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PERFORMANCE INDICES FOR MILITARY HOSPITALS

by

Marvin Ernest Prigmore

and

Harold Lane Crank

June 1977

Thesis Advisor: D. R. Whipple

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PERFORMANCE INDICES FOR MILITARY HOSPITALS

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I. INTRODUCTION

Present day interest in health care is no longer limited to that of the individual seeking out the services of the medical profession when, and if, the need may arise. Societal changes, along with changes in the profession itself, have impacted in such a way that many in the U. S. view the health care delivery profession as an industry unto itself. The health care system has become one of the major industries in terms of Gross National Product, following construction and agriculture, and it has thus generated much interest in the economics of its operation. From these changes has come a new social awareness concerning this vast industry. No longer does the American institution of health care enjoy the relatively autonomous existence it was privileged to enjoy in the past. This new social sensitivity has lead to an atmosphere of questioning. These questions take form at the political, the market and the individual level. Moreover, legislative changes from the past and current decades, such as Medicare and Medicaid, along with spiraling health care costs, have led to real economic questions regarding how much of the nation's resources society is willing to devote to obtaining good health through medicine. To aid in finding answers to such crucial questions, a relatively new role in the health care profession has evolved--the health care economist. The health care economist is a professional who is actively engaged in explaining the behavior of the health care market system and in attacking such problems as financing, pricing, staffing , and organizing health and medical services in this country. Their efforts are motivated towards a more efficient and effective use of very scarce and costly

resources.

As a nation, the organization of the American health care industry is generally fragmented. The health profession in the private sector has been allowed to operate after a fashion resembling free enterprise. This has led to the evolution of a variety of formal and informal structures or arrangements in which health care is delivered. Therefore, the health care economist is faced with having to address specific structures when dealing with the basic economic questions. One such structure is the Military Health Services System (MHSS).

Although the MHSS can be viewed as a relatively closed system, it is not immune to the economic questions of efficiency, effectiveness and the distribution of scarce resources. In fact, in August of 1973, the President commissioned the Military Health Care Study (MHCS) due to concern in several areas, one of which was the increasing overhead and support costs within the Department of Defense (DOD).[1] The MHCS, constituted by representatives from DOD, the Department of Health, Education and Welfare and the Office of Management and Budget, reported its findings in December of 1975. These findings included: 1) Planning is based upon historical workload rather than through forecasted demand; 2) Historical workload planning may result in undesirable incentives for management; and 3) The concept of regionalization over the three separate services has not achieved its optimal cooperative management efforts. As a result of these and other findings, the MHCS made nine specific recommendations, one of which was that, "Resource programming and budgeting for the MHSS should be on a capitatation basis."[2] This form of budgeting, frequently referred to as Capitation Budgeting (CB), is not an entirely new concept in the private sector. Efforts for establishing a prepayment mode for health care delivery have been

numerous. It is generally accepted that health care providers operating under a prepayment mode in the private sector have many incentives to minimize costs of the services they render. Since CB within the MHSS will more closely resemble a prepayment mode, the motivation for this recommendation by the MHCS was to provide additional endogenous cost containment incentives to further enhance the efficiency of the MHSS in delivering health care to the population elegible to use it.[3]

Although there is an apparent incentive within the prepayment mode in the private sector for the providers to reduce costs and strive for continued efficiency (e.g. seeking the most efficient or optimal mix of services capable of maintaining the health status of the enrolled beneficiaries), a major question is, can this same incentive work in the MHSS? What authority and responsibility structures must exist? What must be the rewards and penalties for the managers and providers? Moreover, how can efficiency be identified, measured and reported so that these rewards and penalties can be meted out objectively and corrective actions taken when portions of the system are not as efficient as possible? In other words, what form must the management control system take?

The crucial theme underlying the above questions is one of perfcrmance measuring. In order to provide an objectively sound management control structure and insure an incentive towards efficiency, managers have a need to review and analyze performance of subordinate managers and providers. For health care delivery systems in general, and the MHSS specifically, this may be a relatively difficult process. To demonstrate the problem as it exists, first consider the system model for management control depicted in Figure 1.

