Wound, fingers	.0	1	.0	2
891.0	Wound, knee, leg	.0	1	.0	2
915.0	Injury, fingers	.0	5	.0	1
918.0	Other multiple injuries	.0	3	.0	1
928.0	Contusion, foot, toes	.0	2	.0	2
Y000	General physical exam	.36	527	.20	15
T151	Headache	.11	44	1.67	3
T461	Abdominal pain	.66	82	.0	1
T761	Lumbar pain	.62	26	.0	2

Summary Values	MD Mean RVS Value	MD Variance	MD N	PA Mean RVS Value	PA Variance	PA N
t = .74	.30	.97	1771	.24	.81	119

*Significant at less than 1% level

Source: 5% Health Plan Sample data, July 1971 - July 1973

APPENDIX D: VARIANCE ANALYSIS OF DIFFERENCES IN ALL-PHYSICIAN STAFF ESTIMATES

From the analytical models used to calculate annual output in physician hours and average hours in the physician work year, the number of physicians required to handle the year's output without PA assistance was 51.2. The empirical record shows, however, that 40.8 MDs (actually 39.0 MDs and 3.8 PAs, which translates into 40.8 MDs given the PA/MD substitution rate of .47) handled the output during the annualized study period.

The minutes of provider input into primary-care OVs and time estimates for overhead services (Tables 1 and 3) were taken from the clinic observation which occurred between November, 1974 to June, 1975. The OV categories and their frequencies, on the other hand, were taken from annualized data for a period extending from mid-1971 to mid-1973. (See Table 1, p. 67.) How much of the gap between 51.2 MDs and 40.8 MDs for presumably the same output can be explained (a) by average OV times and time data for other work-week components which differ for 1971-73 and 1974-75, (b) by a fall in average MD productivity between the two periods, or (c) by the arbitrary way in which widely varying OV minutes for individual morbidities were averaged for the 28 subcategories (SeeTable 1, p. 67.) to be used in calculating the annual output?

A variance analysis was designed to try to explain at least part of the gap in relation to two variables. We began with the suppositions that two components of physician year -- the primary-care and the nonscheduled services -- were understated by one standard deviation* and that the average minutes spent by MDs on the various subcategories of primary-care OVs were overstated by one standard deviation. Because these suppositions bring the numerator (total annual output hours) down** and the denominator (hours in the average MD year) up, the estimated number of MDs required fell by 1.92 to a total of 49.28. Using two standard deviations instead of one reduced the required MDs by 3.47 to a total of 47.73.

Thus the calculus using one standard deviation explains 18% of the variance at the 68% level of confidence, and the calculus using two standard deviations explains 33% of the variance at the 95% level of confidence. Moreover, data which are being collected for another

*The other component, scheduled nonprimary-care services, was assumed to be accurate for 1975 because the data were taken from the official schedules. Data for the primary care component were based on observed number and length of clinic half days; data for nonscheduled activities were compiled from interviews.

**Although not by the full amount of the reduction in estimated hours for the primary-care services. Because the supportive services (other scheduled activities and nonscheduled activities) for the annual output and for the physician year are calculated from the same base, a rise in the nonscheduled activities for the denominator has a similar rise in the numerator, but not enough to offset the large downward drag on the numerator caused by reducing the primary-care minutes by one standard deviation. Nonscheduled services are only 23% of the MD's work load, whereas primary care is 50%.

study in the system indicate that there has been a substantial decline, over recent years, in the number of clinic half days per MD.

Of course, as stated in the footnote referred to above, this issue is peripheral to the present study, which is directed to alternative ways of staffing a given level of services at a given moment rather than fluctuations in output or productivity over time. The variance analysis is offered here as a methodological note for possible usefulness to other researchers. A summary of the variance analysis is set forth below.

Net effect of Raising Two Components of the Physician Year By One SD and Lowering OV Minutes for Primary Care by One SD:

		Direction of Change
Annual Hours of Output		
Primary Care OVs	61,391	↓
Other Scheduled Services	33,772	—
Nonscheduled Services	31,302	↑
TOTAL	126,465*	
Hours in Average MD Year		
Primary Care Half Days	1,264	↑
Other Scheduled Services	676	—
Nonscheduled Services	626	↑
TOTAL	2,566	

$$\frac{\text{Annual Hours of Output}}{\text{Hours in Average MD Year}} = \frac{126,465}{2,566} = 49.28 \text{ MDs}$$

*As opposed to 126,823 before the reduction. The figure of 51.2 MDs was originally estimated by dividing 126,823 by an average MD year of 2,477 hours.

Original gap to be explained = 51.20 - 40.79 = 10.41 MDs

Gap between 51.20 and 49.28 = 1.92

$\frac{1.92}{10.41}$ = 18% of the gap explained by one SD.

Net effect of Raising Two Components of the Physician Year by Two SDs and Lowering OV Minutes for Primary Care By Two SDs:

		Direction of Change
Annual Hours of Output		
Primary Care OVs	58,434	↓
Other Scheduled Services	33,772	—
Nonscheduled Services	34,424	↑
TOTAL	126,630	
Hours in Average MD Year		
Primary Care Half Days	1,289	↑
Other Scheduled Services	676	—
Nonscheduled Services	688	↑
TOTAL	2,653	

$\frac{\text{Annual Hours of Output}}{\text{Hours in Average MD Year}} = \frac{126,630}{2,653} = 47.73$ MDs

Original gap to be explained = 51.20 - 40.79 = 10.41 MDs

Gap between 51.20 and 47.73 = 3.47 MDs.

$\frac{3.47}{10.41}$ = 33% of the gap explained by two SDs.

NOTE: The above analysis does not deal with the possible slippage in using 1975 estimates of supportive services for primary care services described by 1972 frequencies. (See (a) on the first page of this Appendix.) That issue is discussed on page 42.

APPENDIX E: PHYSICIAN PREFERENCES CONCERNING MIX OF COMPLICATED AND UNCOMPLICATED CASES

The total cost savings achievable for the system by replacing an all-physician staff with a least-cost combination of MDs and PAs were calculated to be about $325,000. To get an estimate of what portion of the potential savings might be frustrated by physician preferences concerning case mix, we polled 9* of the MDs in the sample of 14. Eight physicians filled in the attached questionnaire. The 8 answers to Question 1, with respect to the percentage of primary-care office visits which appropriately could be shifted to PAs were as follows: 80, 77.5, 75, 50, 40, 30, 20, and 10 -- for an average of 47.8%, but with quite a range. The physicians were selected to include varying degrees of exposure to PAs: from regular supervisor to substitute supervisor to casual contact. Although there appears to be a positive correlation between extent of association with PAs and percentage of OVs deemed shiftable, the sample was too small to state such a relationship with confidence. An upcoming survey of the whole Department, as part of another Project, will include these questions.

In answer to Question 2, two MDs said they wished to retain none of the shiftable OVs in their own practice. The portions which

*The number permissible without special approval by OMB.

the other 6 MDs preferred to keep again had a wide range, as indicated in the following summary:

MD	Shiftable OVs	Portions Preferred to Retain	Shiftable OVs in Preferred Case Mix
1	80 %	1/4	20 %
2	77.5%	0	0 %
3	75 %	1/2	37.5%
4	50 %	1/5	10 %
5	40 %	0	0 %
6	30 %	1/2	15 %
7	20 %	1/10	2 %
8	10 %	1/2	5 %
Average	47.8%	Appr. 1/4	11.2%

The reasons for wishing to retain some of the shiftable OVs, as checked on the questionnaires, are tabulated on an attached sheet. Reason d seemed to be of greatest importance. One physician marked it heavily. It also appeared as one of the two responses -- "continuity of care" and "patients depend on me even if problem is simple" -- to the open-ended question about "other reasons."

