A STUDY OF

THE COST SAVINGS POTENTIAL OF THE MILITARY - CIVILIAN HEALTH SERVICES PARTNERSHIP PROGRAM IN THE NUCLEAR MEDICINE AND RADIOIMMUNOASSAY SERVICES AT IRELAND ARMY COMMUNITY HOSPITAL, FORT KNOX, KENTUCKY

A Graduate Research Project

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of

Master of Health Care Administration

by

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Using workload data for Calendar Year 1987, a cost savings analysis was performed on the following three options (involving the Nuclear Medicine Department at Ireland Army Community Hospital); 1) Elimination of Radioimmunoassay Internal Service, 2) Civilian Military Health Service Partnership Program and 3) Fixed price contract for Nuclear Medicine Services. This study revealed the Civilian-Military Health Services Partnership Program would potentially generate the greatest cost savings and recommended that it be implemented in other areas throughout the Army Medical Department.

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CHAPTER 1

Introduction

The federal health care system has become an active target for reduced cost growth in the congressional process now dominating federal budgeting. With the passage of the Gramm-Rudman Deficit Reduction Act, it has become imperative that all federally funded programs become as efficient and economical as possible. In response to this fiscal pressure, the Office of the Assistant Secretary of Defense - Health Affairs (OASD-HA) has taken an active role in developing programs and initiatives designed to enhance the purchasing power of the Uniformed Services medical care dollar.

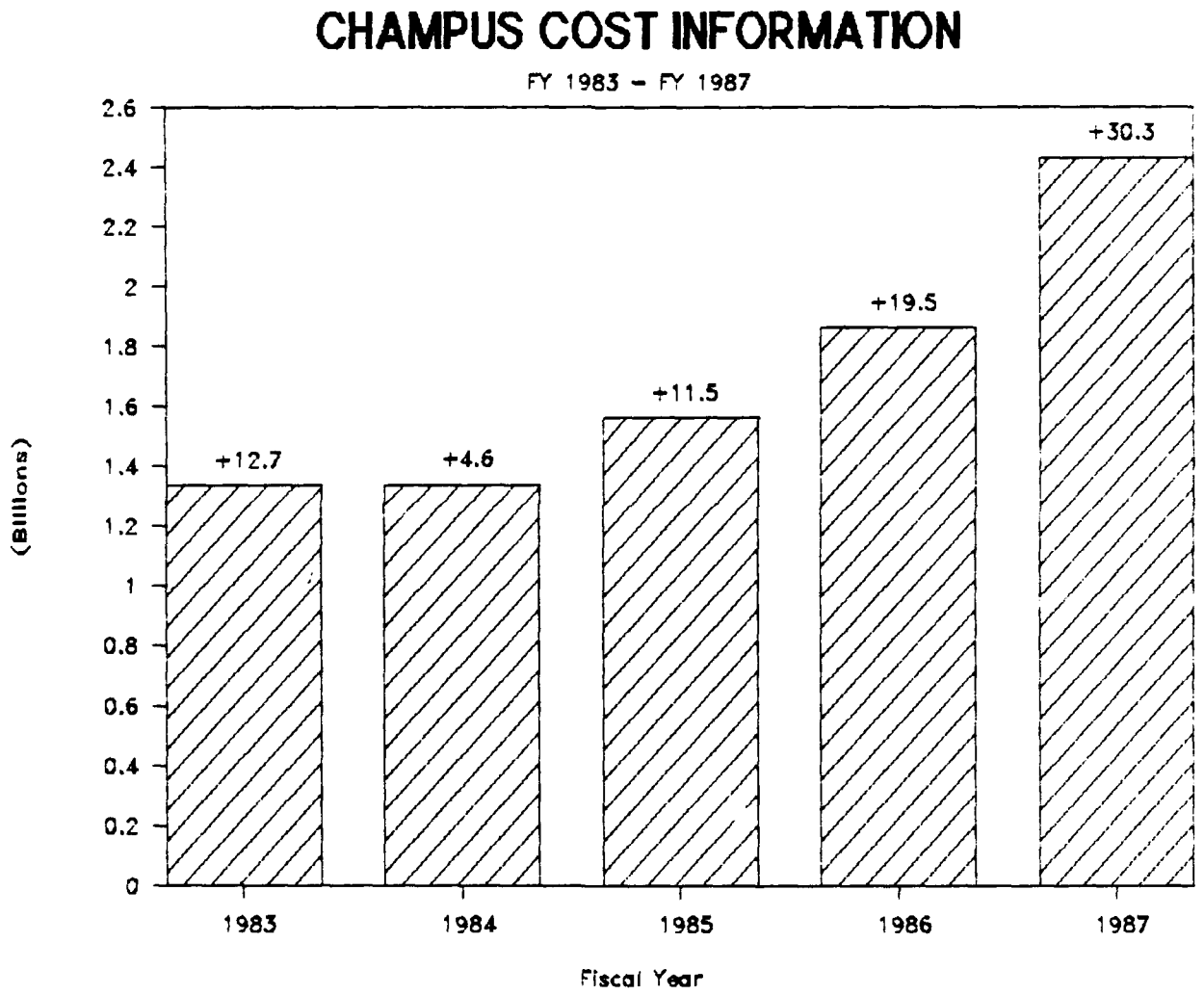
Three mechanisms currently exist for purchasing direct health care for eligible Uniformed Services personnel and beneficiaries. First, the direct health care system of the individual service branches operates hospitals and clinics throughout the world. Active duty personnel and their qualifying family members, retired military personnel and their qualifying family members, and surviving qualifying family members of deceased active duty or retired service members are authorized care in these facilities. Second, civilian health care can be purchased through central open allotment accounts or from local supplemental care accounts for active duty and non-active duty qualifying beneficiary personnel when direct military health care is unavailable. Finally, the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) can be used to purchase health care for qualifying non-active duty beneficiary personnel

from civilian medical sources. Funding for the CHAMPUS and Uniformed Services programs are separately appropriated by the federal government and monies are not transferable between accounts.

CHAMPUS has been receiving heightened interest due to its history of steadily increasing cost. As reported by The Office of the Civilian Health and Medical Program of the Uniformed Services (OCHAMPUS), expenditures for this program escalated from $1.3 billion in 1983 to $2.4 billion in 1987 (OCHAMPUS 1,7). This growth was dominated by a one year increase of 30.3% in expenditures, recorded from fiscal year 1986 to 1987; however, this figure may be understated due to incomplete data from the 1987 budget year (see Table 1, pg. 3). Currently, OCHAMPUS estimates a Fiscal Year 1988 budget requirement of $2.56 billion (OCHAMPUS 1, 25).

At the military service level, the health care expense portion of the U.S. Army budget also shows a large outlay for health service delivery. Total Army figures are not yet available for Fiscal Year 1987, due to computer program problems with the Manpower Expense and Personnel Reporting System (MEPRS). Figures for Fiscal Year 1986, however, show that the U.S. Army Health Services Command portion of the total costs, for both inpatient and outpatient health care delivered in military treatment facilities and clinics, totaled $1.5 billion. It is important to note that U.S. Army Health Services Command includes military medical treatment facilities and clinics in Alaska, Hawaii, Panama, and the Continental United States and, while it

Table 1: Total CHAMPUS Cost Information by Fiscal Year for the Period 1983 through 1987.



Total Dollars in Millions.

FY 1983	FY 1984	FY 1985	FY 1986	FY 1987
$1338.6	$1339.7	$1561.2	$1869.9	$2431.8

NOTE: Table Copied from FY 1988 - CHAMPUS Program Status by Permission.

excludes health care services provided in other parts of the world, represents the largest source of Army medical expense outlays.

In its 'Report to Congress on CHAMPUS Demonstration Projects', OASD-HA noted the following:

> The Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) has several significant problems. First, its costs, now surging past the $2 billion level, have been rising much faster than health care costs generally. Second, services are inadequate, particularly in failing to provide a simple, affordable alternative to overcrowded military facilities. And third, there is poor coordination between military facilities and CHAMPUS, resulting in program inefficiencies. In view of these problems, DoD's focus in developing workable CHAMPUS reforms has been on three principle objectives: contain costs, enhance services and improve coordination. (1)

In addition to CHAMPUS and direct health care dollars being separately appropriated accounts, prohibitions exist that inhibit creativity in efforts to achieve these principle objectives. Stringent requirements of Title 10 of the United States Code do not permit civilian physicians to freely request admitting and practice privileges in the closed military medical treatment facility. Previous initiatives designed to contain costs or increase accessibility of beneficiaries to health care services have been separately focused at either the direct care or CHAMPUS care programs without coordination of effort.

The Army, in an attempt to continue to meet the demand for health care services, has implemented a variety of programs designed to increase accessibility and/or lower costs. Utilization of Physician Assistant and Nurse Practitioner personnel that have long been integrated into the Army Medical Department to extend the patient care capacity of limited physician personnel through delegation and use of non-physician providers has increased. Fixed-price contracting for civilian physicians and other hospital services has also been initiated to increase provider and service accessibility and to attempt cost containment. Though total services available were increased and unit costs were contained in some settings, total health care costs continued to rise yearly.

Despite any previous gains, the current climate in the federal legislature toward downsizing the active duty force bodes poorly on current system attempts to contain healthcare costs. Fiscal Year 1989 holds a potential for the reduction of 400 personnel in the Army Medical Department officer strength (MG Strevey). If directed, these strength reductions may include professional physician and nursing personnel. These reductions may negate the positive effects of a multi-year buildup of the active duty force of enlisted personnel. Where unit costs fall and because the supply of providers increases low cost direct care access, the volume of services provided may cause total costs to continue to rise.

The most promising CHAMPUS initiative for cost containment

is the Fiscal Year 1988 implementation of a Diagnosis Related Group-based (DRG) reimbursement mechanism patterned after Medicare for inpatient care (OASD-HA, 2). This initiative was implemented to achieve significant cost savings in the more costly inpatient portion of CHAMPUS expense; However, DRG reimbursement affects only inpatient costs and does nothing to achieve outpatient cost containment.

It is readily apparent that past program initiatives implemented independently by the separate agencies of the Army and CHAMPUS, coupled with externally imposed constraints that have a negative economic impact, have been unsuccessful in containing total program costs or encouraging coordination of services. Fortunately, new programs are being developed that hold promise toward achieving economy through coordination of effort despite negative outside variables. One such program is "The Military-Civilian Health Services Partnership Program".

The Military-Civilian Health Services Partnership Program

One of the new initiatives that has resulted from the work of OASD-HA is a demonstration project titled the "Military-Civilian Health Services Partnership Program". This program is designed to address the objectives of improving coordination and enhancing beneficiary services (OASD-HA, 3). Scheduled for implementation in early FY 1988, this program is designed to "provide for the economical sharing of resources between military hospitals and CHAMPUS (OASD-HA, 3)". The program would be applicable "when the [military treatment facility] is unable to provide sufficient

health care services for CHAMPUS beneficiaries through [their] own resources (CHAMPUS Policy Manual 6010.47-M, 4.1.2)".

The Partnership Program is directed at health care providers and can exist in two agreement formats: Internal or External.

> . . . [Internal] Partnership Agreements will allow CHAMPUS providers, accompanied by appropriate support personnel and other resources, to provide care to CHAMPUS beneficiaries on the premises of military treatment facilities. This will allow reduced charges to CHAMPUS in view of the civilian provider's reduced overhead and will provide the opportunity to serve more CHAMPUS beneficiaries. From the beneficiaries' standpoint, military facility fees, rather than the much higher cost-sharing, will apply. The Partnership Program provides a significant opportunity for cost savings by providing more care in the less expensive military setting and increased availability of services in military treatment facilities. (OASD-HA, 3)
>
> The external partnership agreement is an agreement between a military treatment facility commander and a CHAMPUS authorized institutional provider, enabling military health care personnel to provide otherwise covered medical care to CHAMPUS beneficiaries in a civilian facility. Authorized costs associated with the use of the facility will be paid through CHAMPUS under normal cost-sharing and reimbursement procedures currently applicable under the basic CHAMPUS. Savings will be realized under this type agreement by using available military health care personnel to avoid the

civilian professional provider charges which would otherwise be billed to CHAMPUS (CHAMPUS Policy Manual 6010.47-M, 4.1.1)

This initiative displaced the Joint Health Benefits Delivery Program. Under the former program, military medical treatment facilities were permitted to enter into fixed-price contracts for care. Civil sector providers used military facilities and staff in the process of providing care. Beneficiaries paid the daily charge rate for care in military facilities and also paid the CHAMPUS cost share for professional services.

Several elements that address coordination of services can be identified in the Partnership Program. The internal partnership agreement will allow nonmilitary providers to practice within the military medical treatment facility utilizing facilities, equipment, and staff resources. The provider can avoid many of the overhead costs associated with a private practice and CHAMPUS billing will be assisted by the military medical treatment facility. For the beneficiary receiving the care, there will be no requirement to cost-share (as with the Joint Health Benefits Delivery Program or the CHAMPUS program) when care is provided in the civilian community facilities. It is anticipated that the cost savings experienced by the beneficiary will induce a greater utilization of the less costly military medical treatment facility services. A secondary benefit accruing to the military health care system, would be a reduction of the amount of the more costly inpatient CHAMPUS care purchased in civilian facilities. This would result from increased use of the

military medical treatment facility inpatient services by patients seeing the 'partnership' civilian providers.