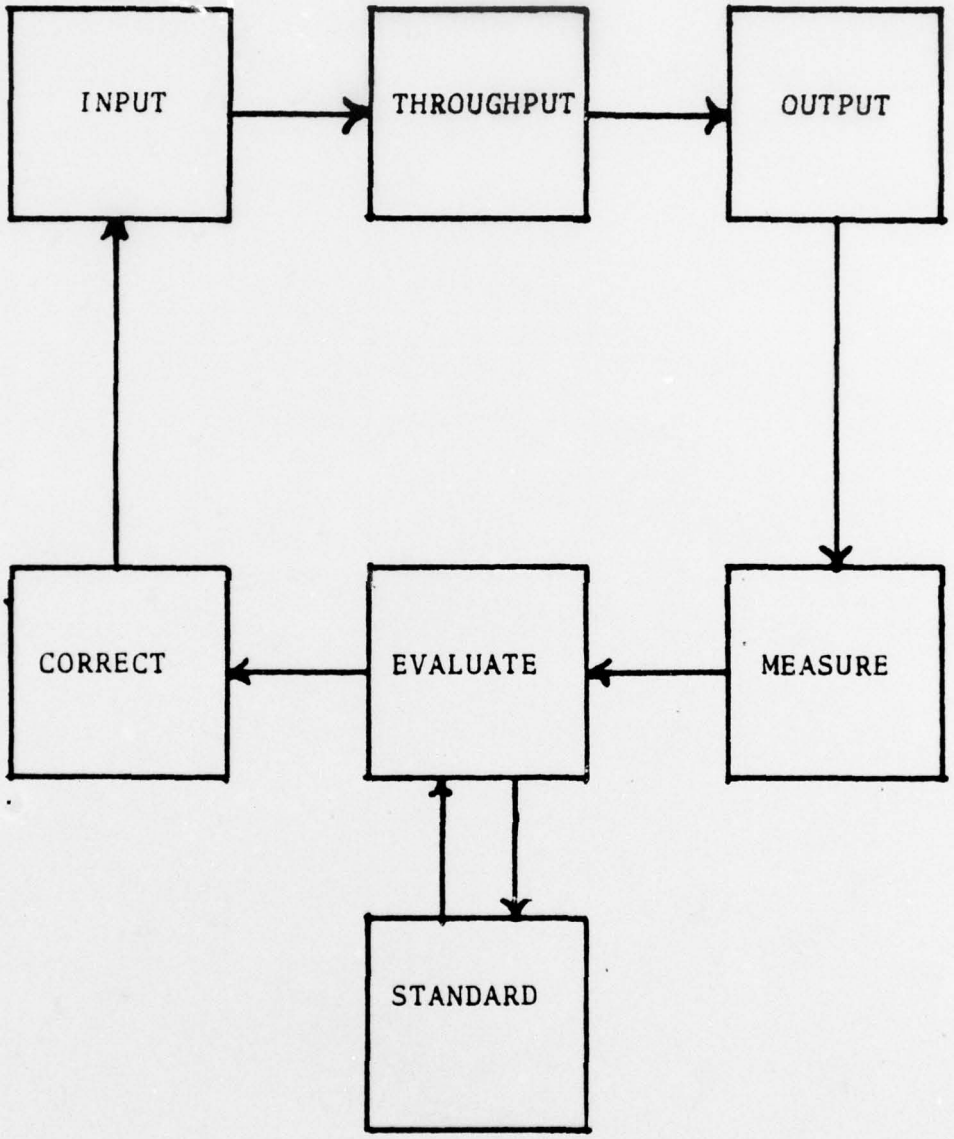


Figure 1 - MODEL FOR MANAGEMENT CONTROL

This simple model is an effective way of viewing management control in a typical production process.[4] The steps within the process are easily identified. In essence, it merely involves the measurement of the outputs of the system, followed with an evaluation of these measurements against some pre-determined standard(s). Depending upon the result of the comparison, managers know how to proceed. Either the outputs of the system are meeting expectations or else an indication for corrective action may exist. If costs were the concern, then the standards to be met might be an expected unit cost of production. This then being the case, with a deviation of abnormally rising cost, management would be allerted.

There are two underlying assumptions required for this model to work, and it is these assumptions which, in a large part, complicate management control in the health care sector. The two assumptions are: 1) There is an incentive to control the costs of the production process; and 2) The output of the system can be identified and measured. The latter assumption requires the further assumption that a set of standards exist.

In the rational market sector the interaction of supply and demand forces may result in a natural incentive for controlling the production costs. This may be true because in the long-run, it is the efficient producer who survives in the market place as a supplier of a given product.[5] In the traditional health care market structure this incentive is usually found lacking.[6] This lack stems in part from the interaction of the professional providers' control over both aspects of supply and demand and the ability of the providers to pass along increased cost to the third-party payers of health care. Since the consumer neither controls the amount of the resources to be consumed for an illness

episode nor has a direct interest in the cost of those resources, assuming some form of coverage which minimizes out-of-pocket costs, a perverse market situation exists. Therefore, due in part to this imperfect market system, there is no inherent incentive for producing health care outputs efficiently.

Moreover, in many production processes the specification and measurement of unit output can be relatively easily accomplished. But due in part to the multi-product nature of health care services and the limits of technology in medicine, the identification and measurement of the outputs is an extremely difficult task. To date, no adequate methodology for measuring health care output has been developed.[7]

This lack of a natural incentive for seeking efficient production of health care and the inability to adequately measure health care output results with management control over costs within the health care system being extremely difficult. The MHSS essentially faces these problems of management control. However, the historical budgeting used by the MHSS, as previously mentioned, may in fact force the incentive problem to be relatively more pronounced. The Composite Work Unit (CWU) has been the traditional output measure for the MHSS. It has been demonstrated that the use of this measure effectively goes beyond the state of a 'lack of an incentive' to a state of a 'negative incentive'.[8] As pointed out by the MHCS, historical workload budgeting has been capable of fostering over utilization in the MHSS. The CWU is composed of the following weighted index:

$$CWU = [(10) \times (TA + TB)/(OBD)] + (ADPL) + [(0.3) \times (TO)/(OBD)];$$

where TA = total admissions

TB = total births

OBD = operating bed days
ADPL = average daily patient load
TO = total outpatient visits

Thus, using the CWU in the historical workload budgeting may have the following effect. It can be seen that the inpatient represents a much higher value to the hospital manager than the outpatient visit. Therefore, in the interest of insuring adequate operating funds for future periods, the incentive may be to admit the patient rather than treat him or her on an outpatient basis. Thus, it may not be in the interest of the manager to seek the most efficient level of care for the patient, assuming the same effectiveness of care at either level. This incentive to 'over-use' services is the form of the negative incentive.