Question 5, inviting "other opinions on the general subject" got these responses:

"Would not want to see as many patients per day if all cases were difficult."

"Operating a blood-pressure clinic would be an efficient way of using PAs."

"Continuity and reassurance probably prevent multiple OVs; can handle own patients more rapidly than others; having burden of unknown patients, other physicians' patients, removed is major benefit of PAs."

It is perhaps useful to compare the reasons checked, a through e, with the physician's preference in regard to percent of shiftable OVs to be retained in his case mix.

MD	Shiftable OVs MDs Prefer to Retain	Reasons Checked*				
		a	b	c	d	e
1	20 %	-	-	-	mj.	-
2	0 %	-	-	-	-	-
3	37.5%	mj.	mn.	mj.	mj.	mj.
4	10 %	mn.	mn.	mj.	mj.	mj.
5	0 %	-	-	-	-	-
6	15 %	mj.	mj.	mj.	mj.	mj.
7	2 %	mj.	mn.	mn.	mj.	mj.
8	5 %	mj.	mj.	mj.	mj.	mj.

*mj = major importance, and mn = minor importance

1. Of all the individual office visits handled by you in the outpatient clinic during an average work week, <u>not counting your subspecialty, if any,</u> what percentage of the visits could in your opinion be shifted to the PAs under present Kaiser policy without threatening the quality of care?

   ______________%

2. Would you prefer to retain some of those nonspecialty visits in your own practice (as opposed to shifting all of them to PAs)?

   PLEASE CIRCLE: Yes No

3. If you answered yes to question 2, about what portion of <u>that percent of visits in question one</u> would you prefer to retain?

   PLEASE CIRCLE THE FRACTION CLOSEST TO YOUR PREFERENCE:
   1/10 1/5 1/4 1/3 1/2 2/3 3/4

4. Please indicate below your reasons for preferring to retain a portion of the PA-appropriate (shiftable) visits. Add reasons, as desired, in the blank spaces. More than one reason can be checked, but in each case indicate whether it is of major or minor importance in your thinking.

   a. Retention of some simple cases would permit me to pace myself better through the clinic day; treating only complex cases would be too demanding.

      MAJOR IMPORTANCE 4 MINOR IMPORTANCE 1

   b. Treating only complex morbidities would mean a smaller "recovery" rate, and I would find it psychologically more agreeable to see a larger portion of my patients get well, or at least show some progress.

      MAJOR IMPORTANCE 2 MINOR IMPORTANCE 3

   c. I feel that I need to see a full range of cases to maintain my overall proficiency.

      MAJOR IMPORTANCE 4 MINOR IMPORTANCE 1

   d. Some of the patients I treat for complex morbidities would want to see me even for minor problems.

      MAJOR IMPORTANCE 6 MINOR IMPORTANCE ______

   e. I myself would prefer to see such patients (d., above) rather than shift them to a PA for minor problems.

      MAJOR IMPORTANCE 5 MINOR IMPORTANCE ______

Are there any other reasons you can identify?

5. Do you have other opinions on this general subject? If so, we would appreciate your sharing them with us.

APPENDIX F: DETERMINANTS OF LENGTHS OF OUTPATIENT VISITS IN A PREPAID GROUP PRACTICE SETTING*

J.E. O'Bannon
J.P. Mullooly
M.A. McCabe

Output definition is critical for studies concerned with the cost effectiveness of substituting medical providers in health care systems, yet no agreement exists in the literature on what constitutes output. How important are patient characteristics, system characteristics, and type of provider in explaining variations in the length of office visits? If there are identifiable variables that account for the amount of time a medical provider spends with patients, then those variables may aid in defining the output of a medical care system.

Although most studies that have explored this issue have recognized the problem of variability, they have used aggregate measures that may not have been homogeneous.[1] A few studies have explored the homogeniety issue by concentrating on combinations of "tasks" performed for patients.[2] The output categories generated were examined for intensity (the amount of a given set of outputs produced for a patient) by looking at initial and return visits within a morbidity episode and at

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the age of the patient. Intensity was found to decrease for continued visits and with the increasing age of the patient.

We examined time physicians (MDs) and physician's assistants (PAs) expended on office visits to determine the extent to which a series of patient-related and system-related characteristics explain variations in that time. No attempt was made to establish output categories; rather the purpose was to indicate factors that should be taken into account by persons wishing to set up categories of output. We also used discriminate analysis to attempt to distinguish between PA visits that require MD input and those that do not. Not only does this type of analysis have value for exploring the homogeneity issue,but it has administrative implications for scheduling.

Observations of outpatient visits in the Department of Medicine within the Kaiser-Permanente system in the Portland metropolitan area provided the basic data. This is a prepaid, group health system that services nearly 200,000 members, or about 18% of the SMSA population. PAs practice in the outpatient clinics in a manner similar to the MDs. Consultation with an MD is left to the discretion of the PA who has developed a working relationship with his supervisor. The observations concentrated on five PAs (100% of those in the Department of Medicine) and 14 MDs (28% of the MDs in that Department) during three, four-week units of time--November 1974, February-March 1975, and May-June 1975.

Recorded visits to the MD numbered 1800, those to the PA, 960. Of the latter, 116 required the PA to consult the physician.

Clinic observers sat in the hallways and recorded the amount of time the provider was with patients in exam rooms, in offices, in waiting rooms, and in hallways. We also collected other data, such as patient's age and sex, presenting morbidity (the morbidity that motivated the visit), type of appointment, clinic location, symptoms, whether the chart was available during the visit, day of the week, time of the appointment, initial or continuing visit within a disease episode, number of associated morbidities, and whether specific chronic diseases were present.

REGRESSION ANALYSES

To analyze our data we ran several, stepwise multiple regressions.[3] First, we examined MD and PA visits where no consultation was necessary as opposed to those PA visits where an MD consultation was necessary. Secondly, we looked at MD-alone visits separately from PA-alone visits. Finally, we controlled for certain morbidities and symptoms to determine which factors might influence time in MD and PA visits.

For all the regressions, we used provider time with the patient as the dependent variable. A better measure of time for an office visit would also have included time spent on activities related to the visit in the absence of the patient , such as phone calls to the lab and writing in the patient's chart. Unfortunately, the clinic observers were unable to correctly assess this related time. They were, however, able to record times PAs consulted MDs outside the patients' presence for specific office visits. The length of the meetings were included in the dependent variable for consultation visits.

The independent variables used for the various regression analyses (table 1), can be grouped into two categories: (1) those related primarily to the Kaiser-Permanente system and (2) those related primarily to patient characteristics. Variables in the first category include clinic, type of appointment, day of the week, type of episode, chart availability, type of provider, and patient load. Variables that relate primarily to patient characteristics are symptoms, number of associated morbidities, age and sex of the patient, and presence or absence of a chronic disease.

The frequencies given are for the 2760 observation visits to the MDs and PAs. For regression equations involving PA-alone or MD-alone visits or visits for specific purposes, the frequencies are reduced.

System Characteristics

Observations were done at eight clinics.[4] At times, the variable "clinic" is synonomous with an individual provider because the clinic had only one PA or one MD in it. Where this is the case, we have identified the provider as either a PA or an MD (see tables 7, 8, 9, 11, 14, 23, 27 and 28). For all regressions, we used Clinic G as the reference category. All the clinics are general purpose outpatient clinics serving different areas of the region.