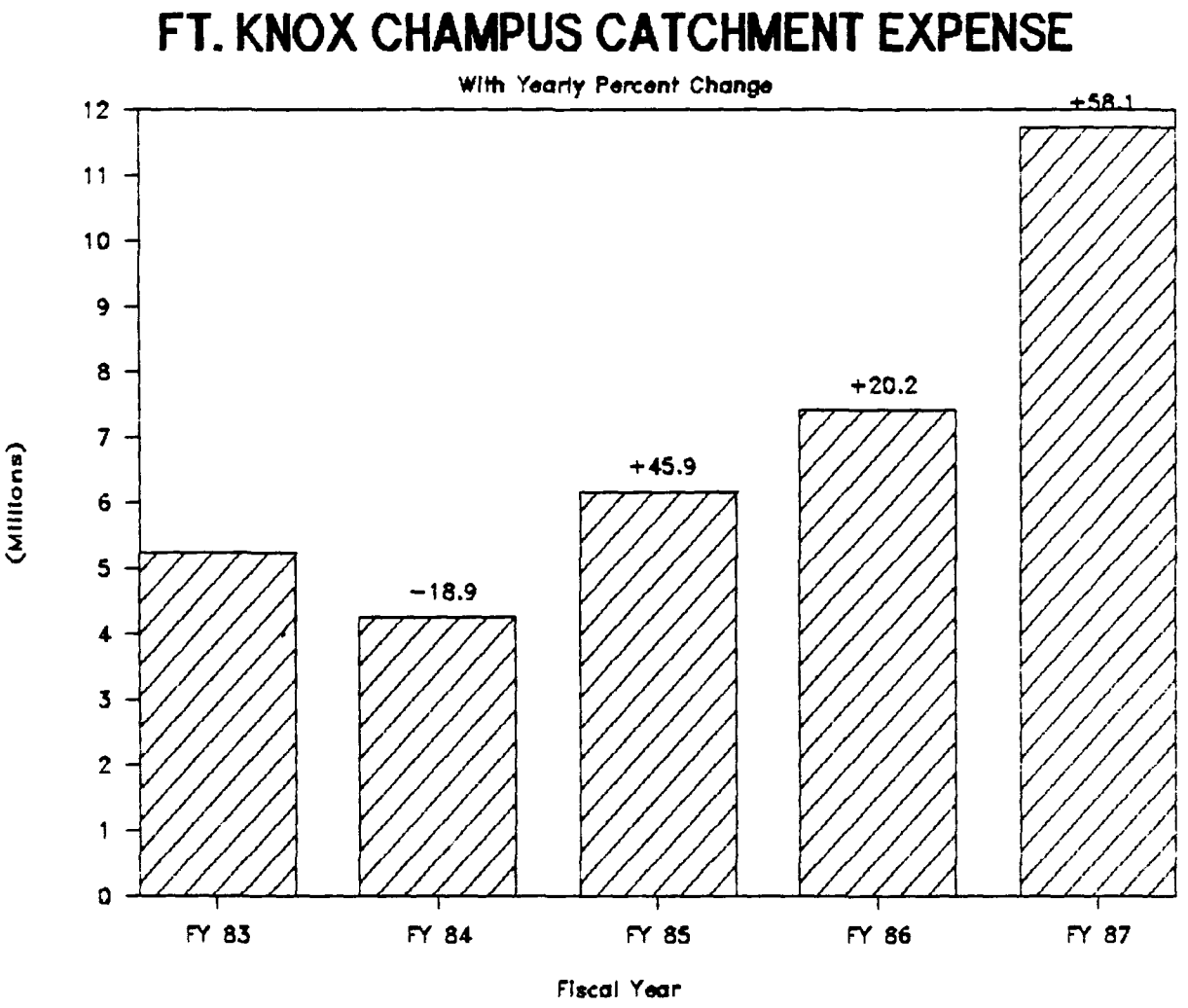
In an external agreement, physician charges to CHAMPUS would be eliminated. Additionally, a tighter control over ancillary testing and services would also assist in assuring economical care delivery in the civilian health care setting.

The Military-Civilian Health Services Partnership Program is directed toward the coordination of services and enhanced services goals of the OASD-HA. This program, however, has not been demonstrated, therefore it cannot be assumed that it will be effective in reducing overall costs. The untested potential of this program provides an interesting area for study.

Conditions Which Prompted the Study

Ireland Army Community Hospital, Fort Knox, Kentucky, is a general medical and surgical inpatient facility supporting a FY 87 population of over 67,000 eligible beneficiaries as documented by the Defense Enrollment Eligibility System (DEERS) Support Office. The facility is a York and Sawyer architectural design originally programmed to accommodate 500 inpatient care beds. In August of 1980 a large outpatient clinic addition was opened to accommodate the increasing ambulatory care work load from the beneficiary population. There are presently 181 operating inpatient beds, with an average daily patient load of 140 to 150 patients. Yearly outpatient clinic visits total nearly 500,000 per year as reported by the Patient Administration

Table 2: Fort Knox Catchment Area CHAMPUS Expense by Fiscal Year as Consolidated by OCHAMPUS for the periods 1983 to 1987.



Government Cost in Thousands.

FY 1983	FY 1984	FY 1985	FY 1986	FY 1987
$5238.7	$4251.0	$6162.9	$7409.1	$11,716.3

NOTE: Based upon Figures Obtained from OCHAMPUS for the Fort Knox Catchment Area Titled, Catchment Area Summary by Primary Diagnosis, Summarizing Reported Fiscal Year Costs from 1 October through 30 September.

Division, Medical Records Statistical Section of the hospital.

CHAMPUS costs in the Ireland Army community Hospital catchment area have shown a significant growth since 1983. Table 2 graphically indicates this point.

The number of direct care providers available in the Fort Knox Medical Treatment Facility experienced a reduction during the FY 87 time period, as indicated in Table 3.

Table 3: Average total Physicians and Physician Assistants available by fiscal reporting year for Fort Knox Medical Treatment Facility, Fort Knox, Kentucky.

	Mil./ Civ. Assistants	Mil./Civ. Physicians
FY 84	52.1	9.1
FY 85	53.6	9.5
FY 86	57.4	8.4
FY 87	53.3	7.3

NOTE: Information obtained from the Manpower and Statistics Branch of the Resource Management Division of the Fort Knox Medical Treatment Facility, Fort Knox, Kentucky.

As indicated in Table 2, CHAMPUS health care costs to the government for FY 87 for the Fort Knox catchment area were $11.7 million (OCHAMPUS, 2). This represented a 58.1% increase over FY 86. One possible reason to support this rise is indicated in Table 3, where FY 87 showed an average drop in both physician and physician assistant assets within the Medical Treatment Facility.

Though catchment area costs to CHAMPUS are rising with a concomitant decrease in provider availability in the medical treatment facility, internal ancillary services are showing a strong increase in services provided. Of these services, Nuclear

Medicine Service (which includes the Radioimmunoassay Laboratory) workload has grown dramatically since its beginning in 1984. During CY 87, a total of 2,754 nuclear scans and 17,744 Radioimmunoassay procedures were performed in the facility. This service increase has reciprocally decreased the amount of services for Nuclear Medicine procedures purchased from the community. During FY 87, only 148 assorted outpatient scans ($9,469.11 estimated government cost) and 74 assorted inpatient scans ($4,121.58 estimated government cost) were performed and paid for by CHAMPUS in the catchment area (OCHAMPUS 5). Comparison of these numbers readily indicates the dramatic decrease in the number of services needing to be purchased from the local community.

It was anticipated that in July of 1988 the Nuclear Medicine Service would lose its military provider with no programed replacement anticipated over the next 12 months. The need to purchase Nuclear Medicine testing services from the civilian health care market could severely escalate the amount of federal cost to both the CHAMPUS and direct health care system.

The Military-Civilian Health Services Partnership Program offers a possible alternative for continuing to provide Nuclear Medicine services within the medical treatment facility. The question of the cost benefit and effectiveness of providing the service through this mechanism must first be explored thoroughly to determine what overall impact it might exert on cost. Would implementation of a partnership agreement for services with a

civilian provider be the most economical alternative use of resources for continuing to provide the service? To what degree would the impact to CHAMPUS of loosing the military provider be lessened? What would the impact of facility cost to produce services be on the overall government cost of a CHAMPUS provider and direct health care marriage?

These questions need to be explored prior to implementation of a provider partnership in the area of Nuclear Medicine. This analysis would assist in determining if a partnership could be implemented with an expectation of minimizing the impact on total government costs. A study of Nuclear Medicine Services may provide a model for evaluating the desirability of implementing the Partnership Program in other non-personal service areas, as well.

Problem Statement

The problem is to determine if the implementation of the Military-Civilian Health Services Partnership Program in the Nuclear Medicine Service at Ireland Army Community Hospital, Fort Knox, Kentucky, would produce a cost savings to the government.

Objectives

The objectives of this study are:

1. To review the literature to determine what models exist for cost outcome analysis.

2. To compile workload statistics for a 12 month period to determine the magnitude of the services provided to the beneficiary population.

3. To develop a cost model based upon available direct and indirect costs for the Nuclear Medicine and Radioimmunoassay Services of Ireland Army Community Hospital.

4. To develop a standard matrix that displays individual episode cost of care based upon the cost model developed for both service areas.

5. To determine possible alternatives for delivery of Nuclear Medicine Service to the beneficiary population.

6. To develop a cost model for each alternative selected based upon available cost projections and impact on direct and indirect costs to the facility.

7. To formulate a cost-outcome analysis model that includes each of the alternatives selected.

8. To evaluate results and make recommendations based on

the cost-outcome analysis model to determine if a government cost savings can be realized by developing a Military-Civilian Health Services Partnership agreement.

9. To evaluate the transportability of the model to other services within the MTF and the Military Health Care System.

10. To recommend possible areas for further study.

Criteria

The decision to select one alternative over other possibilities will be based on the cost benefit analysis ratio methodology findings which yield not only the least cost approach to service provision but also that alternative which demonstrates the most acceptable approach to the system in which it would be implemented. To select the least cost alternative without consideration of the organization's ability to effect that alternative may result in failure in implementation due to unknown or known barriers within the system. The decision analysis must therefore recognize potential implementation difficulties that would affect the selection process.

Assumptions

Methods for developing cost estimates for the alternatives selected are assumed to accurately reflect cost relationships, as reflected in the discussion that follows.

Limitations

A successful conduct of this study will be affected by the

following limitations:

1. Financial cost data, whether defined or projected, include both the CHAMPUS and MEPRS data bases. Internally derived MEPRS data is subject to variability in emphasis on accuracy in reporting from period to period. These include personnel changes and the amount of available time to collect necessary input data. CHAMPUS cost data is, in like manner, subject to reporting variances from one fiscal intermediary to another. No standardized collection procedure (computerized model) is required for all fiscal intermediaries. OCHAMPUS must therefore convert the data received from all regions into a standard report format. Additionally, delays in reporting of all transactions that occurred within any specified reporting period can cause inaccuracy in data. For purposes of this study, this data will be accepted as a reasonably accurate reflection of the actual costs of service provision.

2. Findings of this study may not be generalizable to other populations or facilities due to variability in user patterns, service availability and non-military provider availability to perform those services.

Review of Literature

A thorough literature review is essential to any research study. This review will center on effective decision making among alternatives. Specifically, the area of cost-outcome analysis will be explored.

Decision making, according to Koontz, O'Donnell, and

Weihrich entails, ". . . the selection from among alternatives of a course of action" (238). The steps in that decision making process, of necessity, include the following:

1. Known goals and clear planning premises.
2. The development of alternatives.
3. Evaluation and selection from among the alternatives based on quantitative and nonquantitative criteria (Koontz, et. al., 239 - 242).

Point three is very important to this decision process where costs and outcomes are concerned. Denton and Smith confirm this point in the following:

> Treating costs without consideration of outcomes results in knowing which of several alternatives are least expensive, without knowing whether any of them produce the desired outcomes. Treating outcomes without attention to costs can result in selecting program alternatives that are only marginally more effective, but exorbitantly more expensive than other alternatives. Only by incorporating both costs and outcomes within comparative studies of program alternatives can one reliably determine which alternative is most effective for a given cost or how much it would cost to obtain a desired level of effect. (2)

This excellent summation of the need for a cost and outcome duality for decision making is well supported in the literature

(Rowland and Rowland, 255 - 264; Bittel and Ramsey, 201 - 203; Navaratnam, Hillison and Oliver, 3 - 5).

Three primary techniques are most often used to combine the components of cost and outcome: cost utility analysis, cost benefit analysis, and cost effectiveness analysis.

Cost Utility Analysis

"Cost-utility analysis compares the costs of programs to outcomes which have been estimated" (Smith, 8). Denton and Smith further refine this definition by stating, "Cost-utility analysis involves the subjective measure of probable outcomes" (3). A utility measure is then, ". . . combined with cost data to form a cost-utility ratio. A rank ordering of cost-utility ratios for two or more programs will indicate which program has more utility relative to its costs" (Smith, 9). Outcome measures can be unidimensional or multidimensional (Smith, 9) and can integrate multiple outcome measures into a single value (Denton and Smith, 3).