Therefore, in adopting CB within the MHSS, the need for management control will still exist. Based upon the above discussion, it may be seen that for successful operation, the MHSS needs to identify a measure of performance, an indicator, whereby the appropriate subset of inputs-outputs of the system can be measured while at the same time be applied in such a fashion as to provide an incentive for managers and providers to seek the efficient production of health care services.

Thus, the remainder of this thesis will be aimed towards that end. First, a review of some of the research into reimbursement schemes and health care performance measures will be presented. The purpose of this review is to identify some of the problems associated with measuring hospital productivity and to identify what, if any, successful methodology may have been adopted. Following this, a brief review of the current MHSS will be presented in order to highlight the significant structural

relationships which must be considered when addressing incentives within the system. Next, a discussion of an hypothesized MHSS structure will be given in order to develop the necessary changes which will complement both Capitation Budgeting and an incentive mechanism. Finally, the last section will be a discussion of possible applications or problems with application of the methods discussed within the MHSS.

II. PROPOSED SOLUTIONS FROM THE LITERATURE

A. INTRODUCTION

The previous discussion has revealed the necessity for some form of measurement of the activities within the MHSS. Moreover, for objective management control, this measurement should provide an incentive for management which motivates efficiency. This section will discuss several forms of productivity schemes, performance indicators, and incentive mechanisms designed within a general framework of performance measurement, evaluation and analysis, and incentive for corrective action. More specifically, an analysis of a selected sample of reimbursement schemes designed to provide a cost reduction incentive will be presented, followed by a discussion of indices used for measuring performance as related to cost, case-mix measures as a methodology, a suggested output measure entitled a Synthesized Case, along with a short discussion of a current proposed methodology being developed for implementation in a prepaid group practice in the private sector of health care.

II. PROPOSED SOLUTIONS FROM THE LITERATURE

A. INTRODUCTION

The previous discussion has revealed the necessity for some form of measurement of the activities within the MHSS. Moreover, for objective management control, this measurement should provide an incentive for management which motivates efficiency. This section will discuss several forms of productivity schemes, performance indicators, and incentive mechanisms designed within a general framework of performance measurement, evaluation and analysis, and incentive for corrective action. More specifically, an analysis of a selected sample of reimbursement schemes designed to provide a cost reduction incentive will be presented, followed by a discussion of indices used for measuring performance as related to cost, case-mix measures as a methodology, a suggested output measure entitled a Synthesized Case, along with a short discussion of a current proposed methodology being developed for implementation in a prepaid group practice in the private sector of health care.

B. INCENTIVE REIMBURSEMENT

1. General

To begin, Medicare with its attendent cost increases and concerns over inappropriate (inefficient) use by other third party payers aided in the focus of a great deal of attention on the methods of reimbursement for medical services rendered and how these methods might be used as an incentive to reduce, or at least contain, costs and more fully utilize health care resources. In general, these incentive reimbursement schemes are financial plans aimed at rewarding the low cost producer and penalizing the high cost producer. Incentive reimburesement plans have specific objectives which are generally, as pointed out by Feldstein, to minimize the cost of hospital care for given levels of care, or else, to minimize the cost of an episode of illness.[9] Ideally, the model to strive for would be one that would motivate both objectives. However, in reality, the achievement of both may not occur.

When a system seeks to reduce the cost of hospital care, the emphasis is on efficiency. Institutional costs may be reduced by savings in the use of resources, people and equipment. For example, one of the reported benefits of the Kaiser-Permanente system is the "beds not built", and consequently, "not staffed".[10] Accordingly, this has a major impact on total system costs. Although this may have some effect upon the cost of an episode of illness, a cost reduction of an episode of illness speaks more to the level of care provided and the effectiveness of the resources used. Again using Kaiser-Permanente as an example, the

ccmparatively shorter length of stay for an episcde of illness impacts upon the cost of that episode as well as upon total system costs. However, effectiveness, in part, connotes the quality of care which generally cannot be measured or evaluated with the precision necessary in financial or cost system of which reimbursement systems are necessarily comprised. Therefore, the primary focus is on the efficient use of resources, the measurement of production, and how these measures can be used as incentives to reduce the total institutional costs, assuming quality controls are incorporated and active.

In most cases, incentive reimbursement provides rewards for either the process of care or the direct output of care. Examples of process incentives include rewards for establishing institutional systems such as utilization review, management by objectives, or for such data collection activities as subscribing to PAS or HAS. It is believed that such undertakings will lead to reduced costs. On the other hand, direct output incentives reward the institutions (or penalize them) based upon the final output, i.e., the services or activities rendered as measured by cost, wherein cost is used as the measure of output of a given quality of care. Rewarding or penalizing institutions upon the measurement of output is similar to the incentives which drive the economy in the private sector where rewards are related to the prices and costs of production. It may be assumed that institutional factors such as enumerated under process incentives would also be present in a system that rewards direct output (e.g. utilization review etc.).