The variable "type of appointment" is primarily, though not solely, a system characteristic. The appointment center has established a guide for the length of time to be allotted a patient, however, the scheduling does, in a general way, take into account the patient's reason for the visit, and thus the variable is in part a patient characteristic. For example, urgent problems, undefined in the guide, are given 15 minutes. Some types of physical examinations, such as college physicals, are given 15 minutes, whereas general physicals are given 30 minutes. Return visits for an unspecified condition are scheduled for 15 minutes as are post-hospital visits. General consultation visits have 30, 45, or 60 minutes set aside depending on the subspecialty. Thirty minutes are allowed for such activities as lumbar punctures or bone marrow aspirations. Walk-in visits, that is, unscheduled visits, were used as the reference category in the analyses.

Certain groups of visits, which we initially analyzed with type of appointment as an independent variable, we later controlled for the type of appointment. For example, the MD and PA visits where no consultation was necessary were first analyzed using type of appointment as an independent variable. Then we looked at all unscheduled visits, 15-minute visits, and 30-minute visits separately within this group of visits. The same type of analysis was done for the visits for specific morbidities and symptoms.

Observations were done for all days of the week, but on Sunday, only the after-hours walk-in clinic is open. Wednesday was chosen as the reference category.

The "type of episode" variable refers to an initial or continuing visit within a morbidity episode. Although we have classified this variable as a system characteristic, it has elements of patient characteristics in it. The patient initiates the first visit, and it is his decision whether to return even if the MD has requested him to do so. The patient may also prolong a visit by seeking information beyond that which the provider has volunteered. However, the appointment center does establish time allotments for visits. The provider who finds himself pressed for time may have the patient return in order to complete his handling of the patient.

Clinic observers recorded whether the chart was available at the start of an office visit. This observation was used as an independent variable.

Whether the provider was an MD or a PA was excluded as a variable from the regression equation that examined MD-alone visits separately from PA-alone visits and also for PA visits that required an MD consultation.

The "patient-load" variable was derived by dividing the number of patients the provider saw by the number of clinic minutes in one observation session. An observation session lasted a half day and began when the first patient entered and ended when the last patient left.

Patient Characteristics

"Symptom" variables were chosen in accordance with the Hurtado-Greenlick classification system, which was developed specifically to analyze morbidity data.[5] The "accident" symptom was an addition to the Hurtado-Greenlick classes. In the regression equations relating to specific morbidity and symptom groups, the symptom variables were not used as independent variables. Because of the way our data are recorded, we were able to use symptoms as an independent variable only if we considered initial visits. We looked at initial visits for the MD and PA visits which required no consultation. When symptoms were used, the reference category was "no symptoms present." Because of an insufficient number of visits to make analysis meaningful, the presenting morbidity was not used as an independent variable.

The "number of associated morbidities" refers to the number of other morbidities accompanying the presenting morbidity, which brought the patient to the clinic. These morbidities were classified by the International Classification of Disease, Adapted. The variable "presence of a chronic disease" refers to a list of chronic diseases which if present, would likely result in the patient being triaged to the MD. The observation data shows that only 13% of patients with these diseases went to the PA. See table 2 for a list of the chronic diseases. Although frequencies for the age of the patient, number of associated morbidities, and patient load have been grouped for ease of display in table 1, the analyses used individual values.

MD and PA Visits--No Consultation

The independent variables used for all MD-alone and PA-alone visits explained 38% of the variation in time. The significant independent variables (listed in the order in which they entered the stepwise regression), along with the beta and R^2 values are shown in table 3. An examination of the table shows that system characteristics were more important in explaining time variation than were patient characteristics. Scheduled 30-minute appointments was the most important factor, as it entered the stepwise regression first. The difference between the unstandardized betas for scheduled 30-minute and scheduled 15-minute visits, also a significant variable, showed that scheduled 30-minute visits take an average of 6.4 minutes longer.

The next most important factor as judged by the R^2 and the order of its entry into the stepwise regression was patient load, i.e., number of patients per minute during the clinic period. The heavier the patient load at any given time, the less time the provider spent with each patient. For each one-tenth of a unit increase in load, the time spent with a patient decreased by an average of 8.4 minutes.

Other variables with a high system content were also significant: clinic A used an average of 2.4 minutes and clinic B an average of 2.2 minutes more than clinic G, the reference category. Clinic C used an average of 1.2 fewer minutes for each visit. Significant patient characteristics included number of associated morbidities, which was third in importance according to the order in which it entered the stepwise regression. For each unit increase in the number of associated morbidities, the visit length increased an average of 1.3 minutes. Visits by females were about half a minute longer on the average than those by males.

One factor of note is that, after we adjusted for time differences with other variables, whether the provider was the PA or MD was not a significant factor in explaining time differentials. Thus any difference in visit length for nonconsultation visits must be accounted for by factors other than the provider.

Because the method in which our data are recorded does not permit symptoms to be used as independent variables except for initial visits, we ran another regression for the MD and PA nonconsultation visits which considered only the initial visits. Table 4 shows that 52% of the variation in time is explained by the independent variables with symptoms added. The order in which the first five variables enter the stepwise regression is the same as that for the regression in table 3, which considered both initial and continuing MD and PA nonconsultation visits with symptoms omitted as an independent variable.

Six of the 17 possible symptom variables were significant. Mouth, nose, dermatologic and ear symptoms took less provider time than when no symptoms were present, whereas digestion and psychiatric symptoms required more provider time. The difference between the unstandardized betas for visits involving psychiatric symptoms, which required the most provider time, and visits involving dermatologic symptoms, which required the least amount of provider time, indicated a spread of 7.5 minutes.

Other regressions run on the MD and PA nonconsultation visits controlled for type of appointment (see tables 5-7). The unadjusted R^2 showed that all variables explained 16%, 17%, and 39% of variation in time for unscheduled, 15-minute scheduled, and 30-minute scheduled visits, respectively. The variables entering the stepwise regression first (patient load) and second (number of associated morbidities) were the same for unscheduled and 15-minute scheduled visits. In both regressions, the heavier the patient load, the less provider time spent with the patient, whereas the more associated morbidities involved in the visit, the greater the amount of provider time spent with the patient.

For unscheduled visits, clinics C and D used less provider time than clinic G. Clinic C used about two-fifths of a minute less than clinic D. Monday is a significant variable for this regression. About one minute less of provider time was expended on the patient on Mondays than on other days of the week. (Although Wednesday is the reference category, the other days of the week have the same relation to Monday as Wednesday, because they were not significant.) In the Kaiser-Permanente system, Mondays are heavy walk-in days; thus, the Monday variable is in accord with the patient load variable.

Scheduled 15-minute visits involved more provider time for younger patients. Clinics A and B required more provider time than did clinic G. Clinic A used almost a minute more of provider time than did clinic B.

Although more system characteristics were significant for the 30-minute scheduled visits, a patient characteristic was the most important as judged by the order in which it entered the stepwise regression. As the number of associated morbidities increased, the unstandardized beta showed that 2.2 minutes more provider time was spent with the patient. The four significant clinics all used more provider time than clinic G. Clinic F, where only one provider was observed, may reflect the individual rather than the clinic. Each one-tenth of a unit increase in patient load reduced the time by an average of 12.5 minutes. Continuing visits averaged 3.4 minutes more than initial visits as shown by the unstandardized beta.

Note that the provider was not a significant factor for explaining time variation, even when the same set of visits were more narrowly defined in terms of appointment type. Other factors accounted for the time variation.

PA Consultation Visits

Using the unadjusted R^2, our independent variables explained 39% of the variation in time for PA consultation visits. Only 27% of that variation was accounted for by the significant variables, as shown in table 8. The adjusted R^2, which takes into account the number of degrees of freedom, indicated that significant variables explained 25% of the variation, but after all variables had influenced the regression, 27% of the variation was explained. Only three variables were significant; all were system characteristics. Clinic D was the most important variable as judged by its order in the stepwise regression. Only one PA was observed in the clinic; therefore, the average of six minutes less provider time spent in this clinic than in clinic G, and by implication the other clinics because they were not significant, may be a reflection of the individual.