Cost utility analysis does, however, have limitations. "Utility is a measure of human value; consequently, estimates of program outcomes are more likely to reflect personal biases than actual program functioning" (Smith, 10). Denton and Smith add, ". . . because the measures and analysis are highly subjective, the results are generally not replicable" (3). To assure the highest level of validity and reliability of the data used in cost utility analysis, Levine (1983) suggests that utility ratings be formulated by those who will be most affected by changes brought about by the analysis and especially the use of

group, as opposed to individual, ratings.

Cost utility analysis is an effective tool for planning at the administrative level (Smith, Denton and Smith) but ". . . provides a weak basis for making programmatic decisions" (Smith, 3).

Cost Benefit Analysis

Cost benefit analysis is an alternative approach to comparing costs and outcomes. Denton and Smith supply a very concise statement concerning this approach.

> Cost-benefit analysis provides replicable results and enables one not only to compare alternatives for a given program, but to compare across programs which have different classes of outcomes. Because all outcomes are expressed in terms of dollar benefit, one can compare reading programs with counseling programs with athletic programs. (3)

In the cost benefit analysis approach, "There is a need to relate inputs and outputs in terms of dollars" (Navaratnam, Hillison, Oliver, 3). Rowland and Rowland additionally identify five sequential steps that must occur with cost benefit analysis in the health care arena:

1. Articulation of a clear, unambiguous statement of the decision faced and objectives sought by the health planner;
2. Identification of alternative actions or programs that satisfy stated objectives;

3. Identification separately of the costs and benefits associated with the proposed undertaking and each alternative action;

4. Quantitative evaluation of all costs incurred and benefits returned for each action;

5. Comparison of alternatives against explicit decision criteria to yield the preferred program. (254)

The major disadvantage with the use of the cost benefit model is the difficulty encountered in assigning monetary values to outcomes (Denton and Smith, 3; Smith, 16; Navaratnam, et. al., 5; Levin and Seidman, 5; Bittel and Ramsey, 201). Denton and Smith further state, '. . . it is frequently very difficult to assign monetary values to program outcomes. Since any dollar value assigned to such outcomes as increased music appreciation, reading comprehension, self-confidence, and computer literacy are highly questionable, cost-benefit studies frequently have little credibility with local administrators' (3).

Validity and reliability of benefit measures, and whether or not they accurately reflect the function of a program is a problem. Smith evaluates this problem by emphasizing that, '. . . the evaluator should have confirmed with the decision makers that the measure would be meaningful. . . . If it is meaningful, then the evaluator should examine the methods . . . and consider the possibility of systematic biases which may affect responses' (20).

Evaluation using the cost benefit method includes

calculation of a cost benefit ratio where total program cost is compared to total program benefit (Smith, 20). The cost benefit ratio is interpreted as the cost associated with producing $1.00 (or other sum) in benefit.

Cost Effectiveness Analysis

"Cost-effectiveness analysis compares the cost of a program to outcomes measured in units of effectiveness. Analysis of effectiveness data can be used formatively to improve program functioning, or summatively to make programmatic decisions" (Smith, 21).

Limitations do exist in using the cost effectiveness approach. "Because one does not convert all outcomes to the same unit (dollars) one cannot use cost-effectiveness analysis to compare across programs (e.g., to compare reading programs to athletic programs)" (Smith, 3).

Validity and reliability problems associated with cost effectiveness analysis are many. Reliability, or the stability of the outcome measure, should rely on aggregated data to avoid spurious results (Smith, 23). Validity, or the relationship between program implementation and the outcome, has many variables that could affect whether the outcome measure accurately represents program effectiveness (Smith, 24). Smith has summarized these well in an example of a pre and post reading test administration. These variables can include stability of the test group (movement into and out of the group by students), similarity or dissimilarity of comparison groups,

test difficulty (too easy or too hard for the group in the study), recall of the previous pretest, and outside distractors (24).

As with other evaluation models, cost effectiveness analysis uses the cost effectiveness ratio for decision making. This ratio can be interpreted as the ". . . cost to produce one unit of effectiveness" (Smith, 25).

The review of the literature presented above, makes clear that the proper selection of a cost outcome analysis model for use in evaluation of a program must include consideration of the outcome wanting to be measured. Without close and careful analysis of the parameters of the outcome measure desired, much effort will be wasted with little or no gains realized.

Research Methodology

1. The cost model for the Nuclear Medicine and Radioimmunoassay services must include all direct and indirect costs of producing all services within the department. Based on that total departmental cost, individual element of service costs will be formulated using a weighted value methodology. The Manpower Expense and Personnel Reporting System (MEPRS) is currently used by Health Services Command to allocate both direct and indirect costs of services.

Berman and Weeks define this cost finding approach as, ". . . the process of allocating all costs of operating the hospital to cost centers of departments which produce revenue" (124). The footnote to this statement further defines "all

costs as, ". . . including salaries, supplies, and other expenses of doing business, including depreciation" (124). This approach is well supported in the literature by both Donald Beck and Malcom MacEachern.

MEPRS data uses a system that is consistent with this philosophy. Using a step down approach, costs from non-revenue producing hospital areas and general costs of operating the physical plant are stepped down to other non-revenue and revenue producing services. For purposes of the military direct health care system, revenue centers are identified as direct and indirect patient care centers and non-revenue centers as non-direct patient care centers. Terminology is changed due to military health care centers being prohibited from selling or charging for services.

Step down allocation in the MEPRS system follows generally accepted accounting principles for cost allocation by this method. Data used from Ireland Army Community Hospital for this research was unfortunately aggregated into one expense category covering both services. To more accurately reflect actual individual service costs, a variety of approaches will be used to separate individual elements of resource.

For clarity, depreciation expense for all hospital elements is aggregated and stepped down based upon square footage. Actual direct depreciation for this department is higher than allocated depreciation due to the number of high cost technological pieces of instrumentation contained in the clinic. Depreciation as allocated by MEPRS understates this amount due to the allocation

method. Because total depreciation expense is allocated over all services, this discrepancy can be disregarded. To separate depreciation into individual Nuclear Medicine and Radioimmunoassay services, the departmental totals will be pro-rated according to workload. Janitorial services are also not reflective of actual costs for the department as they are also expensed according to square footage.

Certain expenses of operation are not directly accounted for in the MEPRS entry system and must be individually adjusted at the end of each reporting period. For the Nuclear Medicine Department, one such required adjustment is for non-scheduled biomedical maintenance services and preventive maintenance checks. These costs are individually entered at the end of each month to assure actual costs associated with the department are properly expensed. Other general biomedical overhead costs of operation are expensed across all applicable departments using the standard step down methodology.

Personnel costs, as appropriate, are apportioned according to reported percentage of time each employee worked in either service. Similarly, non-contractual supply and overhead operating costs are apportioned relative to workload. The resulting allocation more accurately reflects the total resource use by separate missions.

Subsequent to developing individual service cost totals, individual episode of service costs will be calculated for each type of procedure offered. This is necessary as any later

comparison with an alternative mode of service delivery would cost that purchase on a fee-for-service basis. A weighted value unit system from the MEPRS model will be used to determine these costs. Information on how these weighted value units were formulated is in Appendix A.

Total weighted value units of service will be divided into total MEPRS derived service cost to determine the monetary value of one weighted value unit. This value will in turn be multiplied by the total weighted value units for a singular service procedure to ascertain the total cost associated with all services of this type. That figure would then represent what portion of the total service cost is represented by that service type. Division of this value by the number of that type services performed over the period indicated would yield the individual element of service cost for that service type. The results would then be comparable to solicited figures from services outside the facility to determine if alternatives were higher or lower in price than the internal value.

The results of these two operations will then be portrayed in a matrix to form a model from which comparison with alternatives can be made. Data in the matrix will be based upon calendar year 1987 procedures.

Adjustments to salary costs due to year-end salary increases will be made to accurately reflect personnel costs. Calendar year 1987 was a necessary choice over most current data due to implementation of the Composite Health Care System

computer system that has hampered the reporting structure parameters to the MEPRS database. Although changes are minor, discrepancies in start-up have required considerable adjustment for uncaptured workload. To avoid this problem, the period selected will include a minimum of these discrepancy periods where necessary hand tabulation from duplicate workload accounting systems needs to be done.

2. Three alternatives have been chosen from currently available, military-accepted alternatives. These include:

a. Closing the service and purchasing care exclusively from the civilian health care market is a possible choice. Active duty patients would have their service purchased through supplemental care funds of the military hospital. Non-active duty patients would be referred to civilian health care sources for care under the existing CHAMPUS cost-sharing program or, as appropriate, under Medicare or Medicaid.

b. The Military-Civilian Health Services Partnership Program will be the second alternative. Under this program, an individual provider agreement could be formed as previously described in this research. Payment for services would be from both CHAMPUS for eligible beneficiaries and supplemental care funds of the facility for both active duty and other non-CHAMPUS eligible beneficiaries.

c. The third alternative will be to form a fixed-price contract with a provider for services within the facility using tne currently available army personnel and equipment. Payment

for services would be from a central contracting fund of Health Services Command.

3. A cost model for each of the alternatives will be formulated based upon the model developed for internal procedure costs to permit comparison based upon individual episodes of care for the calendar year 1987 base period.

One problem is evident with this method of comparison. Transportation costs to other facilities, lost work time increases, and cost of inconvenience should be included to fully represent the cost of an alternative. For purposes of this research, and because of the difficulty to accurately reflect those figures, these costs will not be included in the total costs of providing a service alternative. Their potential influence, however, will be taken into account during discussion of the findings of the analysis.

4. Since cost is the unit of measure being developed for each alternative, a cost-benefit analysis matrix will be constructed comprising all alternatives, including the current cost of service with the military provider. For each alternative, a cost-benefit ratio will be calculated. The cost-benefit ratio will define the cost associated with producing one unit of benefit. That ratio that demonstrates the greatest benefit for the least proportionate expenditure of funds would therefore be the most preferred.

5. Analysis of the cost-benefit ratios will be used to determine if the Military-Civilian Health Services Partnership Program can be viewed as a viable alternative for providing

Nuclear Medicine and Radioimmunoassay services to beneficiaries presenting for services.

6. An assessment of the transportability of this analysis model to other services within the facility will be presented with recommendations for further study and refinement of the model developed.

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CHAPTER 2

Discussion and Findings

Constructing Workload Data

Collecting workload data for one year was difficult. Recent implementation of a new Composite Health Care System (CHCS) computer has changed the workload accounting method for the Nuclear Medicine service. Problems in extracting that data were a continuing problem and automated reports are not possible until software updates are finalized. Workload accounting was, therefore, based upon continuing hand tabulation records from the service.

Calendar year 1987 provided the most complete and least affected time period for purposes of this study. Nuclear Medicine workload figures at Table 4, checked against hand recording methods still in use, were determined to be accurate. Radioimmunoassay test workload, however, showed a very erratic pattern. Thyroid function testing always includes five components at Ireland Army Community Hospital. Table 5 indicates a consistently high number of T-7 tests on months that show consistency on the other four elements of this test. Other months (April, May and June) were very erratic and showed no pattern for thyroid function testing. It was noted that during these months, hardware for the CHCS computer system was being installed in the service and could have caused inconsistency in recording of data. September and October data required complete reliance on hand recorded data as this period was the time of conversion to the new CHCS software reporting system. One

Table 4: Workload Statistics for Nuclear Medicine Service for Calander Year 1987

Procedure	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Brain	5	1	4	2	3	3	0	1	2	1	1	1	24
Bone	117	169	172	167	132	141	119	113	150	159	152	124	1715
Liver-Spleen	8	12	7	9	7	5	6	14	5	13	12	12	110
Renal	10	9	19	8	7	8	15	8	7	9	7	7	114
Renal Reflux	4	2	1	0	0	0	0	2	0	0	1	0	10
Profusion Lung	2	3	2	8	5	2	1	1	0	2	0	0	26
Ventilation Lung	2	3	2	7	5	2	1	1	0	2	0	0	25
DISIDA Gallbladder	3	1	1	0	1	1	1	2	4	2	1	4	21
Meckl's Scan	0	0	0	0	0	0	0	0	0	1	0	0	1
Gastric Reflux	0	0	0	0	0	0	0	1	0	1	0	0	2
I-123 Thyroid	11	3	5	9	9	7	10	7	9	11	7	14	102
Thyroid Uptake	11	3	5	9	9	7	10	7	9	11	7	12	100
Rest MUGA	8	6	8	10	6	5	9	13	13	20	0	12	110
Stress MUGA	1	0	1	0	2	0	0	0	0	2	0	0	6
IM Infarct	3	0	1	2	0	0	1	0	0	0	0	0	7
Cardiac Shunt	0	0	0	0	6	5	9	13	13	20	0	12	78
Thallium	12	13	14	20	10	9	3	14	11	20	3	17	156
Testicular	2	1	0	9	1	0	2	1	1	1	0	0	18
Gallium	5	3	12	1	4	2	12	16	19	13	3	10	100
I-131 Whole Body	0	0	2	1	1	0	0	0	0	0	0	1	5
I-131 >30mCI	0	0	0	1	0	0	0	0	0	0	0	0	1
I-131 <30mCI	5	0	0	0	0	0	1	0	0	1	0	0	7
Labelled WBC	4	0	1	0	0	0	1	3	5	0	0	1	15
Dacryocystogram	0	0	0	0	0	1	0	0	0	0	0	0	1
	213	229	257	263	208	198	201	217	248	289	204	227	2754