In general, the aim or the objective of reimbursement schemes seems to be to achieve an effect on the long-run performance of institutions. A good explanation of this concept is provided by Feldstein in his previously referenced article. Economic theory and empirical research

posits a U-shaped average cost curve for industries, including the health care industry (see Figure 2).

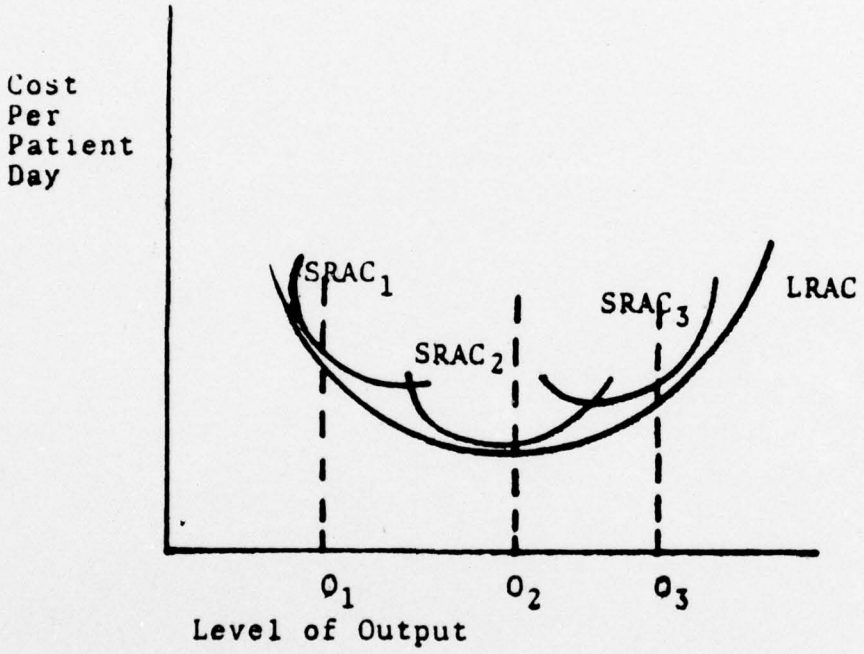
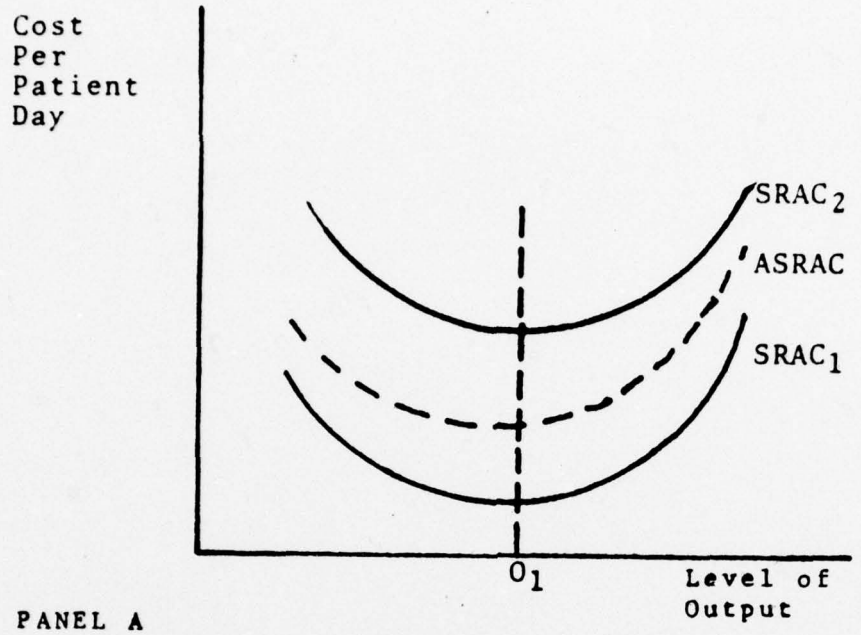
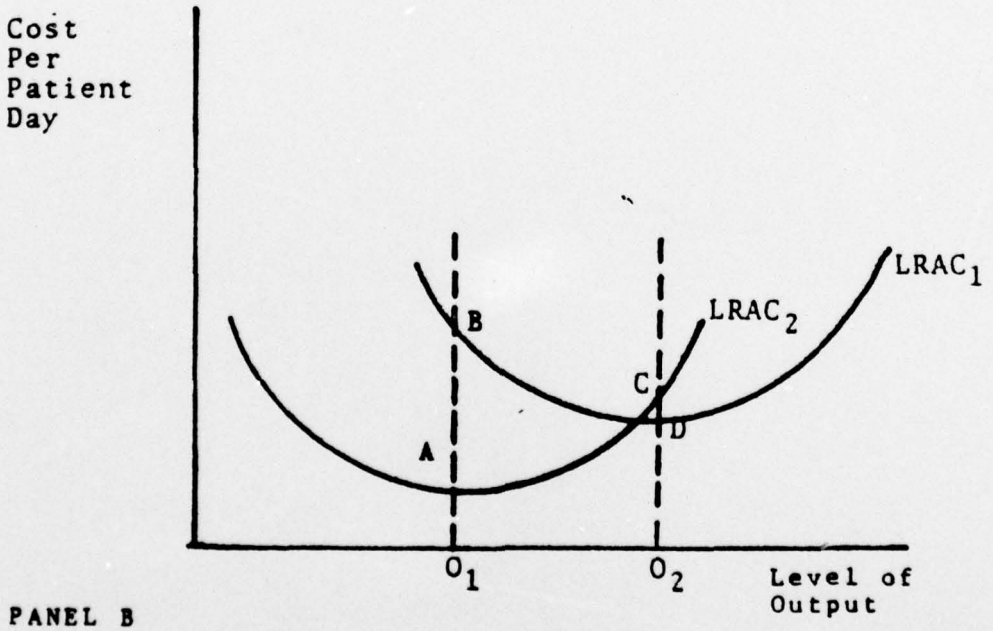