Scheduled 15-minute visits were not significant, indicating they were not different from unscheduled visits. Scheduled 30-minute visits were significant and came second in the stepwise regression; they averaged 6.7 minutes longer than all other visits. Continuing visits within a morbidity episode took 4.9 minutes longer on the average than the initial visit for the morbidity.

<u>MD-Alone and PA-Alone Visits Separately</u>

To compare factors that influence the MD's time with those that influence the PA's time with patients, we ran separate regressions for MD-alone visits and PA-alone visits. Tables 9 and 10 show both similarities and differences. For both, factors with a high system content explained most of the time variation. Scheduled 30-minute visits, averaging 7.2 minutes more than 15-minute visits in the MD-alone regression, entered the stepwise regression first. The regression for PA-alone visits showed scheduled 30-minute visits second in importance by its entrance into the regression. These visits averaged 4.5 minutes longer than all other visits. The reverse order of importance for explaining time variation existed for the patient load variable; first for PA-alone visits and second for MD-alone visits. Each one-tenth increase in the patient load for MD-alone visits decreased the average minutes on a visit by 8.1 minutes whereas for PA-alone visits the decrease was 5.3 minutes.

More clinic variables were significant for the MDs than for the PAs, perhaps because PAs worked in only five of the eight possible clinics. Clinic B was third in importance by its placement in the stepwise regression. Here the distinction between whether it was the clinic or the individual that is significant is confounded because only one PA worked in that clinic. Visits in that clinic were about five minutes longer on average than in other clinics where PAs worked.

As indicated by the R^2 values, all variables, as well as just the significant variables, explained about twice as much of the variation for MDs as they did for PAs. In the dependent variable, however, there is less variation to be explained for MDs than for PAs since the time spread for MDs is less than that for PAs.

To understand the influence of patient symptoms on MD-alone and PA-alone visits, we ran separate regressions for initial visits. The results presented in tables 11 and 12 indicated that more symptoms were significant for PA than for MD visits. Mouth symptoms for MD-alone visits took an average of 1.8 minutes less of MD time than when no symptoms were present, the reference category, or when visits occurred for other symptoms because no other symptoms were significant. Mouth, ear, eye, nose, dermatologic, and respiratory symptoms, significant variables for PA-alone visits, all took less PA time than when no symptoms were present or when visits associated with the remaining eleven symptom variables occurred.

The shorter time spent on visits for eye, ear, nose, mouth and dermatologic symptoms may be related to the PAs' probable tendency to refer patients with these symptoms rather than treat them. Visits for respiratory symptoms, associated primarily with upper respiratory infections, were routine, short visits.

Although patient characteristics of symptoms and number of associated morbidities were significant variables, system characteristics were more important in both regressions for explaining time variations. Scheduled 30-minute visits was the most important explanatory variable for MD-alone visits, averaging about 5.5 minutes more time than scheduled 15-minute visits, another significant system characteristic. The regression for PA-alone visits, lists in order, Clinic B, scheduled 30-minute visits, and clinic D as the three most important explanatory variables. The clinics may be individual rather than clinic factors in explaining time variation as only one PA worked in each clinic. Both clinic B and clinic D were significant variables for the MD-alone visits. Like the clinic B variable for PA- alone visits, this variable required more MD time for MD-alone visits. Unlike the clinic D variable for PA-alone visits, however, the clinic D variable for MD-alone visits used more MD time.

Visits to the PA in the After-Hours Clinic

To this point, we have considered visits to the providers in the general purpose clinics that service the membership during regular clinic hours for both scheduled and unscheduled visits. In the Kaiser-Permanente system there is one clinic that services patients after clinic hours, primarily on an unscheduled basis. The five medical PAs work in that clinic on Sundays. To see if the variables which influence the length of time of PA visits in the two types of clinics were similar, we ran a regression on the 79 observed PA visits in the after-hours clinic. The independent variables used in this regression were type of appointment, episode type, number of associated morbidities, age and sex of the patient, chart availability, presence of a chronic disease, and patient load.

We contrasted the after-hours clinic regression shown in table 13 with a regression (table 14) run on PA visits, both consultation and non-consultation, using all independent variables except provider and symptoms. Both regressions indicated that patient load was the most important variable for explaining time variation. Each one-tenth increase in load reduced PA time by an average of 14.7 minutes in the after-hours clinic and by 5.6 minutes in the general purpose clinics.

In the after-hours clinic, the necessity for consultation, the only other significant variable in this regression, increased PA time spent with a patient by an average of 2.7 minutes. This variable was not significant in the general purpose clinics.

Significant variables in the general purpose clinics, with one exception, were system characteristics. The two significant clinics had over a five-minute time difference between them in length of time spent with patients. This may be attributable to the clinics or to individuals as each had only one PA.

Visits for Specific Reasons

So far, we have looked at explanatory factors across all visits without regarding the reason for the visit. To see if explanatory variables group themselves for visits of a specific type similar to the way explanatory variables were grouped across all visits, we looked at four different illness complaints and at physical exams. The four complaints we examined were: upper respiratory infection (URI); ear, nose, and mouth symptoms; respiratory symptoms; and digestive symptoms. Tables 15-19 show, again, that factors with a high system content were more important in explaining variation for all visits for a specific reason. Clinic D was the most important variable for all URI visits, and clinic B was the most important variable for all physical exams, as judged by the order in which they entered the stepwise regression. Patient load was the first significant variable in the stepwise regression for the symptom variables ear, nose, and mouth (table 17) and digestion (table 19). Scheduled 15-minute visits entered the stepwise regression first and patient load second for all visits related to respiratory symptoms.

Among significant patient characteristics was the number of associated morbidities, which appeared in four of the five regressions looking at all visits related to specific reasons (see tables 15-18). This variable was also significant for all other regressions except PA consultation visits. Age and sex were the only other significant patient variables related to visits for specific reasons.

We chose to look at visits for specific reasons, controlling for the type of appointment. Tables 20-26 give the regression results for those analyses where there were significant variables and where the sample size permitted analysis. Two relationships between these regressions and those already discussed should be noted. First, for two of the regressions a patient characteristic was the most important explanatory factor for length of a visit (see tables 21 and 24). Referring back to table 7 (30-minute nonconsultation visits), we see that this also occurred when PA and MD nonconsultation visits were broken down by the type of appointment. It did not occur for any of the other regressions. Second, the provider was a significant explanatory factor for scheduled 30-minute physical exams. The PA averaged about two minutes longer than the MD.

The provider has not been significant for any of the other regressions. The finer breakdown of visits by purpose and type of appointment seems to attach a different significance to variables than when a broader definition of visits is used.

DISCRIMINANT ANALYSIS

Although the regression analysis showed that in general the provider type was not important in explaining time differences, we know from other evidence that PA visits which require MD consultation are more expensive than single-provider visits over all morbidity groups.[6] Therefore, an identification of those factors that cause PAs to consult with an MD would be valuable.

One method of trying to identify those factors is discriminant analysis,[7] a measure that is designed to statistically discriminate between two or more groups of cases to permit classification of new data into one of the established groups. We divided PA visits into "no-consult" and "consult" groups. The variables included in the analysis were age, sex, number of associated morbidities, type of episode, appointment type, whether a chronic disease was present, clinic, and whether the chart was available during the visit. Mathematically, these variables were then weighed and linearly combined to force our two groups to be as statistically distinct as possible.

This analysis produced a low degree of separation between the groups, as indicated by the final Wildes Lambda (.966) and a canonical correlation of .184 for the discriminant function. The percentage of variation of the discriminant score explained (3%), however, was significant (chi-square = 29.9).