Table 5: Uncorrected Workload Statistics for the Radioimmunoassay Laboratory for Calander Year 1987

Procedure	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Schillings Test	0	0	0	0	2	0	0	1	2	2	1	0	8
Blood Volume	0	0	0	1	0	0	0	0	1	0	0	0	2
TSH	187	299	266	260	230	162	236	192	244	245	396	218	2935
T-3 Uptake	187	299	266	407	244	247	236	192	269	269	396	218	3230
T-4	187	299	266	295	263	246	236	192	259	260	396	218	3117
T-7	257	389	346	570	324	336	316	262	365	365	486	278	4294
T-4 Free	0	0	266	295	266	246	236	192	264	264	396	218	2643
B-HCG Quant.	32	32	32	32	32	32	32	32	32	32	32	32	384
B-HCG Qual.	250	250	250	250	250	250	250	250	250	250	250	250	3000
PAP	0	38	11	0	36	0	0	0	60	61	0	0	206
	1100	1606	1703	2110	1647	1519	1542	1313	1746	1748	2353	1432	19819

Table 6: Corrected Workload Statistics for the Radioimmunoassay Laboratory for Calander Year 1987

Procedure	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Schillings Test	0	0	0	0	2	0	0	1	2	2	1	0	8
Blood Volume	0	0	0	1	0	0	0	0	1	0	0	0	2
TSH	187	299	266	295	263	246	236	192	116	117	396	218	2831
T-3 Uptake	187	299	266	295	263	246	236	192	116	117	396	218	2831
T-4	187	299	266	295	263	246	236	192	116	117	396	218	2831
T-7	187	299	266	295	263	246	236	192	116	117	396	218	2831
T-4 Free	187	299	266	295	263	246	236	192	116	117	396	218	2831
B-HCG Quant.	32	32	32	32	32	32	32	32	32	33	32	32	385
B-HCG Qual.	250	250	250	250	250	250	250	250	249	249	250	250	2998
PAP	0	38	11	0	36	0	0	0	60	61	0	0	206
	1217	1815	1623	1758	1635	1512	1462	1243	924	930	2263	1372	17754

additional reason for these errors could have been due to inconsistency of operators during this time-frame. Upon checking actual hand entries it was found that, depending upon the operator, control samples may or may not have been counted as actual patient test samples analyzed.

As a result of the CHCS distractors and inconsistent entry of tests completed, a hand search was initiated to correct the errors. Table 6 shows the results of that process.

One additional problem was encountered with Beta HCG tests. There are two types of tests that can be run: qualitative or quantitative. MEPRS database reporting requirements do not differentiate between these tests. The requirements for personnel time and test kit costs for the two separate tests are, however, quite different. A qualitative test requires a single dilution and test kit. A quantitative test requires a much more extensive, more costly procedure in terms of operator time and test kit cost. Additionally, the MEPRS data instructions allot a value of 2 for every test of this type, causing workload to be doubled in the database. To correct these problems, the actual test logs were searched to acquire not only the yearly total of quantitative and qualitative tests performed, but also to determine the exact number of individual patient test requests performed. In doing so, control samples were eliminated from the totals and errors in reporting were corrected.

To correct the data for these identified problems, HCG tests were averaged over the entire year from the total derived

and separated into quantitative and qualitative types. Corrected results are shown in Table 6. All subsequent tabulations will be based on workload totals from tables 4 and 6.

Constructing Service Cost Data

MEPRS data for the period 1 January to 31 December 1987 was used to establish the cost of operations for the service. MEPRS data does not separate total costs by service, therefore, a model of costs by service needed to be constructed. Table 7 shows the results of that process.

Contractual supply costs and total travel costs were calculated directly from purchase orders and applied to their respective services. Personnel apportionment was accomplished from reported percentages of time in one or the other services to the MEPRS database with the singular exception of other personnel costs for Radioimmunoassay. Costs for this category were based on the salary associated with a military grade E-5 with six years of government service. This technician performed in the service for the bulk of the data base year. This salary rate is, therefore, unique to this service. All other categories were apportioned according to the workload generated within the services: 66% of workload for Radioimmunoassay and 34% of workload for Nuclear Medicine. The totals of each service indicated the amount of resource associated with operations over a one year time frame. These totals, since they use known current costs for calculations,

TABLE 7: Aggregated Facility Costs of Operation for the Nuclear Medicine and Radioimmunoassay Services for the Calendar Year 1987 Period

	TOTAL DEPARTMENT COSTS		RADIOIMMUNOASSAY COSTS		NUCLEAR MEDICINE COSTS	
CONTRACTUAL SUPPLY	74,305.00		22,394.00		51,911.00	
OTHER SUPPLY	20,332.00		13,419.12 (1)		6,912.88 (2)	
TOTAL		94,637.00		35,813.12		58,823.88
BASOPS		15,298.00		10,096.68 (1)		5,201.32 (2)
TRAVEL		0.00		0.00		0.00
PERSONNEL						
PHYSICIAN	69,799.25		27,919.70 (3)		41,879.55 (3)	
OTHER	148,991.75		18,424.36 (4)		130,567.39	
TOTAL		218,791.00		46,344.06		172,446.94
DEPRECIATION		63,680.00		42,028.80 (1)		21,651.20 (2)
LOCAL MAINT.		2,398.00		1,582.68 (1)		815.32 (2)
		$394,804.00		$135,865.34		$258,938.66

(1) : Indicates a 66% allocation of total Element of Resource to the service. (MEPRS data)
(2) : Indicates a 34% allocation of total Element of resource to the service. (MEPRS data)
(3) : Physician time split 40% RIA lab, 60% Nuclear Medicine Lab. (MEPRS data)
(4) : Based on salary for one E-5 at 6 years service.

also account for fluctuations in supply processing, inflation, and increased salary costs for personnel from one fiscal year to the next.

It is important to note that the contracted supply cost for nuclear medicine is quite low for the level of services offered. Ireland Army Community Hospital, unlike any other hospital in the state of Kentucky, operates its own radionuclide generator laboratory. This singular service reduces the purchase cost of unit dose radionuclides by some 80%. This is accomplished by calculating the number of doses available for one type of scanning procedure. In some cases, as many as 12 to 20 scans can be accomplished from one radionuclide generation. By grouping patient scan requests on specified days, maximum use of the radionuclide can be made, thus dramatically reducing the per test cost of the dose. As an example, the test kit for a liver-spleen scan costs an average of $120.00 per kit. Up to 16 test doses can be generated from one kit. By grouping patients on a singular test day, per dose costs have been dramatically reduced. In contrast, unit dose purchase prices for this same radionuclide, when procured from civilian sources, run $52.00 per dose.

Internal Episode of Service Cost Calculation

Internal episode of service cost calculations for the Nuclear Medicine and Radioimmunoassay services can be found in Tables 8 and 9. Some problems were encountered in the Nuclear Medicine service with this process due to individual

Table 8: Internal Cost Per Episode of Care - Nuclear Medicine Service
Using MEPRS Weighted Values (WVU) and CY 87 Workload
Ireland Army Community Hospital, Fort Knox, Kentucky

Nuclear Medicine Procedure	CY 87 Total Tests	WVU Per Proc.	Total WVU All Proc. (1)	Cost Per WVU (2)	Per Proc. Cost (3)	Combined Procedure Analysis Cost (4)	Dollar Total All Procedures (5)
Brain	24	75	1,800	0.87	65.25		1,566.00
Bone	1715	100	171,500	0.87	87.00		149,205.00
Liver-Spleen	110	45	4,950	0.87	39.15		4,306.50
Renal	114	30	3,420	0.87	26.10	65.25	7,438.50
Renal Reflux	10	40	400	0.87	34.80		348.00
Profusion Lung	26	60	1,560	0.87	52.20		1,357.20
Ventilation Lung	25	30	750	0.87	26.10		652.50
DISIDA Gallbladder	21	75	1,575	0.87	65.25		1,370.25
Meckl's Scan	1	60	60	0.87	52.20		52.20
Gastric Reflux	2	45	90	0.87	39.15		78.30
I-123 Thyroid	102	30	3,060	0.87	26.10		2,662.20
Thyroid Uptake	100	40	4,000	0.87	34.80		3,480.00
Rest MUGA	110	60	6,600	0.87	52.20	208.80	22,968.00
Stress MUGA	6	90	540	0.87	78.30	234.90	1,409.40
MI Infarct	7	30	210	0.87	26.10	182.70	1,278.90
Cardiac Shunt	78	60	4,680	0.87	52.20	208.80	16,286.40
Thallium	156	90	14,040	0.87	78.30	234.90	36,644.40
Testicular	18	30	540	0.87	26.10		469.80
Gallium	100	60	6,000	0.87	52.20		5,220.00
I-131 Whole Body	5	60	300	0.87	52.20		261.00
I-131 >30mCI	1	120	120	0.87	104.40		104.40
I-131 <30mCI	7	40	280	0.87	34.80		243.60
Labeled WBC	15	60	900	0.87	52.20		783.00
Dacryocystogram	1	60	60	0.87	52.20		52.20
Cardiac Analysis	357	180	64,260	0.87	156.60		N/A
Renal Analysis	114	45	5,130	0.87	39.15		N/A
			296,825				$258,237.75

(1) = CY 87 Total Tests * WVU per Procedure.
(2) = $258,939 (Table 7) / 296,825 (Tot. WVU) = $0.8723 per WVU.
(3) = WVU Per Procedure * Cost Per WVU.
(4) = Renal and Cardiac Analysis cost added to procedure cost.
(5) = CY 87 Total Tests * Total Per Procedure Cost.

Table 9: Internal Cost Per Episode of Care - Radioimmunoassay Lab
Using MEPRS Weighted Values (WVU) and CY 87 Workload
Ireland Army Community Hospital, Fort Knox, Kentucky

RIA Procedures	CY 87 Total Tests	WVU Per Proc.	Total WVU All Proc. (1)	Cost Per WVU (2)	Per Proc. Cost (3)	Direct Supply Cost / Proc. (4)	Total Per Proc. Cost (5)	Dollar Total All Procedures (6)
Shillings Test	8	60	480	0.51	30.60	0.58	31.18	249.44
Blood Volume	2	80	160	0.51	40.80	0.78	41.58	83.16
TSH	2831	12	33972	0.51	6.12	2.08	8.20	23,214.20
T-3	2831	8	22648	0.51	4.08	0.86	4.94	13,985.14
T-4	2831	10	28310	0.51	5.10	0.92	6.02	17,042.62
T-7	2831	3	8493	0.51	1.53	0.03	1.56	4,416.36
T-4 Free	2831	20	56620	0.51	10.20	0.19	10.39	29,414.09
B-HCG Quant.	385	60	23100	0.51	30.60	5.60	36.20	13,937.00
B-HCG Qual.	2998	15	44970	0.51	7.65	2.24	9.89	29,650.22
PAP	206	20	4120	0.51	10.20	9.50	19.70	4,058.20
			222,873					$136,050.43

(1) = CY 87 Total Tests * WVU per Procedure.
(2) = [$135,865 (Table 7) - $22,394 (Direct Supply)] / 222,873 (Tot. WVU)
(3) = WVU Per Procedure * Cost Per WVU.
(4) = Locally derived figures from Direct Supply Costs (Table 7).
Cost per procedure includes an added amount to account for waste.
(5) = Per Procedure Cost + Direct Supply Cost per Procedure.
(6) = CY 87 Total Tests * Total Per Procedure Cost.

test requirements. Test requirements differ markedly not only between type but from patient to patient for the same test. As an example, a limited bone scan would require no more than three hours for the average negative finding. Bone scans that show impressionable areas on a whole body scan, however, may require one to six sites to be rescanned for localization and determination of results. There are no statistics currently kept to separate which of the historical workload required additional processing. Another problem occurs with Gallium scans. This test requires several days and multiple serial pictures to be taken for an accurate results determination.

To overcome these problems, it was determined that cost averaging over all tests of a singular type would yield an appropriate average cost per test. Though some studies may have their costs somewhat overstated, in like manner the more complex tests of the same type would be understated. Table 7 results and calculations (where appropriate) were based on this averaging principle.

Table 9 (Radioimmunoassay) also required some adjustments to more accurately reflect the per episode care costs. Known direct supply costs for this service (Table 7) were deducted during initial per procedure cost calculations because of the high cost of test kits for some of the procedures. After per procedure costs were calculated, direct supply costs were then added to the totals to more accurately reflect true costs.

MEPRS weighted values were used for determining the per procedure cost for both services. By dividing the total

service cost from Table 7 by the calculated total of all weighted value units, the cost per weighted value unit was determined. Subsequent manipulations using this derived value then yielded the per procedure cost, yearly total cost of a procedure, and ultimately a yearly total cost for all procedures performed. Yearly combined totals from Tables 8 and 9 should closely approximate the Table 7 figures. Some variance did occur due to rounding to the second decimal place.

One additional manipulation was performed after individual episode costs were calculated. The last two Nuclear Medicine procedures, Cardiac Analysis and Renal Analysis (Table 8), are separately captured procedures, reflecting work accomplished for renal and cardiac related scans. Prior to dollar totaling all procedures for Table 8, these costs were combined with their appropriate tests to more accurately reflect the per episode cost. This combined cost will be more appropriate for later comparison with alternative delivery modes.