Figure - 2 AVERAGE COST CURVES



PANEL A



PANEL B

Figure 3 - LONG-RUN AND SHORT-RUN AVERAGE COST CURVES

The average cost curves represent average cost per unit, however the unit may be measured. In Figure 2, the average cost is specifically that of the cost per patient day. In reference to Figure 2, both the long-run average cost curve (LRAC) and the short-run average cost curves (SRAC) are defined as follows. SRAC are for periods in which not all of the components of hospital costs can be changed, e.g., size of facility or scale of plant, while the long-run is that time period in which all components of a system, including size of plant or facility, can be altered. At any point in time, however, a hospital is operating on a specific SRAC curve which may have various positions relative to those of other hospitals (see Figure 3).

Figures 3A and 3B show two possible comparative sets of SRAC/LRAC "envelopes" for different hospitals. When comparing hospitals, it is important to note that they may be operating at the same level of output (0_1 of Figure 3A) yet have different SRAC curves. The disparity between the SRAC of separate facilities, even for the same level of output, might be explained by different patient mix, different levels of quality, or different levels of efficiency in production. It may well be, for example, the case that two separate facilities are both as efficient as is possible, but each of the facillties has a different case mix for which it is equipped and staffed, and hence, each has a different SRAC. This may be amplified by Figure 3B which shows two facilities with different LRAC curves. At level of output 0_1, facility two is at its minimum cost (point A) whereas facility one would be operating at the decreasing portion of its LRAC curve (point B). However, as the level of output is increased to level 0_2, facility two

ceases to be the low cost facility and is now operating on the increasing portion of its LRAC curve (point C) whereas facility one is now operating at its minimum (point D). Each facility has a different composition of equipment and staff depending upon the patient mix it encounters or its specific mission (i.e., a specialty hospital). Therefore, each facility is relatively more efficient at different levels of output because each is involved with a different set of circumstances and on a different LRAC curve. In a given geographic region, there may be facilities operating at a specific level of output (see Figure 4). At level O_1, both facilities are operating on relatively higher cost positions of their LRAC curves. Optimally, both facilities could reduce cost if facility one reduced output and facility two increased output.