The variables that contributed most to differentiating the two groups and that were significant are shown in table 27. The clinic B coefficient showed that consultation was more likely to occur in that clinic than in clinic G and, by implication, in the other clinics where PAs worked (these clinics were not significant). Clinic B had one PA, and thus the greater tendency to consult may be an individual phenomenon rather than a clinic one. It is interesting to note that the PA in clinic B has a tendency to consult less than the other PAs before we adjust for our independent variables. If clinic B is an individual rather than clinic variable, the discriminant analysis suggests that after adjusting for all our independent variables, this PA has a tendency to consult more than the other PAs.

Consultation was more likely to occur for female patients and on Friday, while less likely to occur on Thursday.

Such factors as age and sex did not significantly contribute to the ability to discriminate between the two groups--nor did the number of associated morbidities. This may reflect the fact that PAs did not see many patients with associated morbidities--80% of their patients had no associated morbidities.

Symptoms could be used as an independent variable for initial visits only. In order to check the effect of symptoms on the ability to discriminate between consult and no consult visits, we looked only at initial visits to the PA. As shown in table 28 the percentage of variation in the discriminant score explained (9%) was low but significant.

The significant variables which contributed to differentiating the two groups included three symptom variables. Dermatologic symptoms, the most important discriminator, and blood-forming system symptoms were less likely to be consult visits,but nose symptoms were more likely to be consult visits. Visits for blood-forming symptoms and dermotologic symptoms are probably more apt to be referred rather than treated by the PA.

Again, consultation was more likely to occur in clinic B or for the individual in clinic B than in the other clinics. Mondays tended to produce fewer consultation visits perhaps due to the busy Monday schedule.

Once a set of variables that provides satisfactory discrimination for cases with known group memberships has been found, it is possible to derive a set of functions that will permit classification of new cases with unknown memberships. Thus, by using the variables identified above for distinguishing between no-consult and consult visits, we could classify new patient visits into these categories.

As a check on the adequacy of our variables, we classified our original sets of visits to see how many were classified correctly by the variables used. Mathematically, classification involved the separate linear combination of the discriminating variables for each group that produced a probability of group membership. The case was assigned to the group with the highest probability.

The results shown in table 29 indicated that for all PA visits we correctly classified visits based on our variables 59% of the time and incorrectly 41% of the time. A false positive, i.e., incorrectly classifying a no-consult visit, occurred in 41% of the no-consult visits. A false negative, i.e., incorrectly classifying a consult visit occurred in 37% of the consult visits.

Table 30 shows for initial visits that we correctly classified visits based on the variables 74% of the time and incorrectly 26% of the time. A false positive occurred on 25% of the no-consult visits. A false negative occurred in 39% of the consult visits.

Conclusion

Selected variables in a prepaid group health outpatient setting were examined to determine their influence on time physicians and physician's assistants spent on office visits. The regression analyses indicated that system factors exert a greater influence than do patient characteristics on the length of an office visit. The discriminant analysis exhibited the importance of system characteristics and patient characteristics in distinguishing probable consult visits. Certainly, anyone attempting to establish homogeneous categories of output should consider these system factors. The strong influence of system characteristics seems to dissipate somewhat when a narrower definition of visits is used.

The findings reinforce those of Over and Smith[8] whose work indicated the importance of looking at system and patient characteristics. Our study shows that, in general, the effect of age is to decrease time on office visits as patients get older (see tables 3, 6, 10, 16, 22 and 24). Where type of episode was significant, return visits consumed more time (see tables 7, 8 and 14). The Over and Smith study showed that the effect of age in their model decreased the intensity (a measure involving combinations of "tasks"), the exceptions being five and twelve year olds. Furthermore, return visits in their model involved a less intense output than first visits. Although the age factor tends to move in the same direction in both studies, the episode variable does not. The difference may be explained by the different settings in which the studies were done. It may also be due to our dependent variable defined as time and their variables being related to intensity.

With the exception of one group of visits (scheduled 30-minute physical exams) the provider makes no difference in explaining time variation. Other variables must be used to explain variation in the length of office visits.

FOOTNOTES

1. See, for example, studies on the physician's assistants: Nelson, Eugene C., A. I. Jacobs, Karyn Codner and K. G. Johnson, "Financial Impact of Physician Assistants on Medical Practice," New England Journal of Medicine, Vol. 293, No. 11, Sept. 11, 1975; Pondy, Louis R., "Utilization and Productivity of the Duke Physician's Associate," Duke University, Graduate School of Business Administration, 1972; Record, Jane C., J. E. O'Bannon, P. D. Lairson and J. P. Mullooly, "Cost Effectiveness of Physician Associates: Kaiser-Permanente Experience," a paper presented to HERO, Dallas, Dec., 1975 (and which forms the substance of the first part of this report--pp. 1-77); Zeckhauser, Richard and Michael Eliastam, "The Production Potential of the Physician's Assistant," Journal of Human Resources, Vol. IX, No. 1, Winter 1974.

2. Much work in identifying homogeneous encounter groups has been done by Golladay, F. L., M. F. Hansen, K. R. Smith, E. J. Davenport, and A. M. Over, Jr., "The Empirical Study of Efficient Health Manpower Utilization," Research and Analytic Report Series, Health Economics Research Center, University of Wisconsin, May, 1975. Also see Over, Jr., A. M., and K. R. Smith, "The Estimation of the Ambulatory Medical Care Production Function When Output is an Unobservable Variable," a paper presented at the Econometric Society, World Congress, August 20-26, 1975, Toronto, Canada, for homogeneous groupings of symptoms.

3. The regression analysis was carried out using the SPSS program package. See Nie, Norman H., C. H. Hull, J. G. Jenkins, K. Steinbrenner, and D. H. Brent, Statistical Package for the Social Sciences, 2nd ed., McGraw-Hill, 1975.

4. Only seven of the clinics were used as independent variables due to the different nature of the eighth clinic. A separate regression was run for this clinic (see p. 303), an after-hours walk-in clinic.

5. Hurtado, Arnold V. and M. R. Greenlick, "A Disease Classification System for Analysis of Medical Care Utilization, with a Note on Symptom Classification," Health Services Research, Vol. VI, No. 3, 1971.

6. Record, et. al., op. cit. The study found consultation visits to be more expensive when the cost of the PA's time and the cost of the MD's time were combined for the visit.

7. As with the regression analysis, the discriminant analysis was done by SPSS.

8. Over and Smith, op. cit.

TABLE F-1

INDEPENDENT VARIABLES - REGRESSION ANALYSIS

Variable		Code	Frequencies
Nonspecific symptoms	No	0	2641
	Yes	1	119
Psychiatric symptoms	No	0	2752
	Yes	1	8
Neurologic symptoms	No	0	2698
	Yes	1	62
Eye symptoms	No	0	2727
	Yes	1	33
Ear symptoms	No	0	2652
	Yes	1	108
Nose symptoms	No	0	2531
	Yes	1	229
Mouth symptoms	No	0	2510
	Yes	1	250
Blood-forming system symptoms	No	0	2749
	Yes	1	11
Circulatory symptoms	No	0	2756
	Yes	1	4
Respiratory symptoms	No	0	2501
	Yes	1	259
Digestive symptoms	No	0	2598
	Yes	1	162
Breast symptoms	No	0	2754
	Yes	1	6
Urinary and male genital symptoms	No	0	2699
	Yes	1	61
Gynecologic symptoms	No	0	2729
	Yes	1	31
Dermatologic symptoms	No	0	2712
	Yes	1	48
Muscoskeletal symptoms	No	0	2624
	Yes	1	136