Formulation of a Standardized Cost Matrix

To compare internal costs to the cost of alternatives first required that data be properly defined. Calendar year 1987 total tests contained both a CHAMPUS and a non-CHAMPUS eligible patient population. The subject of this research being a CHAMPUS authorized program required that only CHAMPUS eligible patient procedures be incorporated into the matrix. The CHAMPUS eligible population included only those patients who were family members of an active duty sponsor, were retired

active duty personnel, were family members of retired active duty personnel still eligible for care within the military direct health care system, or were surviving members of deceased active duty military and their family members still eligible for care in the military direct health care system. The non-CHAMPUS eligible population included previous military direct health care beneficiaries who had attained Medicare eligibility age and active duty military members.

Witnin the 24 nuclear medicine procedure categories provided in calendar year 1987, a total of 2754 tests were performed. Hand tabulation was undertaken to determine the total CHAMPUS eligible portion of each procedure category. Only 16 categories yielded usable results. The remaining eight of the 24 categories could not be tabulated with accuracy as to the CHAMPUS eligibility of the patient. Because the usable portion of the data set encompassed 98% of the total 2754 tests performed, it was determined that the sample size was sufficient to accurately reflect a total cost impact on the service. The resulting 16 Nuclear Medicine test matrix was constructed for use as the basis of the matrix construction for all alternatives (Table 8A). Further breakdown of the information was accomplished to separate CHAMPUS and Non-CHAMPUS eligible beneficiaries. Only those procedures performed on CHAMPUS eligible beneficiaries in calendar year 1987 were included under total CY procedures performed. This was felt to be appropriate since it was a CHAMPUS payment program that was the subject of consideration for this research. Standardization of matrix

Table 8A: Standardized Matrix - CHAMPUS Eligible Procedures Only
Internal Cost Per Episode of Care - Nuclear Medicine Service
Using MEPRS Weighted Values (WVU) and CY 87 Workload
Ireland Army Community Hospital, Fort Knox, Kentucky

Nuclear Medicine Procedure	CY 87 CHAMPUS Total Tests	WVU Per Proc.	Total WVU All Proc. (1)	Cost Per WVU (2)	Per Proc. Cost (3)	Dollar Total All Procedures (4)
Brain	12	75	900	0.87	65.25	783.00
Bone	686	100	68,600	0.87	87.00	59,682.00
Liver-Spleen	70	45	3,150	0.87	39.15	2,740.50
Renal w/anal.	76	30	2,280	0.87	65.25	4,959.00
Profusion Lung	13	60	780	0.87	52.20	678.60
Ventilation Lung	13	30	390	0.87	26.10	339.30
DISIDA Gallbladder	14	75	1,050	0.87	65.25	913.50
I-123 Thyroid	58	30	1,740	0.87	26.10	1,513.80
Thyroid Uptake	57	40	2,280	0.87	34.80	1,983.60
Rest MUGA w/anal.	58	60	3,480	0.87	208.80	12,110.40
Stress MUGA w/anal.	3	90	270	0.87	234.90	704.70
MI Infarct w/anal.	5	30	150	0.87	182.70	913.50
Card. Shunt w/anal.	41	60	2,460	0.87	208.80	8,560.80
Thallium w/anal.	112	90	10,080	0.87	234.90	26,308.80
Testicular	15	30	450	0.87	26.10	391.50
Gallium	62	60	3,720	0.87	52.20	3,236.40
	1,295		101,780			$125,819.40

(1) = CY 87 Total Tests * WVU per Procedure.
(2) = $258,939 (Table 7) / 296,825 (Tot. WVU) = $0.8723 per WVU.
(3) = WVU Per Procedure * Cost Per WVU.
(4) = CY 87 Total Tests * Total Per Procedure Cost.

Table 9A: Standardized Matrix - CHAMPUS Eligible Procedures Only
Internal Cost Per Episode of Care - Radioimmunoassay (RIA)
Using MEPRS Weighted Values (WVU) and CY 87 Workload
Ireland Army Community Hospital, Fort Knox, Kentucky

RIA Procedures	CY 87 Total Tests	WVU Per Proc.	Total WVU All Proc. (1)	Cost Per WVU (2)	Per Proc. Cost (3)	Direct Supply Cost / Proc. (4)	Total Per Proc. Cost (5)	Dollar Total All Procedures (6)
Shillings Test	8	60	480	0.51	30.60	0.58	31.18	249.44
Blood Volume	2	80	160	0.51	40.80	0.78	41.58	83.16
TSH	2406	12	28872	0.51	6.12	2.08	8.20	19,729.20
T-3	2406	8	19248	0.51	4.08	0.86	4.94	11,885.64
T-4	2406	10	24060	0.51	5.10	0.92	6.02	14,484.12
T-7	2406	3	7218	0.51	1.53	0.03	1.56	3,753.36
T-4 Free	2406	20	48120	0.51	10.20	0.19	10.39	24,998.34
B-HCG Quant.	366	60	21960	0.51	30.60	5.60	36.20	13,249.20
B-HCG Qual.	2848	15	42720	0.51	7.65	2.24	9.89	28,166.72
			192,838					$116,599.18

(1) = CY 87 Total Tests * WVU per Procedure.
(2) = [$135,865 (Table 7) - $22,394 (Direct Supply)] / 222,873 (Tot. WVU)
(3) = WVU Per Procedure * Cost Per WVU.
(4) = Locally derived figures from Direct Supply Costs (Table 7).
Cost per procedure includes an added amount to account for waste.
(5) = Per Procedure Cost + Direct Supply Cost per Procedure.
(6) = CY 87 Total Tests * Total Per Procedure Cost.

construction and consideration of only CHAMPUS eligible workload will provide a common basis from which to calculate cost impacts in a comparable manner. Radioimmunoassay workload was treated in the same manner (Table 9A).

Calculating Alternative Costs

Of the three alternatives to be offered, two are CHAMPUS authorized programs. Some difficulty was encountered when attempting to determine the per episode reimbursement rates for some of the included procedures. Specifically, not all of the procedures had a CHAMPUS reimbursement rate established for the Kentucky region.

CHAMPUS establishes its reimbursement rates at the 80th percentile of billed charges received from a defined region. New technology or scarcity of test availability frequently makes it difficult to establish reimbursement rate. When available, calculated rates, based on CHAMPUS area weighted averages, were requested from OCHAMPUS. For those tests where not even a calculated rate could be determined, OCHAMPUS policy is that billed charges are usually paid. For purposes of this analysis, area average billed rates were surveyed from all facilities offering Nuclear Medicine services that would have the highest probability of being used by beneficiaries were the service unavailable within the military hospital. This encompassed all hospitals in the Elizabethtown and Louisville, Kentucky area. Elicited prices were then averaged to produce a surrogate local charge for the area. This surrogate service charge was used as an estimate of the CHAMPUS reimbursement rate when applicable.

It should be noted, however, that this surrogate charge was only for performance of the procedure. It did not include office visit fees or other hospital charges that may have applied.

Alternative 1: Eliminate Nuclear Medicine and Radioimmunoassay services from the direct health care facility.

Tables 10 and 11 represent the potential CHAMPUS cost, based upon historical workload, should Nuclear Medicine and Radioimmunoassay services be eliminated as an internal service department. Having constructed the standardized matrix, total CHAMPUS eligible workload was used to estimate the potential CHAMPUS cost at the full reimbursement rate. To determine this cost estimate required that potential procedure costs be adjusted according to current CHAMPUS policy.

This current CHAMPUS policy requires that each individual user of CHAMPUS pay a $50.00 fee deductable for the first claim in each fiscal year. Additionally, depending upon the type of service requested and the category of beneficiary, service costs must be cost shared between CHAMPUS and the requesting beneficiary. For ambulatory care services, this cost share is 20% of allowable service charges for active duty family members and 25% of allowable service charges for other qualifying beneficiaries. Inpatient service procedures are not cost shared for active duty family members but require a 25% cost share for other qualifying beneficiaries. For purposes of this research, since inpatient procedures performed during the base year comprised less than 2% of all test procedures, inpatient cost

Table 10: Alternative 1 - Elimination of Nuclear Medicine Internal Services
CY 87 CHAMPUS Workload - Actual/Surrogate Reimbursement Rates
Ireland Army Community Hospital, Fort Knox, Kentucky

Procedure	CY 87 CHAMPUS Total Proc.	Kentucky CHAMPUS Reimb. Rate (1)	Local Avg. Rates (2)	Total CHAMPUS Estimated Cost (3)	Estimated Total CHAMPUS Cost With Deduction (4)	Est. Per Proc. Cost (5)
Brain	12	369.75	299.00	4,437.00	2,973.68	247.81
Bone	686	321.44	387.00	220,507.84	144,311.08	210.37
Liver-Spleen	70	241.57	310.00	16,909.90	10,392.67	148.47
Renal w/anal.	76	305.66	220.00	23,230.16	15,058.37	198.14
Profusion Lung	13	163.58	300.00	2,126.54	1,144.32	88.02
Ventilation Lung	13	256.36	300.00	3,332.72	2,079.11	159.93
Disida Gallbladder	14	138.04	360.00	1,932.56	955.23	68.23
I-123 Thyroid Scan	58	168.61	240.00	9,779.38	5,331.52	91.92
Thyriod Uptake	57	115.00	200.00	6,555.00	2,871.38	50.38
Rest MUGA w/anal.	58	IC	450.00	26,100.00	17,980.00	310.00
Stress MUGA w/anal.	3	IC	450.00	1,350.00	930.00	310.00
MI Infarct w/anal.	5	IC	280.00	1,400.00	891.25	178.25
Card. Shunt w/anal.	41	327.94	525.00	13,445.54	8,831.54	215.40
Thallium w/anal.	112	IC	1100.00	123,200.00	91,140.00	813.75
Testicular	15	200.65	360.00	3,009.75	1,751.31	116.75
Gallium	62	394.40	500.00	24,452.80	16,548.42	266.91
				$481,769.19	$323,189.88	

(1) = Where no reimbursement rate established, calculated rates used. Individual Consideration (IC) procedures usually pay billed charges.
(2) = Local Average Rates from surrounding area to determine a surrogate figure for IC procedures under CHAMPUS Reimbursement Rate.
(3) = Multiplication of CHAMPUS or Local Avg. Rate by CY 87 Total Procedures.
(4) = Totals reflect a $50.00 deductable per test. Resulting total was split 50/50 with half having a 20% cost share deducted and the other half having a 25% cost share deducted. Grand total reflects the estimated total that CHAMPUS would have paid were these tests performed in the local community.
(5) = Est. Total CHAMPUS cost after deduction / CY 87 total procedures.

Table 11: Alternative 1 - Elimination of Radioimmunoassay Inte
CY 87 CHAMPUS Workload - Actual/Surrogate Reimbursem
Ireland Army Community Hospital, Fort Knox, Kentucky

Radioimmuno-assay Procedure	CY 87 CHAMPUS Elig. Proc.	Kentucky CHAMPUS Reimb. Rate (1)	Local Avg. Rate (2)	Total CHAMPUS Estimated Cost (3)	Estimated Total CHAMPUS Cost With Deductions (4)
Shillings Test	8	197.20	240.00	1,577.60	912.64
Blood Volume	2	IC	500.00	1,000.00	697.50
TSH	2406	56.00	17.96	134,736.00	205,111.50
T-3	2406	28.00	4.73	67,368.00	
T-4	2406	20.00	4.73	48,120.00	
T-7	2406	27.00	16.50	64,962.00	
T-4 Free	2406	29.00	11.25	69,774.00	
B-HCG Quant.	366	46.00	21.74	16,836.00	0.00
B-HCG Qual.	2848	40.00	21.74	113,920.00	0.00
					$206,721.64

(1) = Where no reimbursement rate established, calculated rates
Individual Consideration (IC) procedures usually pay bill
(2) = Local Average Rates from surrounding area to determine a
for IC procedures under CHAMPUS Reimbursement Rate. Pri
discounted rate from ICL Laboratories for other than Shi
volume test procedures.
(3) = CY87 total Proc. multiplied by CHAMPUS, Surrogate or ICL
(4) = Total Estimated CHAMPUS Cost less deductible and cost sha
(5) = Estimated Total CHAMPUS Cost with Deductions / CY 87 Tota

share differences were disregarded. Additionally, after tabulation, it was found that less than 4% of all patients had a repeat test run during the base year period. Therefore, to assist in standardizing calculations, all test procedures were considered as ambulatory care procedures, having a $50.00 deductible extracted, and used an assumption of 50% of total procedures requiring a 20% cost share and 50% requiring a 25% cost share.

Calculations using the preceeding criteria would yield the projected CHAMPUS government cost for the standardized procedure grouping based on Kentucky CHAMPUS reimbursement rates or surrogate procedure rates. Individual episode costs could then be calculated by dividing the resulting total cost of a category of test by the number of eligible procedures performed in that test group during the base year. Because current year procedure costs were used for calculation, the results generated were reflective of what current costs for this alternative would be, based on the workload generated during the current year.

One correction to the basic matrix needed to be performed in the Radioimmunoassay service (Table 11). The test procedures titled TSH, T-3, T-4, T-7, and T-4 Free are normally performed as a singular five component test. Because virtually all patients have all five studies run, deduction of the $50.00 yearly deductible from CHAMPUS charges would have to be calculated based on the singular five component test. To adjust for this problem, the costs associated with performing all five individual tests were aggregated before deductibles and patient

cost sharing were extracted. To maintain comparability across alternatives, this process was duplicated in all matrices constructed.