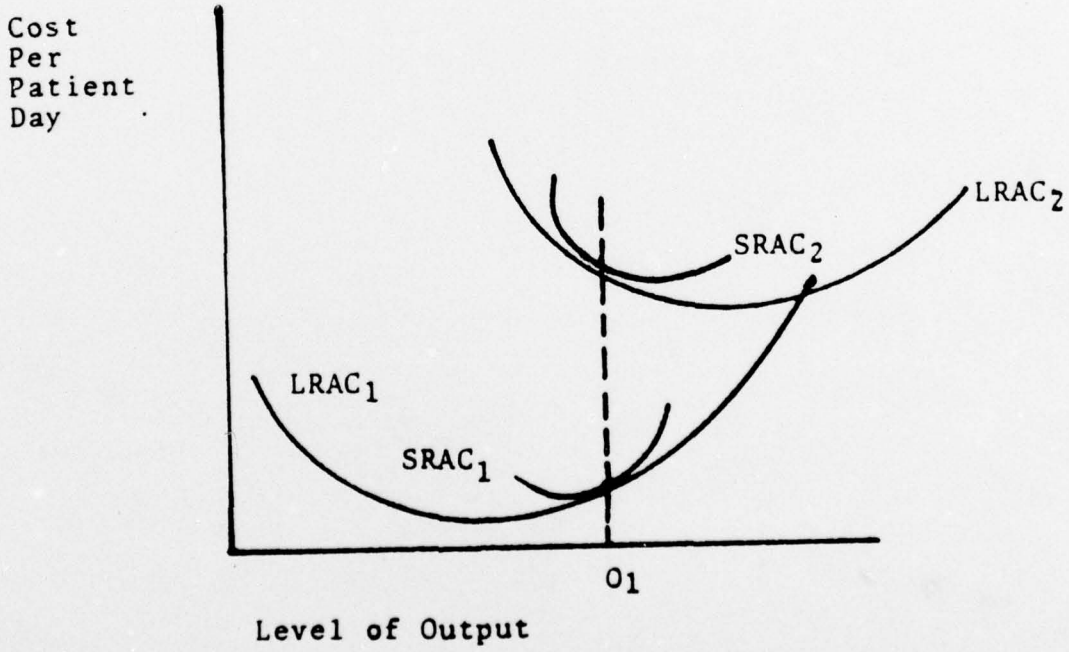


Figure 4 - COMPARISON OF LONG-RUN AVERAGE COST CURVES

As these models are explained, the basic method of relative reimbursement is to set the reimbursement price according to the average of the average costs of all hospitals in the geographic region (e.g., see the ASRAC curve of Figure 3A), thus rewarding the hospitals operating below the mean and penalizing those operating above it. If hospitals are high cost because they are operating on the increasing portion of their LRAC curve (see O_3 in Figure 2), then a lessor payment would force them to reduce their services (in the long-run, maybe reduce the size of the facilities.) If the hospitals are operating on the decreasing portion of their LRAC curve (see O_1 in Figure 2), they may have to change their services, stop offering their services at the same prices, or expand output to where the cost per visit falls. If differences in rates are not due to positions on the LRAC curve as in Figure 3A, there may be differences in efficiency which, it is hoped, would cause the high cost facility to seek greater efficiency or be forced to contract its services, or it may be due to case mix which requires adjustment by some factor. (This problem is discussed more specifically below).

It appears that most reimbursement schemes are some modification of the above general theme. They generally use average cost as a measurement relative to other hospitals or to one individual hospital over time, although the specific unit used in the measurement is often quite different. Examples of units used may be cost of a patient day, the length of stay (some systems use a declining reimbursement for increased length of stay), or direct and variable costs. Whatever unit may be specifically used or measured, it generally provides an incentive to strive for increased efficiency--efficiency as measured in reduced cost of the total system.

2. Full Cost Functions

J. R. Lave, L. B. Lave and L. P. Silverman provide an alternative to the use of average costs.[11] Their proposed approach is a rather sophisticated model which estimates a full cost function for any given facility (ignoring outpatient costs). Given specific data about a hospital, (e.g., disease categories, occupancy rate, length of stay, SMSA and teaching committment are a few of the parameters), their cost function will estimate a total cost which becomes the amount reimbursed. The facility is rewarded by a portion of what their actual cost is below the estimated cost, and they are penalized by a portion of what their actual cost is above the estimated cost.

Reward and penality provide the incentive which motivates the primary objective of efficiency regardless of how the reimbursement scheme may be constructed.

3. Statistical Analysis Of Incentive Reimbursement

Mark V. Pauly and David F. Drake studied the effect of four different methods of reimbursement schemes employed by Blue Cross plans in the relatively homogeneous states of Illinois, Indiana, Michigan and Wisconsin.[12] Their purpose was to discover if different methods of payment and incentive schemes would affect the economic behavior of hospitals (effect of third party methods). Their conclusions were that there were few short-run indications of significance which would either support or challenge their null hypothesis which was that reimbursement schemes have no effect on the economic behavior of hospitals. However, the long-run indications did challenge the null hypothesis and

seemed to indicate that there was an effect on long-run performance.

4. Some Objections To The Use Of Incentive Reimbursement

Even with the above indications, the widespread use of reimbursement schemes designed around some form of comparative average cost or comparative productivity has not been generally accepted. Objections have been raised regarding the use of either the specific methodology or incentive reimbursement schemes in general. One such objection is the question of who should subsidize the cost of education, training and research. Those raising the objections might insist that the current sick should not be forced to bear the cost of these activities, thereby concluding that the more appropriate subsidy would be provided from a separate source of funds (e.g., taxes or endowments). Moreover, it is extremely difficult to separate the portion of the cost of an episode of illness, or illness in general, which is attributable to education and research. Thus, the issue as it is raised presents a seemingly unresolvable paradox. That is, it is generally understood that education and research costs may force the average unit costs to be higher than the same type of care rendered in the absence of these inputs and thus, those institutions would appear to be relatively less efficient. Yet, if the patient is not charged for these resources (nor the institution reimbursed for the cost of these resources) the average cost per unit might appear to be the same as another institution; moreover, that portion of care received by the patient as a result of the training (research) is "free" to him. But, if the patient is charged for the care received, then the institution, under such and incentive reimbursement plan, is penalized for rendering the care and may not

receive full cost reimbursement.

Another paradox concerns applying the rewards in light of current costs when these costs will provide future benefits. For example, it may be that to provide for a more efficient and effective system in the future, a given hospital might require that current costs rise abnormally. For example, if a facility were operating on the decreasing portion of its LRAC curve, and the associated SRAC curve, and foresaw the possibility of reducing the cost of caring for its catchment area population by increasing the physical size of its facility or adding capital equipment necessary to allow the expansion through derived demand generation, it may need to spend more current dollars to save many more dollars later. However, if that same facility was to be penalized substantially because of these costs, then the incentive would tend to be not to develop the more efficient long-run system because of the short-run penalties. Thus, the argument is that the restriction would merely become a constraint upon effective management in a dynamic framework.

Other objections have been expressed regarding the effects of incentive reimbursement upon patient care. It has been suggested that penalizing the higher cost institutions would perhaps result in adverse effects upon current patient care, given that previous costs were in the best interest of the patients. Another issue raised is the question of collusive arrangements.[13] If reimbursements schemes were based upon mean average costs of all hospitals in a given locale, the collusive arrangement need not be formal or spoken. If all hospitals in the area allowed their average costs to rise at the same rate they could perhaps maintain a narrow dispersion (relatively small variance), and still let costs rise faster than the economy as a whole. Therefore, it could be proposed that this kind of reimbursement scheme would provide an incentive to either not seek to control

costs, or else to allow average costs to rise. For example, by using the usual and customary charge as a means of prescribing future reimbursements, physicians and hospitals may have the incentive to allow their average charges to rise. This, of course, is not accomplished through a formal or stated conspiracy; instead, it is the result of the individual actions of the managers and/or providers simply acting in their own individual self interests. The final result then is, by allowing thier individual usual and customary charge to rise, collectively, the overall average charge for health care services will rise.