Variable		Code	Frequencies
Accident symptoms	No	0	2698
	Yes	1	62
Clinic F	No	0	2697
	Yes	1	63
Clinic D	No	0	2045
	Yes	1	715
Clinic A	No	0	2562
	Yes	1	198
Clinic B	No	0	2166
	Yes	1	594
Clinic E	No	0	2663
	Yes	1	97
Clinic C	No	0	2248
	Yes	1	512
Regularly scheduled 15-minute appointments	No	0	1782
	Yes	1	978
Regularly scheduled 30-minute appointments	No	0	2349
	Yes	1	411
Monday	No	0	2213
	Yes	1	547
Tuesday	No	0	2218
	Yes	1	542
Thursday	No	0	2384
	Yes	1	376
Friday	No	0	2293
	Yes	1	467
Saturday	No	0	2502
	Yes	1	258
Sunday	No	0	2681
	Yes	1	79

Variable		Code	Frequencies
Number of associated morbidities*	0		1710
(ascending order)	1-2		921
	3-5		118
	6-9		11
Episode Type - initial visit		0	1664
continuing visit		1	1096
Raw age*	0-19		180
(ascending order)	20-44		1347
	45-64		802
	65+		431
Chart availability	No	0	903
	Yes	1	1828
Chronic disease present	No	0	1609
	Yes	1	1151
Sex - male		0	1127
female		1	1633
Provider - MD		0	1800
PA		1	960
Number of patients per clinic minute*	.018 - .039		162
(patient load in ascending order)	.040 - .059		1137
	.060 - .079		978
	.080 - .107		483

*The frequencies have been grouped for ease of display; the analyses used individual values.

TABLE F-2

Diseases Included in the Variable "Chronic"

002-019	Tuberculosis
140-239	Benign and malignant neoplasms
252	Thyrotoxicosis
253	Myxedema
260	Diabetes
286.0	Malabsorption syndrome
286.5	Malnutrition
772.0	Malnutrition under one year
318-322	Psychotic disorders
334.0	Cerebral arteriosclerosis
345.0	Multiple sclerosis
350.0	Parkinson's disease
353	Epilepsy
354	Migraine headache
377	Retinitis
387	Glaucoma
400	Rheumatic fever
420-424	Arteriosclerotic heart disease
434.1	Congestive heart failure
447	Hypertension
241	Bronchial asthma
527.1	Emphysema
540.0	Gastric ulcer
541.0	Duodenal ulcer
560-561	Hernias without obstruction - with obstruction
572.0	Regional ileitis
572.2	Ulcerative colitis
584	Gall stones
586.9	Gall bladder disease with calculus
585	Gall bladder disease without calculus
593	Nephritis
610	Benign prostalic hypertrophy
705.4	Lupus erythematosis
750-759	Congenital deformities
326.3	Chronic alcoholism
292.7	Sickle cell anemia
294	Polcythemia
710.0	Scleroderma
744.0	Myasthenia gravis
410-417	Chronic rheumatic heart disease
581.0	Cirrhosis of liver
581.1	Alcoholic cirrhosis
311.0	Alcoholism with syndrome or psychosis
295	Hemophilia

TABLE F-3

Regression Coefficients of Significant Variables
for MD and PA Visits-No Consultations

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Scheduled 30-minute visits	7.424	.383	.234	.234
Patient Load (patients per minute)	-83.784	-.201	.313	.312
Number of associated morbidities	1.332	.190	.342	.342
Clinic B	2.229	.135	.357	.356
Clinic A	2.428	.093	.368	.367
Clinic C	- 1.236	-.070	.372	.371
Scheduled 15-minute visits	1.011	.070	.377	.375
Sex	.570	.040	.378	.377
Age	- .016	-.044	.379	.377

Unadjusted R^2 for all variables = .381

Adjusted R^2 for all variables = .377

Variable	Reference Category
Scheduled visits	Unscheduled visits
Clinic	Clinic G

N = 2569

TABLE F-4

Regression Coefficients of Significant Variables for Initial Visits to MDs and PAs-No Consultation

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Scheduled 30-minute visits	6.143	.354	.335	.335
Patient Load (patients per minute)	-58.176	-.138	.399	.398
Number of associated morbidities	1.687	.253	.446	.446
Clinic B	3.438	.213	.476	.475
Clinic A	3.154	.106	.487	.485
Mouth symptoms	- 1.996	-.100	.497	.495
Scheduled 15-minute visits	1.212	.060	.501	.499
Digestive symptoms	1.007	.041	.505	.503
Psychiatric symptoms	5.031	.052	.509	.507
Nose symptoms	- 1.347	-.066	.511	.508
Dermatologic symptoms	- 2.492	-.052	.513	.510
Ear symptoms	- 1.490	-.052	.514	.511
Sex	.573	.040	.517	.513

Unadjusted R^2 for all variables = .522

Adjusted R^2 for all variables = .511

Variable	Reference Category
Scheduled visits	Unscheduled visits
Clinic	Clinic G
Symptoms	No symptoms present

N = 1514

TABLE F-5

Regression Coefficients of Significant Variables
for Unscheduled Visits to MDs and PAs-No Consultation

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Patient Load (patients per minute)	-73.668	-.237	.104	.104
Number of associated morbidities	.881	.106	.121	.120
Clinic C	- 1.257	-.090	.130	.128
Clinic D	- .911	-.082	.142	.140
Monday	- 1.005	-.077	.151	.147

Unadjusted R^2 for all variables = .157

Adjusted R^2 for all variables = .146

Variable	Reference Category
Clinic	Clinic G
Day	Wednesday

N = 1216

TABLE F-6

Regression Coefficients of Significant Variables for 15-Minute Scheduled Visits to MDs and PAs-No Consultation

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Patient Load (patients per minute)	-90.960	-.247	.104	.104
Number of associated morbidities	.871	.125	.141	.139
Age	- .034	-.106	.150	.147
Clinic A	2.420	.123	.156	.152
Clinic B	1.517	.105	.161	.156

Unadjusted R^2 for all variables = .168

Adjusted R^2 for all variables = .153

Variable	Reference Category
Clinic	Clinic G

N = 964

TABLE F-7

Regression Coefficients of Significant Variables
for 30-Minute Scheduled Visits to MDs and PAs-No Consultation

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Number of associated morbidities	2.199	.404	.130	.130
Clinic B	9.453	.529	.252	.250
Clinic A	9.859	.371	.298	.295
Patient Load (patients per minute)	-124.729	-.200	.342	.337
Episode type	3.424	.166	.360	.353
Clinic D	3.919	.184	.368	.359
Clinic F (1 MD)	4.975	.122	.374	.365

Unadjusted R^2 for all variables = .394

Adjusted R^2 for all variables = .368

Variable	Reference Category
Clinic	Clinic G

N = 389

TABLE F-8

Regression Coefficients of Significant Variables for PA Consultation Visits

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Clinic D (1 PA)	-6.013	-.415	.172	.172
Scheduled 30-minute visits	6.705	.280	.223	.215
Episode type (initial vs. continuing visit)	4.936	.304	.269	.253

Unadjusted R^2 for all variables = .394

Adjusted R^2 for all variables = .273

Variable	Reference Category
Scheduled visits	Unscheduled visits
Clinic	Clinic G

N = 98

TABLE F-9

Regression Coefficients of Significant Variables
for PA-Alone Visits

Variable	Unstan-dardized Beta	Stan-dardized Beta	Unadjusted R^2	Adjusted R^2
Patient Load (patients per minute)	-52.827	-.115	.102	.102
Scheduled 30-minute visits	4.452	.174	.139	.138
Clinic B (1 PA)	3.297	.161	.162	.160
Number of associated morbidities	1.270	.115	.194	.190
Clinic D	- 2.117	-.126	.204	.199
Sex	1.035	.070	.209	.203