Alternative 2: Establishment of a Military - Civilian Health Services Partnership Agreement for physician care within the service.

Tables 12 and 13 represent the estimate of the potential cost impact to CHAMPUS should a Military - Civilian Health Services Partnership Agreement provider be used to provide Nuclear Medicine and Radioimmunoassay services from within the military direct care facility.

As discussed in the introduction to this research, a program of this type would eliminate the CHAMPUS $50.00 yearly deductible and cost share portion of medical expense to the patient. To offset these potential increases to overall CHAMPUS expense, a discounted rate per procedure can be negotiated with a provider.

In researching this alternative, it was found that Nuclear Medicine procedures have a dual component to the established CHAMPUS reimbursement rate. The first component, technical services, is the reimbursement rate calculated for compensation of all elements of a procedure except professional physician services. The second component then is the reimbursement rate for the physician charges. The average portion that each component contributes to the total procedure rate is 60% technical component and 40% professional component.

Table 12: Alternative 2 - Civilian / Military Health Services Partnership Program
CY 87 cHAMPUS Workload - Actual/Surrogate Reimbursement Rates
Ireland Army Community Hospital, Fort Knox, Kentucky

Procedure	CY 87 CHAMPUS Elig. Proc.	CHAMPUS Prof. Reimb. Rate / Svc. (1)	Local Prof. Reimb. Rate per svc. (2)	Est. Total CHAMPUS Cost (3)	Est. CHAMPUS Prof. Rate Discounted Cost (4)	Internal Govt. Cost per Proc. (5)	Total Internal Govt. Cost (6)	Total Combined Cost (7)	Est. Per Proc. Cost (8)
Brain	12	85.00	100.00	1,020.00	765.00	54.75	657.00	1,422.00	118.50
Bone	686	95.00	150.00	65,170.00	48,877.50	73.00	50,078.00	98,955.50	144.25
Liver-Spleen	70	74.00	85.00	5,180.00	3,885.00	32.85	2,299.50	6,184.50	88.35
Renal w/anal.	76	122.26	80.00	9,291.76	6,968.82	54.75	4,161.00	11,129.82	146.45
Profusion Lung	13	65.47	100.00	851.11	638.33	43.80	569.40	1,207.73	92.90
Ventilation Lung	13	102.54	100.00	1,333.02	999.77	21.90	284.70	1,284.47	98.81
Disida Gallbladder	14	57.00	110.00	798.00	598.50	54.75	766.50	1,365.00	97.50
I-123 Thyroid Scan	58	67.44	75.00	3,911.52	2,933.64	21.90	1,270.20	4,203.84	72.48
Thyriod Uptake	57	46.00	60.00	2,622.00	1,966.50	29.20	1,664.40	3,630.90	63.70
Rest MUGA w/anal.	58	IC	150.00	8,700.00	6,525.00	175.20	10,161.60	16,686.60	287.70
Stress MUGA w/anal	3	IC	150.00	450.00	337.50	197.10	591.30	928.80	309.60
MI Infarct w/anal.	5	IC	135.00	675.00	506.25	153.30	766.50	1,272.75	254.55
Card. Shunt w/anal	41	131.77	175.00	5,402.57	4,051.93	175.20	7,183.20	11,235.13	274.03
Thallium w/anal.	112	IC	450.00	50,400.00	37,800.00	197.10	22,075.20	59,875.20	534.60
Testicular	15	80.26	120.00	1,203.90	902.93	21.90	328.50	1,231.43	82.10
Gallium	62	157.76	130.00	9,781.12	7,335.84	43.80	2,715.60	10,051.44	162.12
				$166,790.00	$125,092.50		$105,572.60	$230,665.10	

(1) = Where no reimbursement rate established, calculated rates used. Individual Consideration (IC) procedures usually pay billed charges.
(2) = Local Average Rates from surrounding area to determine a surrogate figure for IC procedures under CHAMPUS Reimbursement Rate.
(3) = CY 87 CHAMPUS Elig. Proc multiplied by CHAMPUS or local surrogate Prof. Reimb. Rate.
(4) = 75% of Est. Total CHAMPUS Cost.
(5) = At $0.73 per Weighted Value Unit.
(6) = Internal Govt. Cost per Proc multiplied by CY 87 CHAMPUS Elig. Proc.
(7) = Est. CHAMPUS Prof. Rate Discounted Cost plus Total Internal Govt. Cost.
(8) = Combined Cost divided by CY 87 CHAMPUS Elig. Proc.

Table 13: Alternative 2 - Civilian / Military Health Services Partnership Program
CY 87 CHAMPUS Workload - Actual/Surrogate Reimbursement Rates
Ireland Army Community Hospital, Fort Knox, Kentucky

Radioimmuno-assay Procedure	CY 87 CHAMPUS Elig. Proc.	CHAMPUS 100% Prof. Rate (1)	Local Prof. Rate (2)	Est. CHAMPUS Total Cost (3)	Est. CHAMPUS Discounted Cost (4)	Internal Cost Per Proc. (5)	Total Internal Cost (6)	Total Combined Cost (7)	Per. Proc. Cost (8)
Shillings Test	8	78.88	90.00	631.04	126.21	28.80	230.40	356.61	44.58
Blood Volume	2	IC	100.00	200.00	40.00	38.40	76.80	116.80	58.40
TSH	2406	56.00	17.96	134,736.00	26,547.80	5.76	61,208.64	87,756.44	36.47
T-3	2406	28.00	4.73			3.84			
T-4	2406	20.00	4.73			4.80			
T-7	2406	27.00	16.50			1.44			
T-4 Free	2406	29.00	11.25			9.60			
B-HCG Quant.	366	46.00	21.74	16,836.00	3,367.20	28.80	10,540.80	13,908.00	38.00
B-HCG Qual.	2848	40.00	21.74	113,920.00	22,784.00	7.20	20,505.60	43,289.60	15.20
					$52,865.21		$92,562.24	$145,427.45	

(1) = Where no riembursement rate established, calculated rates used. Individual Consideration (ICO procedures usually pay billed charges.
(2) = Local Average Rates from surrounding area to determine a surrogate figure for IC procedures unde CHAMPUS Reimbursement Rate.
(3) = CY 87 CHAMPUS Elig. Proc. multiplied by CHAMPUS or local surrogate Prof. Reimb. Rate. 61208.
(4) = 20% of Est. Total CHAMPUS Cost.
(5) = At $0.48 per Weighted Value Unit.
(6) = Internal Govt. Cost per Proc. multiplied by CY 87 CHAMPUS Elig. Proc.
(7) = Est. CHAMPUS Prof. Rate Discounted Cost plus Total Internal Govt. Cost.
(8) = Combined Cost divided by CY 87 CHAMPUS Elig. Proc.

A partnership provider operating from within a military hospital facility would not have the personnel and overhead expenses associated with a private practice. Neither would an institutionally based practice need to have hospital-supplied overhead reimbursed. Therefore, a partnership proposal could concentrate on the professional reimbursement component, when negotiating a discounted CHAMPUS reimbursement rate, since the technical components of personnel and other overhead expense would be provided by the military treatment facility.

Radioimmunoassay procedures, except for the Shillings test and the Blood Volume determination, do not separate the technical and professional components. These procedures would require full cost reimbursement rates to be considered when negotiating a CHAMPUS discounted reimbursement rate.

Construction of the cost matrix for this alternative must include an additional step. Unlike alternative one, where internal costs of operation could be ignored due to closure of the service, this alternative must include these relevant costs if an accurate assessment of the total government cost impact is to be determined. To determine the impact of overhead costs on a per episode basis, the total overhead cost of internal operations for each service (Table 7) was recalculated to extract the physician cost component. The resulting totals were then divided by the total of all weighted value units from Tables 8 and 9 to determine an overhead cost per weighted value unit. This process yielded a $0.73 cost per weighted value unit for Nuclear Medicine and $0.48 for Radioimmunoassay. These

results were then multiplied by the total weighted value unit assigned to an individual episode of care to determine the portion of overhead applicable to any individual test procedure. Adding the physician per test cost to the overhead per test cost resulted in a total per procedure cost to the government. This procedure was consistent with the desire to insure all costs were included in the calculations.

For purposes of this matrix, a discounted rate of 75% of the professional component for Nuclear Medicine procedures and 20% of Radioimmunoassay procedures was suggested. To validate whether these discount rates were acceptable, three potential local applicants who would qualify for the position were queried. Two of the three found, after individual calculations, that these discount rates were acceptable, thus validating these rates as appropriate from the professional standpoint. Additionally, U.S. Army Health Services Command, CHAMPUS Branch, was queried as to the likelihood of these discount rates being acceptable for reimbursement. Although it was felt that total reimbursement was high, a proposal submitted at these rates would probably be approved. Having had these discounted rates validated, it was felt that their use was appropriate. The results displayed in Tables 12 and 13 are reflective of these discounting rates.

Alternative 3: Develop a fixed price professional services government contract for providing the service.

A non-CHAMPUS alternative was added to this research as a

control. It was felt that concentration on a single method for reimbursement might result in its favorable consideration while ignoring a variety of alternative approaches. It was hoped that by adding a non-CHAMPUS alternative, premature narrowing of the field could be avoided and outcome comparisons would have greater credibility.

Ample precedent has been set in the military direct health care system for contracting professional services. To establish a potential pricing range for this approach, the central contracting division of Fort Knox was contacted. After lengthy deliberation, a potential bid price of $250,000 was offered. Although this might appear to be an exorbitant salary, it is based upon the scarcity of this type provider in the health care market. To attract a fully credentialable medical doctor with the full range of capability to provide the desired services as well as the training and credentials to operate a radionuclide generator pharmacy would require appropriate compensation. The high bid price is, therefore, considered appropriate for this position.

Tables 14 and 15 display the calculation results for this alternative. Individual episode of service costs for this alternative are based upon the same matrix as all other alternatives. Additionally, as in alternative two, the overhead cost per episode of service was added to the provider reimbursement calculations to determine the full cost to provide the service.

Table 14: Alternative 3 - Fixed Price Contract for Nuclear Medicine Service
CY 87 Workload / Using MEPRS Weighted Value Units (WVU)
Ireland Army Community Hospital, Fort Knox, Kentucky

Procedure	CY 87 CHAMPUS Elig. Proc.	WVUs Per Proc.	Prof. Cost Per WVU (1)	Prof. Cost Per Proc. (2)	Internal Overhead Cost / Proc. (3)	Combined Per Proc. Cost (4)	Estimate Combined Full Year Cost (5)
Brain	12	75	0.51	38.25	54.75	93.00	1,116.00
Bone	686	100	0.51	51.00	73.00	124.00	85,064.00
Liver-Spleen	70	45	0.51	22.95	32.85	55.80	3,906.00
Renal w/anal.	76	75	0.51	38.25	21.90	60.15	4,571.40
Profusion Lung	13	60	0.51	30.60	43.80	74.40	967.20
Ventilation Lung	13	30	0.51	15.30	21.90	37.20	483.60
Disida Gallbladder	14	75	0.51	38.25	54.75	93.00	1,302.00
I-123 Thyroid Scan	58	30	0.51	15.30	21.90	37.20	2,157.60
Thyriod Uptake	57	40	0.51	20.40	29.20	49.60	2,827.20
Rest MUGA w/anal.	58	240	0.51	122.40	43.80	166.20	9,639.60
Stress MUGA w/anal.	3	270	0.51	137.70	65.70	203.40	610.20
MI Infarct w/anal.	5	210	0.51	107.10	21.90	129.00	645.00
Cardiac Shunt w/anal.	41	240	0.51	122.40	43.80	166.20	6,814.20
Thallium w/anal.	112	270	0.51	137.70	65.70	203.40	22,780.80
Testicular	15	30	0.51	15.30	21.90	37.20	558.00
Gallium	62	60	0.51	30.60	43.80	74.40	4,612.80
							$148,055.60

(1) = From MEPRS data, 34% of $250,000 contract price allocated to Nuclear Medicine.
(2) = 34% of $250,000 divided by total WVUs for Nuclear Medicine in CY 87.
(3) = Table 7 Nuclear Medicine internal cost less Physician personnel divided by total WVUs for Nuclear Medicine in CY 87. Result multiplied by WVU of one. procedure.
(4) = Internal overhead cost per procedure plus Professional Cost per procedure.
(5) = Per procedure combined cost multiplied by CY 87 CHAMPUS Eligible Procedures.

Table 15: Alternative 3 - Fixed Price Contract for Radioimmunoassay Service
CY 87 Workload / Using MEPRS Weighted Value Units (WVU)
Ireland Army Community Hospital, Fort Knox, Kentucky

Radioimmuno-assay Procedure	CY 87 CHAMPUS Elig. Proc.	Weight Value Per Proc.	Prof. Cost Per WVU (1)	Prof. Cost Per Proc. (2)	Internal Overhead Cost / Proc. (3)	Combined Cost Per Proc. (4)	Estimate Combined Full Year Cost (5)
Shillings Test	8	60	0.45	27.00	28.80	55.80	446.40
Blood Volume	2	80	0.45	36.00	38.40	74.40	148.80
TSH	2406	12	0.45	5.40	25.44	49.29	118,591.74
T-3	2406	8	0.45	3.60			
T-4	2406	10	0.45	4.50			
T-7	2406	3	0.45	1.35			
T-4 Free	2406	20	0.45	9.00			
B-HCG Quant.	366	60	0.45	27.00	28.80	55.80	20,422.80
B-HCG Qual.	2848	15	0.45	6.75	7.20	13.95	39,729.60
							$179,339.34

(1) = From MEPRS data, 66% of $250,000 contract price allocated to Radioimmunoassay.
(2) = 64% of $250,000 divided by total WVUs for Radioimmunoassay in CY 87.
(3) = Table 7 Radioimmunoassay internal cost less Physician personnel divided by total WVUs for Radioimmunoassay in CY 87. Result multiplied by WVU of one procedure.
(4) = Internal overhead cost per procedure plus Professional Cost per procedure.