C. INDEX APPLICATION FOR EFFICIENCY MEASUREMENT

1. Indices In General

The above discussion of reimbursement schemes aimed towards providing incentives relative to the efficient production of health care services assumes a comparability between providers performance and/or a comparability of performance to a standard. One approach for providing a basis for comparison is the hospital cost index. This index approach may take a variety of forms, depending upon the specific purposes for which it is developed or the data from which it is developed.

In general, the index is usually a ratio, or formula which expresses the ratio of one quantity to another. In its most ideal form, a hospital cost index is one that can accurately reflect the amount of inputs necessary to produce a given level of outputs. But, in part, because of the difficulties associated with measuring the outputs of the health care system as previously discussed, most indices

have had to rely upon proxy measures for establishing a basis for comparison. Moreover, because of the dissimilarities in health care facilities, such as the level of available services, quality of the inputs, or patient characteristics and case mix, a variety of models are developed wherein adjustments for the differences are made. This adjustment reduces the measure to some comparable unit or base. In the absence of these specific adjustments, the methodology employed is to group facilities according to some scheme of classification, such as bed size, capacity of services, numbers of training or teaching programs, etc., to provide the basis for comparability.

As was stated, indices are developed for a variety of purposes. In general, the aim is to be able to identify a ranking of hospitals relative to cost and thereby identify the differences in cost or charges, or else they are used to identify the portion of costs attributable to inflation.

2. Variable Cost Insurance

For example, Newhouse and Taylor have proposed a Variable Cost Insurance (VCI) in order to 'expense rate' hospitals to refelct their relative rate of charges.[14] In the expense rating of hospitals, their aim is to increase X-efficiency and reduce the subsidy effect of hospital insurance. Their hospital index takes the form of:

$$(2)\quad E(i) = \sum(TR_{ij} AR_{ij})/(TR_{i} AR_{j});$$

where: $E(i)$ = expense rating of the ith hospital

AR_{ij} = average charge in hospital i for the

j^{th} type case

AR_{ij} = average charge for j^{th} case or service in all hospitals

TR_{ij} = total revenue from the jth case in the ith hospital

TR_i = total revenue in the Ith hospital

The index provides an expense rating relative to the various hospitals which can then be compared by the consumer of the hospital services when seeking those services. Although the above description is not intended to describe the authors' total VCI proposal, it does reflect the construction and application of an index reflecting the ranking of a hospital relative to its cost.

The effectiveness of the Newhouse and Taylor proposal has been questioned.[15] Morton Schnabel, as well as others, has demonstrated that it would be possible for a hospital to manipulate the proposed index for its own advantage. That is, he suggests that it would be possible for a hospital to reduce its expense rating simply by allowing the average charge of a service to rise, granting that the service charge was currently less than half of what the hospitals are charging and assuming a constant demand rate. The argument has been extended to demonstrate that the proposal might provide the incentive for hospitals to strive for good expense rating through case-mix specialization in less complex cases.[16] It is suggested that because neither the weights nor the prices are held constant, the proposed index will not provide a stable base for comparison between hospitals or over time.

3. An Index For Measuring Factor Disproportionality

Another example of an index is that proposed by Lee.[17] He suggested his model as an approach for regional hospital planning, and it is aimed towards reducing inefficiency through a more appropriate combination of inputs, thus, perhaps reducing duplications, underutilizations and waste. Lee suggests that a composite index can be prepared for each hospital and this index will result in an indication of the overall input combination pattern. The composite index is simply stated as being "...the averages of actual and optimal specialized input to bed ratios for all disease groups."[18] In a general sense, Lee is proposing an index approach for reducing factor disproportionality or the ratio of specialized inputs to hospital beds.

Criticisms have been raised regarding Lee's approach. For example, Whipple and Block pointed out that Lee has neglected at least two points.[19] Basically, third party payers have been unable to control overcapitalization due to the use of the usual, customary and reasonable fee guidelines by hospitals in setting prices. In doing so, hospitals can partially determine future prices. The second point is that Lee has failed to consider that, "...the pricing policies of the hospitals do not accurately reflect the cost of care in the specific disease treatment categories."[20] Whipple explains that pricing policies allow an underutilized treatment center to be subsidized by more efficient treatment centers. Thus, because of these considerations, it may be difficult for third party payers or planning agencies to actually control overcapitalization.

4. Weighted Average Index

A weighted average index for identifying the relative cost effectiveness of a hospital has been suggested by Whipple and Block.[21] The measure would be calculated for hospitals within a grouping scheme, perhaps similar to the Berry group. The measure might include a constant weight derived from reported average charges of disease categories (thus adjusting for case mix) and the authors suggest that the relative index values would provide management with a tool for identifying needs for cost control.