Unadjusted R^2 for all variables = .222
Adjusted R^2 for all symptoms = .206

Variable	Reference Category
Scheduled visits	Unscheduled visits
Clinic	Clinic G

N = 783

TABLE F-10

Regression Coefficients of Significant Variables for MD-Alone Visits

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Scheduled 30-minute visits	8.178	.469	.322	.322
Patient Load (patients per minute)	-81.240	-.205	.395	.395
Number of associated morbidities	1.288	.206	.425	.424
Clinic B	2.651	.175	.448	.446
Clinic A	3.149	.148	.456	.455
Scheduled 15-minute visits	.986	.074	.460	.458
Clinic D	1.424	.095	.461	.459
Age	- .016	-.044	.463	.461

Unadjusted R^2 for all variables = .466

Adjusted R^2 for all variables = .460

Variable	Reference Category
Clinic	Clinic G
Scheduled visits	Unscheduled visits

N = 1786

TABLE F-11

Regression Coefficients of Significant Variables
for PA-Alone Visits-Initial

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Clinic B (1 PA)	4.409	.260	.139	.139
Scheduled 30-minute visits	4.287	.198	.248	.247
Clinic D (1 PA)	- 1.735	-.123	.281	.278
Number of associated morbidities	1.207	.131	.306	.303
Ear symptoms	- 2.492	-.113	.338	.331
Mouth symptoms	- 1.942	-.124	.342	.336
Eye symptoms	- 3.730	-.093	.349	.340
Nose symptoms	- 1.153	-.078	.352	.343
Dermatologic symptoms	- 2.980	-.082	.356	.346
Respiratory symptoms	- 1.244	-.074	.363	.351

Unadjusted R^2 for all variables = .376

Adjusted R^2 for all variables = .344

Variable	Reference Category
Clinic	Clinic G
Scheduled visits	Unscheduled visits
Symptoms	No symptoms present

N = 637

TABLE F-12

Regression Coefficients of Significant Variables
for MD-Alone Visits-Initial

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Scheduled 30-minute visits	7.121	.450	.423	.423
Number of associated morbidities	1.798	.302	.486	.486
Patient Load (patients per minute)	-54.606	-.129	.523	.522
Clinic B	3.359	.219	.550	.548
Clinic A	3.407	.144	.559	.556
Scheduled 15-minute visits	1.613	.085	.568	.565
Mouth symptoms	- 1.754	-.074	.573	.569
Clinic D	1.434	.091	.576	.572

Unadjusted R^2 for all variables = .587
Adjusted R^2 for all variables = .571

Variable	Reference Category
Scheduled visits	Unscheduled visits
Clinic	Clinic G
Symptoms	No symptoms present

N = 877

TABLE F-13

Regression Coefficients of Significant Variables for the After-Hours Clinic-PA Visits

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Patient Load (patients per minute)	-147.317	-.353	.095	.095
PA consult visit	2.739	.233	.122	.111

Unadjusted R^2 for all variables = .162

Adjusted R^2 for all variables = .079

N = 79

TABLE F-14

Regression Coefficients of Significant Variables for All PA Visits in the General Purpose Clinics

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Patient Load (patients per minute)	-55.859	-.120	.097	.097
Scheduled 30-minute visits	4.458	.173	.134	.133
Clinic D (1 PA)	-2.546	-.151	.152	.150
Number of associated morbidities	1.197	.106	.180	.176
Clinic B (1 PA)	2.627	.124	.188	.184
Episode type	1.478	.079	.197	.191

Unadjusted R^2 for all variables = .204

Adjusted R^2 for all variables = .189

Variable	Reference Category
Scheduled visits	Unscheduled visits
Clinic	Clinic G

N = 881

TABLE F-15

Regression Coefficients of Significant Variables for All URI Visits

Variable	Unstan-dardized Beta	Stan-dardized Beta	Unadjusted R^2	Adjusted R^2
Clinic D	- 1.398	-.255	.073	.073
Number of associated morbidities	1.214	.206	.130	.126

Unadjusted R^2 for all variables = .207

Adjusted R^2 for all variables = .129

Variable	Reference Category
Clinic	Clinic G

N = 217

TABLE F-16

Regression Coefficients of Significant Variables
for All Physical Exam Visits

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Clinic B	8.608	.504	.150	.150
Number of associated morbidities	2.265	.429	.319	.317
Clinic A	7.524	.304	.371	.368
Age	- .061	-.137	.413	.406
Clinic D	2.783	.140	.429	.421
Sex	1.384	.086	.438	.428
Patient load	-53.989	-.090	.445	.434

Unadjusted R^2 for all variables = .461

Adjusted R^2 for all variables = .430

Variable	Reference Category
Clinic	Clinic G

N = 353

TABLE F-17

Regression Coefficients of Significant Variables for All Ear, Nose, and Mouth Symptom Visits

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Patient load	-22.801	-.112	.100	.100
Clinic D	- 1.098	-.160	.132	.130
Number of associated morbidities	.706	.114	.176	.170
Clinic E	2.625	.127	.185	.178
Clinic B	1.325	.158	.194	.185
Scheduled 15-minute visits	1.243	.095	.205	.195

Unadjusted R^2 for all variables = .227

Adjusted R^2 for all variables = .194

Variable	Reference Category
Clinic	Clinic G
Scheduled visits	Unscheduled visits

N = 477

TABLE F-18

Regression Coefficients of Significant Variables for All Respiratory Symptom Visits

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Scheduled 15 minute visits	4.255	.268	.128	.128
Patient load	-52.308	-.218	.216	.213
Number of associated morbidities	1.031	.122	.253	.247
PA consult visits	- 1.246	-.144	.278	.269
Friday	2.119	.188	.305	.290
Monday	1.697	.164	.319	.301
Clinic D	- 1.781	-.196	.327	.307
Clinic C	- 2.185	-.199	.343	.320

Unadjusted R^2 for all variables = .358

Adjusted R^2 for all variables = .303

Variable	Reference Category
Scheduled visits	Unscheduled visits
Clinic	Clinic G
Day of the week	Wednesday

N = 244

TABLE F-19

Regression Coefficients of Significant Variables
for All Digestive Symptom Visits

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Patient load	-85.409	-.272	.178	.178
Scheduled 15-minute visits	2.941	.209	.220	.215

Unadjusted R^2 for all variables = .318
Adjusted R^2 for all variables = .222

Variable	Reference Category
Scheduled visits	Unscheduled visits

N = 154

TABLE F-20

Regression Coefficients of Significant Variables for Unscheduled Visits of URI

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Clinic D	- 1.661	-.302	.078	.078
Number of associated morbidities	1.259	.192	.128	.124

Unadjusted R^2 for all variables = .206

Adjusted R^2 for all variables = .134

Variable	Reference Category
Clinic	Clinic G

N = 207

TABLE F-21

Regression Coefficients of Significant Variables
for Scheduled 15-minute Physical Exams

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Number of associated morbidities	3.032	.498	.240	.191

Unadjusted R^2 for all variables = .421

Adjusted R^2 for all variables = .095

N = 51

TABLE F-22

Regression Coefficients of Significant Variables
for Scheduled 30-Minute Physical Exams

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Clinic B	9.288	.561	.174	.174
Number of associated morbidities	2.233	.443	.325	.323
Clinic A	8.056	.356	.388	.384
Patient Load (patients per minute)	-74.773	-.129	.412	.406
Sex	1.745	.111	.427	.420
Age	- .060	-.135	.440	.431
Provider	2.269	.106	.455	.442

Unadjusted R^2 for all variables = .463

Adjusted R^2 for all variables = .435

Variable	Reference Category
Clinic	Clinic G

N = 298

TABLE F-23

Regression Coefficients of Significant Variables
for Unscheduled Visits of Ear, Nose, Mouth Symptoms