To properly separate the amount of the contract price by service, allocation of the $250,000 provider reimbursement cost was apportioned in a 60%/40% manner consistent with the development of Table 7. Having apportioned the total cost allocated to each service, the resulting figure was divided by the total of all weighted values from Tables 8 and 9 to determine the portion of the total contract cost attributable to a singular weighted value unit. That result was then multiplied by the total weighted value of a singular procedure to determine the professional reimbursement represented by a single episode of service. Adding this result to the facility overhead cost per individual episode of service resulted in the total cost for providing one episode of service of any procedure type.

Aggregating Alternative Outcomes

The results of the calculations derived for each alternative are displayed in aggregate format in Table 16. This matrix permits comparison across programs not only on an individual element of service basis, but also on a total service and total program basis. Each program has been standardized by using a standard population from a singular historical base workload year of delivered service. With the singular exception of the full utilization of the civilian CHAMPUS alternative (two) all individual element of service prices are based on calculations using a weighted value cost of service.

Table 16: Aggregate Individual Episode, Total Service, and Total Program Cost Comparison Table (CY87 workload and FY 88 Pricing)

Nuclear Medicine Procedure	Current Program	Alt. 1 CHAMPUS Fee for Service	Alt. 2 CHAMPUS Partner Agreement	Alt. 3 Professional Services Contract
Brain	65.25	247.81	118.50	93.00
Bone	87.00	210.37	144.25	124.00
Liver-Spleen	39.15	148.47	88.35	55.80
Renal w/Anal.	65.25	198.14	146.45	60.15
Profusion Lung	52.20	88.02	92.90	74.40
Ventilation Lung	26.10	159.93	98.81	37.20
Gallbladder	65.25	68.23	97.50	93.00
I-123 Thyroid	26.10	91.92	72.48	37.20
Thyroid Uptake	34.80	50.38	63.70	49.60
Rest MUGA w/Anal.	208.80	310.00	287.70	166.20
Stress MUGA w/Anal.	234.90	310.00	309.60	203.40
MI Infarct w/Anal.	182.70	178.25	254.55	129.00
Cardiac Shunt w/Anal.	208.80	215.40	274.03	166.20
Thallium w/Anal.	234.90	813.75	534.60	203.40
Testicular	26.10	116.75	82.10	37.20
Gallium	52.20	266.91	162.12	74.40
Total Service Cost	$125,819.40	$323,189.87	$230,665.10	$148,055.60
Radioimmunoassay Procedure				
Shillings Test	31.18	114.08	44.55	55.80
Blood Volume	41.58	348.75	58.40	74.40
TSH	31.11	85.25	36.47	49.29
T-3				
T-4				
T-7				
T-4 Free				
B-HCG Quant.	36.20	0.00	38.00	55.80
B-HCG Qual.	9.89	0.00	15.20	13.95
Total Service Cost	$116,599.18	$206,721.64	$145,427.45	$179,339.34
Total Program Cost	$242,418.58	$529,911.51	$376,092.55	$327,394.94

Table 17: Cost Benefit Ratio Table for All Alternatives

	Total Cost	Benefit	Cost/Benefit Ratio
Nuclear Medicine			
Current Ops.	$125,819.40	1295	97.16
Alternative 1	$323,189.87	1295	249.57
Alternative 2	$230,665.10	1295	178.12
Alternative 3	$148,055.60	1295	114.33
Radioimmunoassay			
Current Ops.	$116,599.18	5630	20.71
Alternative 1	$206,721.64	5630	36.72
Alternative 2	$145,427.45	5630	25.83
Alternative 3	$179,339.34	5630	31.85
Total Program			
Current Ops.	$242,418.58	6925	35.01
Alternative 1	$529,911.51	6925	76.52
Alternative 2	$376,092.55	6925	54.31
Alternative 3	$327,394.94	6925	47.28

Constructing a Cost Benefit Analysis Table

Table 17 demonstrates the cost benefit ratios based upon derived costs for separate service and total program alternatives. To construct this matrix, two components were required; a cost and a benefit. The cost portion of each was the total separate service costs and total projected program costs of each alternative as displayed in Table 16. Benefit was defined as the total of completed procedures by a service or a total program.

To develop the cost benefit ratio for each group, the total cost to provide the service was divided by the total completed procedures represented by that cost. The resulting ratio could then be defined as the total cost of producing one completed episode of service.

Findings

Primary Findings

Based upon the results of the cost benefit analysis ratios derived in Table 17, the least costly alternative, for continuing provision of Nuclear Medicine and Radioimmunoassay services to the defined population, would be to continue providing those services using a military physician. The next most economical approach would be to contract for service provision, followed by a less economical approach of developing a provider partnership agreement and, the least economical approach of using the existing civilian fee for service CHAMPUS program.

The contracted services alternative demonstrates a $48,697.61 savings over the Partnership Program at the rate established for these calculations. This would be a significant savings for a single facility and service program. The Partnership Program, though somewhat higher in price than the contracted service alternative, still provides a significant savings of $153,818.96 over closing the service and reverting to the civilian CHAMPUS fee-for-service alternative. Some additional considerations must, however, be addressed.

Internal operational costs, although stepped down to all departments according to generally accepted accounting principles as previously stated, would need to be reevaluated with each of the alternatives.

Alternative 1, reversion to the standard CHAMPUS fee-for-service program used an assumption of eliminating internal costs due to service closure. In reality, some internal costs would continue. Calibration and servicing of the high cost equipment that would remain, would continue to be required to assure its serviceability. Of greater concern, however, would be the necessity to reevaluate the cost of monitoring non-CHAMPUS eligible patient procedures performed in the alternative service settings. These patients' services would require other supplemental care military dollars be expended to purchase those procedures. Personnel time requirements to monitor this increase, as well as the increased number of disbursement requests through Finance and Accounting, would need

to be evaluated and stepped down properly in the MEPRS data output. Additionally, it can be assumed that heightened interest in locating lowest cost service sources would occur, thus increasing personnel time devoted to the performance of collateral internal cost increases devoted to the alternative.

Alternative 2, development of an internal partnership agreement, also has hidden costs that would need to be addressed. The current philosophy of this program requires that the military medical facility be responsible for assuring that billing by the provider be audited to assure that the terms of the agreement discount percentage are met. This requirement imposes a significant workload impact due to the volume of individual billings required by the provider. Some adjustment to reflect the amount of additional workload occasioned by this requirement would need to be made to the stepped down costs to this service to more accurately represent actual service overhead costs. Additionally, as with alternative 1, supplemental care military dollar increases would be anticipated on those occasions when the provider affords service to non-CHAMPUS eligible beneficiaries.

Alternative 3, developing a professional services contract, would also occasion some hidden costs. Contract oversight personnel costs, whether at the MACOM or local level, would increase as would auditing requirements.

The hidden costs, as identified for each of the alternatives, have not been addressed in this research in terms of additional dollars representative of the full cost of

service provision. To assure accuracy, these costs would need to be incorporated. Estimates of their impact, however, would be strictly guesses and would not serve to enhance comparison of alternatives as structured in this research. Accuracy would only be attained through historical data capture after program implementation. Use of this research to determine an alternative choice would require that these hidden costs be included in the selectors' decision making approach.

Additional Findings

One interesting result surfaced after construction of Table 16. In alternative one, costs of providing an individual episode of care for the cardiac procedures show that contractor services are lower than those for the military provider. This phenomenon is most likely an artifact of the separation of physician costs in the development of Alternative 4. By separating the provider cost from the total overhead cost and calculating results based upon weighted value units, a leveling effect occurred across the spectrum of procedures used in the study. Total program cost results did show that the contractor service would be expected to cost more than military-provided services.

One additional element of interest that is represented in Table 16 was found in the Radioimmunoassay results. For this service, the partnership proposal alternative proved to be more economical than the contract proposal. This was verified in the cost benefit ratio calculation of Table 17. This result was

most likely due to the selection of such a large discount rate (80% off normal reimbursement rate) for this service. This inconsistency was, however, not affirmed in the cost benefit ratio calculations for total program costs.

CHAPTER 3

Conclusions and Recommendations

This study compared the cost savings potential of four alternatives to providing Nuclear Medicine and Radioimmunoassay services to a defined population of patients in the Ireland Army community Hospital, Fort Knox, Kentucky. The problem under consideration was to determine if the implementation of the Military - Civilian Health Services Partnership Program in the Nuclear Medicine Service as an alternative to providing care through a military physician would produce a cost savings to the government.

Conclusions

On the basis of the research conducted, the following conclusions were made:

1. That the implementation of the Military - Civilian Health Services Partnership Program in the Nuclear Medicine Service at Ireland Army Community Hospital, Fort Knox, Kentucky would produce a significant cost savings to the government over reversion to the current civilian CHAMPUS fee-for-service program.

2. That additional significant savings could be realized in total government dollar costs by developing a fixed price contractual arrangement with a provider for needed services performed from within the military medical facility using government assets.

3. That the matrix model developed to perform this analysis is a useful model that incorporated standardization

allowing comparison across alternative options of providing a defined service.

4. That the cost benefit analysis model is an appropriate tool for use in a military hospital setting for effectively comparing alternatives.

Recommendations

Based on the conclusions of the study, the following recommendations are made:

1. Military - Civilian Health Services Partnership Program planning should begin immediately to establish this alternative as a cost saving program to the government.

2. Since a partnership physician would be the sole provider of care within the service, additional research should begin immediately to determine the impact of such a program on the non-CHAMPUS eligible workload that would be cared for by this service and reimbursed from supplemental care military dollars.

3. A contracting initiative should be developed for consideration at the major command level as an additional cost saving approach to providing this service.

4. The cost benefit analysis model should be assessed for applicability and proliferation as a decision making tool for the military direct health care system.

Recommendations for Further Study

Continued analysis of the potential impact of hidden costs

imposed upon the individual military hospital by the Partnership Program should be on-going. Although immediate results may not be realized, the information gained would be valuable for future analyses of this type.

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APPENDIX 1

Freda 7 MAY 198

DoD 6010.13-M

Medical Expense and Performance Reporting System for Fixed Military Medical and Dental Treatment Facilities

January 1986

Assistant Secretary of Defense (Health Affairs)

7. Nuclear Medicine Procedures Weighted Values

Diagnostic Nuclear Medicine encompasses patient in vivo, and in vitro or laboratory, type studies.

A combination of these individual methods may be used for patient evaluation. This combined method will be considered as a separate study if so indicated in the accompanying outline for Nuclear Medicine procedures. The other type of Nuclear Medicine procedure deals with the therapeutic use of unsealed radionuclides for specific disease entities.

In consideration of the radioisotopic studies and therapies, one must give additional credits to the determined weighted factor for all individual studies and therapies excluding in vitro or laboratory determinations. This added performance factor will be 20 and will represent the average time that it takes for the radioisotopic clerical and preparation procedures for each patient study or therapy. Some of these tasks are listed here: obtaining the radioisotope from the generator, strict quality assurance of prepared radiopharmaceutical, imaging and computer devices and calibration of equipment, preparation of patient radioisotopic dose, radiation safety procedures, and disposal of radioactive waste materials.

The basic unit used to develop weighted factor for in vivo, in vivo with in vitro, and therapeutic nuclear medicine procedures will be 1 minute equal to 1 performance factor. The calculated weighted factor will then be determined by the average time that it takes to complete the study or task. The total weighted factor for each procedure will be the sum of the primary weighted factor per study plus the credit for radioisotopic clerical and prep or 20 and an additional factor of 20 for all portable studies, that demands completing the study outside the nuclear medicine department. This additional factor for portable studies should only be added if the equipment must be taken to the patient. This factor should not be added if the equipment resides in a special clinic or patient ward; for example, the coronary care unit. The developed outline for nuclear medicine procedures excluding in vitro or laboratory type studies and their weighted factors cover those procedures that are presently accepted as relevant to the civilian and military nuclear medicine practice. The in vitro or laboratory type procedures and their calculated weighted factors are described in their section of this outline.