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Clinic D	- 1.443	-.219	.104	.104
Patient Load (patients per minute)	-24.004	-.122	.153	.149
Clinic E (1 MD)	2.391	.109	.178	.170
Clinic F (MD)	3.606	.105	.194	.182

Unadjusted R^2 for all variables = .211
Adjusted R^2 for all variables = .177

Variable	Reference Category
Clinic	Clinic G

N = 440

TABLE F-24

Regression Coefficients of Significant Variables
for Scheduled 15-Minute Visits of Ear, Nose, Mouth Symptoms

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Age	- .146	-.623	.507	.454

Unadjusted R^2 for all variables = .746

Adjusted R^2 for all variables = .344

N = 34

TABLE F-25

Regression Coefficients of Significant Variables
for Unscheduled Visits of Respiratory Symptoms

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Patient Load (patients per minute)	-33.908	-.164	.080	.080
PA consult visits	- 1.149	-.152	.112	.108
Clinic D	- 1.862	-.239	.139	.131
Friday	2.362	.244	.184	.169
Clinic C	- 2.153	-.231	.206	.188
Monday	1.436	.159	.228	.203

Unadjusted R^2 for all variables = .253

Adjusted R^2 for all variables = .190

Variable	Reference Category
Clinic	Clinic G
Day of the week	Wednesday

N = 223

TABLE F-26

Regression Coefficients of Significant Variables
for Unscheduled Visits for Digestive Symptoms

Variable	Unstandardized Beta	Standardized Beta	Unadjusted R^2	Adjusted R^2
Patient Load (patients per minute)	-84.188	-.283	.149	.149

Unadjusted R^2 for all variables = .270

Adjusted R^2 for all variables = .145

N = 124

TABLE F-27

Significant Standardized Discriminant Function Coefficients for All PA Visits

Variable	Standardized Discriminant Function Coefficients	F*
Clinic B (1 PA)	.326	8.7
Sex	.201	3.9
Thursday	-.194	4.3
Friday	.157	4.6

Wilkes Lambda = .966

Canonical correlation = .184 [proportion of variance in discriminate score explained by groups = $(.184)^2$ = .034]

Chi-square = 29.9

N = 881

*For difference between means of individual variables between the two groups

TABLE F-28

Significant Standardized Discriminant Function Coefficients for Initial Visits to the PA

Variable	Standardized Discriminant Function Coefficients	F*
Dermatological symptoms	-.448	16.5
Clinic B (1 PA)	.383	8.9
Nose symptoms	.329	6.5
Blood forming system symptoms	-.305	7.5
Monday	-.171	4.1

Wilkes Lambda = .912

Canonical correlation = .296 [proportion of variance in discriminant score explained by groups = $(.296)^2$ = .088]

Chi-square = 63.9

N = 715

*For difference between means of individual variables between the two groups

TABLE F-29

Prediction Results for Discriminant Analysis
for All PA Visits

		Predicted Group Membership			
Actual Group	No. of Cases	No Consult	Percent	Consult	Percent
No consult	783	459	58.6	324	41.4
Consult	98	36	36.7	62	63.3

Percent of "Grouped" Cases correctly classified: 59.1

TABLE F-30

Prediction Results for Discriminant Analysis for Initial Visits to the PA

		Predicted Group Membership			
Actual Group	No. of Cases	No Consult	Percent	Consult	Percent
No consult	637	478	75.0	159	25.0
Consult	78	30	38.5	48	61.5

Percent of "grouped" cases correctly classified: 73.6

(PHASE II CONTRACT)

ARTICLE I: DESCRIPTION AND SCOPE OF WORK

The contractor shall furnish all personnel, materials, facilities, and equipment to investigate and report on the percentage reduction in total manpower costs which would accrue from utilizing Physician's Assistants (PAs) to their full potential as health care providers within the utilization patterns of an ongoing health care delivery system. Issues to be addressed in the process are: (1) the outer perimeters of estimated PA substitutability for physicians in primary outpatient medical care, given only the constraint of quality assurance; (2) the cost savings that the Kaiser system would achieve if those perimeters were fully exploited; and (3) constraints on cost savings due to (a) legal barriers of state laws, and (b) physician preferences for practice modes.

These issues will be addressed by activities which shall be conducted in two phases. The first phase shall involve managerial activities related to developing and refining an explicit theoretical conceptual schema for exploiting fully the substitutability of PAs for physicians. The second phase shall involve implementing the schema to determine the least-cost combination of PAs and physicians, the cost savings accrued therein, and the cost of constraints on that level of substitutability; and an oral presentation and final report. Phase II shall not commence until the results of Phase I have been approved by the Project Officer.

B. In pursuance of the above, the Contractor shall perform the following:

I. Phase I

a. Obtain data on current nationally recognized perimeters of PA utilization within, but not limited to, such PA function categories as: (a) Data Gathering, (b) Analysis and Interpretation, and (c) Medical and Health Care Strategies.

Sources to be utilized to obtain these perimeters are to include but not be limited to: (1) the literature, (2) Kaiser experience as described and analyzed in HMEIA Contract NO1-MB-44173, which defines Kaiser's present policy with respect to acceptable substitution and also estimates the results of full exploitation of that policy; (3) the National Board of Medical Examiner's National Examination Program for Assistants to the Primary Care Physician, (4) curricula and performance objectives from a minimum of three PA training programs recommended by the Project Officer.

b. Staff and manage the functioning of an interdisciplinary panel of physicians, physicians assistants, nurses and social scientists based in the health field. The panel will use the data from 1.a. sources to develop an explicit theoretical conceptual framework, such as found on page 9 of the March 20, 1975 proposal, to determine the outer perimeters for the substitutability of PAs for physicians.

c. Evaluate the outcome of the panels' deliberations by testing the schema on a representative sample of morbidity situations which outpatient clinics are likely to handle as suggested by Kaiser's empirical experience during the base period of July 1, 1971 to July 1, 1973 and by the ICDA code book.

d. From the preliminary results, present a time schedule for the remainder of the proposed effort.

Should the Project Officer determine that the perimeters of PA substitutability developed by the panel are significantly greater than those currently recognized by the Kaiser system, the Project Officer shall authorize the Contractor to conduct the second phase of the project.

2. Phase II

a. (1) Use the pretested schema to calculate annual frequencies of of relevent morbidity groupings as indicated by data collected in HMEIA contract N01-MB-44173.
(2) With the frequency data, plus input time data which were collected by observation in the HMEIA study, employ linear programming techniques (as set forth on pp. 59-63 of the March 20 proposal) to estimate the least-cost combinations of physicians and PAs to provide the annualized outpatient services of the base period, taking into consideration the physician time required for inpatient services.
(3) Estimate the cost savings which the Kaiser Health Plan would realize if the schema were effectuated. The cost reduction will be stated both as a lump sum and as a per capita figure for the Health Plan population.
(4) Assess the schema's feasibility regarding the statutory constraints and the regulations of state Boards of Medical Examiners in Washington and Oregon. To the extent that the effectuation of the schema would be legally constrained, estimate the frustrated cost savings.
(5) Estimate the extent to which physician preferences would constrain the effectuation of the schema and the resulting impact on cost-efficiency as in (4) above.

C. In pursuance of the above, the Contractor shall perform the work in accordance with the Contractor's technical proposal dated March 20, 1975, entitled "Phase II of a Study of Physician Assistants in the Kaiser System", which is incorporated herein by reference. To the extent that the Description and Scope of work set forth above, or any other provision of the contract, are in conflict or inconsistent with the provisions of the above referenced portion of the Contractor's technical proposal, the provisions of this contract shall be controlling.

It is agreed that any restrictive legend, which is contained in the above referenced portions of the Contractor's technical proposal, is waived.

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