Nuclear Medicine Weighted Values

a. Section: I In Vivo Studies[1]

(1) Central Nervous System

	Weighting Factor	Unit Count
(a) Brain		Patient
1 Dynamic Cervical/cerebral perfusion		
a Probes	20	
b Images	10	
c Computer Acquisiton and Processing or Acq/Pro.	10	
2 [2]Scans/4 Views	60	
a Added View	15	
3 [3]Images/4 Views	20	
a Added View	8	
b Computer Acq/Process	20	
(b) Cysternogram/Myelogram		Patient
1 Scans/4 Views	120	
a Added View	30	
2 Images/4 Views	60	
a Added View	15	
b Computer Acq/Process/View	5	
(c) Cerebral or Spinal Cerebral Spinal Fluid Leaks and CSF Shunts		Patient
1 Scan 4 Views	30	
a Added View	7	
2 Images 4 Views	15	
a Added View	3	
b Computer Acq/Process/View	5	

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[1]Radioisotopic prep. and clerical added factor for each exam — 20

[2]Scans - Rectilinear Equipment

[3]Images - Gamma Camera, Standard or Large Field of View

		Weighting Factor	Unit Count
(2)	Pulmonary System		
(a)	Perfusion Study		Patient
1	Dynamic Perfusion		
a	Images	10	
b	Computer Acq/Process	10	
2	Scans 4 Views	40	
a	Added View	10	
3	Images 4 Views	20	
a	Added View	5	
b	Computer Acq/Process	20	
(b)	Ventilation Study		Patient
1	Gaseous Sequential Images - 6 Images	15	
a	Added Image	2	
b	Computer Acq/Process	20	
2	Nebulized Aerosal Images - 4 Views	30	
a	Added View Images	6	
b	Computer Acq/Process	20	
(3)	Cardiovascular System		Patient
(a)	Cardiac Transit Dynamic Study		
1	Images 1 View	10	
2	Computer Acq/Process	10	
(b)	First Pass Global Ventricular Functions and Muscle Contractibility Studies		
1	Rest Images	10	
2	Stress Images	20	
3	Computer Acq/Process	30	
(c)	Multigated Global or Regional Ventricular Function and Muscular Contractibility		
1	Rest Images/View	30	
2	Stress Images/View	40	
3	Computer Acq/Process	30	
(d)	Single Probe (Cardiostethoscope) Ventricular Function Single Continuous Reading	20	Patient
(e)	Cardiopulmonary Shunts		Patient
1	Dynamic Perfusion Images	10	
2	Images 3 Views	10	
3	Added View	3	
4	Computer Acq/Process	20	

	Weighting Factor	Unit Count
(f) Myocardial Perfusion		Patient
1 Scan 3 Views	60	
a Added View	20	
1 Images 3 Views/rest	30	
a Added View	10	
b Stress 3 Views	40	
(a) Added View	10	
3 Computer Acq/Process	20	
(g) Myocardial Infarct Avid Study		Patient
1 Scan 3 Views	30	
a Added Scan	10	
2 Images 3 Views	15	
a Added View	5	
3 Computer Acq/Process	20	
(h) Pericardial Effusion Study		
1 Dynamic Sequential Images	10	
a Computer Acq/Process	10	
2 Scan and Transmission Technique 1 View	20	
3 Image and Transmission Technique 1 View	10	
a Computer Acq/Process	10	
(i) Arterial Organ or Extremity Perfusion		Patient
1 Scan 2 Views	20	
a Added View	10	
2 Image 2 View	10	
a Add View	5	
b Computer Acq/Process	10	

		Weighting Factor	Unit Count
(j)	Venogram Extremities or Torso		Patient
1	Dynamic Sequential Images	10	
a	Computer Acq/Process	10	
2	Regional Images	25	
a	Additional Images	5	
b	Computer Acq/Process	10	
(k)	Phlebothrombosis Detection		Patient
1	Fibrninogen I 125 Probe Sequential Counts/ Initial Determination and Set Up	30	
a	Each Subsequent Determination	15	
(4)	Hepatic Biliary Systemic Systems		Patient
(a)	Dynamic Perfusion Hepatosplenic Sequence	10	
1	Computer Acq/Process	10	
(b)	Hepatospleen Study		Patient
1	Scan 4 Views	40	
a	Added View		
2	Images 7 Views	20	
a	Added View	3	
b	Computer Acq/Process/View	5	
(c)	Spleen Studies	75	
1	Images denatured tagged RBC's/3 Views	5	
a	Added View	5	
2	Scan denatured tagged RBC's/3 Views	100	
a	Added View	10	
(d)	Hepatobiliary Study		Patient
	Rose Bengal I - 131, TC-99m IMINOACETIC Analogues (IND)		
1	Scan 3	60	
a	Added View	20	
2	Images 6	40	
a	Added Image	6	
b	Computer Acq/Process	20	
(e)	Hepatobiliary Transit/Clearance		Patient
1	Multiple Probes Strip Recorder	60	
2	Computer Acq/Process Sequential Images	20	

	Weighting Factor	Unit Count (Patient)
(5) Gastrointestinal System		
(a) Esophageal Studies		Patient
1 Sequential Images for Transit and or Reflux	30	
a Computer Acq/Process	20	
(b) Stomach		Patient
1 Sequential Images Transit/Emptying Single Phase (liquid or solid)	30	
a Additional Phase	30	
b Computer Acq/Process	20	
2 Gastric Function Relative Acid Production Sequential Images	20	
a Computer Acq/Process	10	
(c) Intestinal		Patient
1 Ectopic Gastric Mercasa Meckel's/ Inflammatory Bowel Disease		
a Sequential Images 5 Views	25	
(a) Added View	5	
(b) Computer Acq/Process	10	
2 G - I Bleeding Study Excluding Denatured RBC's		
a Dynamic Perfusion	10	
b Sequential Images 6 Images Added View	25	
c Computer Acq/Process	20	
(d) Pancreas Study		Patient
1 Scan 3 Scans	45	
a Added Scan	15	
2 Images 3 Views	30	
Added View	10	
a Computer Acq/Process	20	
(e) Peritoneovenous Shunt		
1 Images 3 Views	12	
a Added View	4	
b Computer Acq/Process	10	

	Weighting Unit	Unit Count
(6) Total Body Studies		
(a) Skeletal		Patient
1 [1]Scan 2 View	60	
a Regional Scan	15	
2 [2] Image 2 Views	40	
a Multiple Overlap Images/Each Image	5	
b Multiplanar Tomographic (pho con)	40	
c Computer Acq/Process Example: Bone Ratios of Activity	10	
d Dynamic Perfusion	10	
e Blood Pool/Image	5	
(b) Bone Marrow		
1 Scan 1 View	30	
2 Image 1 View	20	
a Multiple Overlap/Each Image	5	
b Computer Acq/Process Bone Marrow Area/ ratio	10	
c Multiplanar tomographic Pho/Con	40	
(c) Soft Tissue and/or Bone		
1 Galium & Indium WBC's		
a Scan (2) Views	80	
b Images (2) Views	60	
(a) Multiple Overlap/Image	10	
(b) Mulitplanar Tomography Pho/Con	40	

[1]Scan Rectilinear

[2]Images, Moveable camera or table with standard or large field of view camera.

	Weighting Unit	Unit Count
(7) Genitourinary System		
(a) Renal Studies		Patient
1 Dynamic Perfusion	10	
a Computer Acq/Process	20	
2 Renal Scan/Per Kidney Scan	10	
3 Renal Image/Per View	5	
a Computer Acq/Process	40	
Renogram - Functional Studies		
b Renogram Probes	30	
(b) Uninary Bladder		Patient
1 Cystogram Direct	30	
a Computer Acq/Process	15	
2 Cystogram Indirect	10	
a Computer Acq/Process	10	
(c) Testicular		Patient
1 Dynamic Perfusion	10	
a Computer Acq/Process	10	
2 Images/View	5	
(8) Endocrine System		
(a) Thyroid		
1 Probe Uptake/Determination	10	
2 Camera Uptake/Determination	10	
3 Dynamic Perfusion	10	
4 Scan Neck	30	
a Survey/Scan	60	
b Whole Body/Scan	90	
5 Image Neck 4 Views	20	
a Added View	5	
b Survey/2 Views	30	
(a) Added View	15	
6 Fluorescent Scan	30	
(b) Adrenal (IND)		Patient
1 Uptake/Camera Computer	30	
2 Scan/Each View	30	
3 Image Each View	20	
a Computer Acq/Process	15	

	Weighting Factor	Unit Count
(9) Miscellaneous		Patient
(a) Salivary Glands		
1 Dynamic Perfusion	10	
2 Images/View	5	
a Computer Acq/Process	10	
(b) Nasolacrimal duct		Patient
1 Image/View	10	
a Computer Acq/Process	10	

b. Section: II In Vivo With In Vitro Studies[1]

	Weighting Factor	Unit Count
(1) Central Nervous System		
(a) Cerebrospinal Fluid Leak Pledget/Serum Ratios	60	Patient
(2) Gastrointestinal System		
(a) Biliary excretion and Rose Bingal I-131	120	Patient
(b) Intestinal Absorption fat or Protein	120	Patient
(c) Gastro-Intestinal Bleeding Chromium 51	60	Patient
(d) Schilling -- Each Determination	15	
Duopac	20	Patient
(3) Genitourinary System		
(a) GFR	30	Patient
(4) Hematopoietic System		
(a) Red Cell Volume	60	Patient
(b) Plasma Volume	60	Patient
(c) Transfusion Compatability	15	Patient
(d) Red Cell - Survival First Week	60	Patient
Each Additional Week	30	Patient
Red Cell - Sequestration		
First Week	80	Patient
Each Additional Week	40	
(e) Ferrokinetic - First Week	120	Patient
Each Additional Week	60	Patient
(5) Body Fluid Compartment and Composition Study		
(a) Extracellular H_2O with Indium III	20	Patient
(b) Total Body K	20	Patient
(c) Whole Body Counting	60	Patient

[1]Radioisotopic preparation and clerical -- Added Factor for Each Exam 20

c. Section: III In Vivo/Laboratory

(1) Radioassays, Radioimmunoassays Gamma, and Beta Counting

(a) Many different assays are now being done and many new ones have not been implemented.

(b) Most radioassays use Iodine - 125 as the counting marker. However, Beta counting is available for some of the same determinations. These procedures are usually more difficult and time consuming.

(c) Since there are a variety of setups or kits for the same type of analytic determinations, performance unit factors must be determined for each specific kit used by the individual medical facility. The other factor which must be addressed is the type of equipment used for completion of the assays. Usally a comparison between manual, semiautomatic, and automatic methods for these determinations will be self-adjusting to equality because of the increased number of tests accomplished by the more automatic systems.

(d) Therefore, the performance unit value is calculated in the following manner: time for completion of the assay, starting with addition of the initial substrate to the reaction tube and ending with the final calculated results, in minutes.

1 This number in minutes is then divided by the maximal number of samples allowed to be processed by the specific kit and usual method--manual or automatic, etc., used by the individual military medical facilities. This quotient is the weighted factor. The maximal allowable number of samples will be the sum of the standards, controls and patient samples, and their duplicates.

2 Therefore, the raw count for a sample and its duplicate will be two, one for each. Each individual raw count is multiplied by the weighted factor for that specific assay, and that will give the total performance unit value for one sample and a duplicate of the sample.

(e) Determined or calculated values can be used to construct an associated numberical value as another test parameter, for example the FTI, free thyroid index. These parameters are the result of the primary assays or test determinations and will have no weighted factor and be only counted as the raw number done.

(2) Laboratory Procedures should be grouped under the following headings:[1]

[1]No added Special Factor given to these studies

	Weighted Factor	Unit Count or Raw Count per Sample/Run			
	Gamma Counting		Beta Counting		
	Manual	Semiauto or Automatic	Manual	Semiauto or Automatic	
1. Hematology					
Vit. B12 Blood					
Gastric Juice					
Folate Blood					
RBC's or Serum					
Total Iron Binding Capacity					
Ferritin					
Hepatitis Associated Antigens					
Confirmatory Testing for Hepatitis Antigen					
2. Drugs					
Plasma or tissue					
Digoxin					
Gentomycin					
Phenytoin					
Psychoactive					
Cherotherapeutic etc.					
3. Hormones					
Calcitonin, chorionic Gonadatrophia					
Renin/Angiotinsen etc.					
Free T_4					
Thyroxine or T_4					
T_3 - Triiodo Thyronine					
Reverse T_3					
Neonatal T_4					
Neonatal TSH					
TSH					
Normalized T_4					
Effective Thyroid Ratio					
Free Thyroid Index, etc.					
4. Fetal Antigens					
Carcinoembryonic					
Alpha Feto protein					
5. Onco-Placental Antigens					
Placental Lactogen					
Human Chorionic Gonadotrophin, etc.					
6. Other Tumor Markers					
Prostatic Acid, Phsophatase					
7. Myocardial/Skelectal Muscle Markers					
Myogloblin					
Cardiac Specific Myoglobin					

d. Section: IV Therapeutic Procedures With Unsealed Radionuclides[1]

	Weighting Factor	Unit Count
(1) Soluble Phosphorous - 32 for I.V. Injection		
(a) Indications		
1 Polycythemia Rubra Vera	80	Patient
2 Diffuse Skeletal Metastasis Especially for Prostatic CA Metastatic disease	40	Patient
(2) Soluble Iodine - 131 Administered by Mouth		
(a) Indications		
1 Outpatient Treatment for Hypothroidism; Thyroid Ablation	40	Patient
2 Inpatient Treatment Residual Thyroid carcinoma and or Thyroid Metastatic disease	240	Patient
(3) Insoluble Phosphorous - 32 Intra pleural or Intra-peritoneal Infusion		
(a) Indications		
1 In Patient Treatment, malignant pleural or peritoneal effusions	180	Patient

[1]An additional 20 weighted units should be added to each of the above procedures.