5. Index Measuring For Inflation

Another concern related to hospital performance which has prompted the development of hospital cost indices is that of inflation. There have been two common indices in use historically for the health care sector.[22] They are: 1) The Average Daily Service Charge (ADSC) used by the Bureau of Labor and Statistics; and 2) The Average Cost Per Patient Day (ACPPD) used by the American Hospital Association (AHA). With the advent of escalated health care inflation, Medicare (thus, Federal) concerns and the general overall increased awareness of health care costs, numerous attempts have been made to capture the full effects of inflation in the health care setting. In general, the majority of these proposals are deficient for one reason or another.[23]

Although these approaches may carry significance, a relatively recent proposal suggested by Berger and Sullivan will be discussed.[24] The authors have developed a composite index for which the stated purpose is the

measurement of the inflationary pressures of hospital costs in the Commonwealth of Massachusetts. The index identifies a cost threshold for determining reimbursable costs for individual hospitals. Their model is comprised of three primary elements: 1) A set of hospital cost categories; 2) A set of weights for the individual cost categories; and 3) A set of economic change indicators for measuring the inflationary pressures of each category. The index is designed in a manner such that it only accounts for inflationary costs within the reimbursable costs and ignores such things as changes in productivity, labor market supply and demand and additions to facilities, services or equipment.

In developing the composite index for application, a Cost Limitation Factor (CLF) is determined according to the following model in Figure 5.[25]

Cost Categories	Economic Change Indicators				Cost Category Weights	
	I(1)	I(2)	...	I(N)		
CC(1)	A(1,1)	A(1,2)	...	A(1,N)	W(1)	C(1)
CC(2)	A(2,1)	A(2,2)	...	A(2,N)	W(2)	C(2)
CC(3)	A(3,1)	A(3,2)	...	A(3,N)	W(3)	C(3)
⋮	⋮	⋮	...	⋮	⋮	⋮
CC(K)	A(K,1)	A(K,2)	...	A(K,N)	W(K)	C(K)
						CLF

Rules:

1. $A(1,1) + A(1,2) + \ldots + A(1,N) = 1$

   $\vdots$

   $A(K,1) + A(K,2) + \ldots + A(K,N) = 1$

2. $W(1) + W(2) + \ldots + W(K) = 1$

3. $C(1) = W(1) \times [I(1) \times A(K,1) + I(2) \times A(1.2) + \ldots + I(N) \times A(1,N)]$

   $\vdots$

   $C(K) = W(K) \times [I(1) \times A(K,1) + I(2) \times A(K,2) + \ldots + I(N) \times A(K,N)]$

4. $CLF = C(1) + C(2) + C(3) + \ldots + C(K)$

Legend:

CC(1) - Cost Categories
I(1) - Economic Change Indicators (as percentage point charges)
A(1,1) - Influence Coefficients (as a fraction)
W(1) - Cost Category Weights (as a fraction)
C(1) - Components of the Cost Limitation Factor (as percentage points)
CLF - The Cost Limitation Factor (as percentage points)

Figure 5 - MODEL FOR COMPUTING COST LIMITATION FACTOR (CLF)

The CLF then becomes the cost threshold, expressed as a percent, computed with the model in Figure 5. The allowable costs are those explained by the CLF and the prior year's costs, and any additional costs above the threshold are subject to full justification prior to reimbursement.

From the above discusssion it can be seen that hospital cost indices are performance indicators which are used for comparing an institution's performace to a standard and or to other similar institutions. The specific measure used may vary according to purpose and the data base. Two primary aims are to provide a relative ranking of the hospitals according to hospital costs (charges) or to identify inflationary pressures on hospital costs.

D. ADJUSTMENTS FOR CASE MIX

Whether one is discussing reimbursement schemes or indexing methodologies, there is a general concern over adequately measuring or allowing for case mix. Although there are some that do not, there have been many efforts to construct reimbursement formulas and indices which will allow for case mix differences between hospitals. Some use average weights, some use fixed weights, and some group hospitals, but it seems that the importance of case mix requires consideration regardless of the specific methodology employed.

1. Adjustment By Weighting Intermediate Services

It will undoubtedly enhance understanding if some specific cases are examined. Harold A. Cohen attempted to

develcp long-run hospital cost curves which would have useful applications in reimbursement formulas.[26] Cohen believed it important to find measures of hospital size based upon the numbers of intermediate services performed. He developed a measure of service by weighting intermediate services (e.g., X-ray treatments, deliveries, laboratory examinations, emergency room treatments, etc.). Then, using weights (W_i), the output of any hospital is measured by summing the products of the weights and the units of any service performed in that hospital;

$$(3)\quad S^k = \sum W_i Q_i^k;$$

where S^k = service output in the kth hospital

W_i = the weight of the ith service

Q_i^k = the quantity of the ith service in the kth hospital

Since more complex cases require a greater number of services and proportionally greater weights, as based on average costs, S^k is the factor that makes the necessary case mix allcwance between hospitals in the final total cost model Cohen developes. He added other variables to the basic model (3) above in an effort to adjust for quality measures such as hospital accreditation and affiliations with medical schools. However, in any event, S^k remains the factor that adjusts for case-mix. Cohen's effort provides one example of a methodology wherein the allowance for

case-mix is built into a formula that has an application in reimbursement schemes.

2. An Evaluation Of 3 Specific Methodologies For Measuring Case Mix

Nancy A. Roguski, in her Master's Thesis entitled An Evaluation of Techniques for the Measurement of Hospital Case Mix, has provided a review of case-mix methods.[27] Roguski has evaluated the techniques used to adjust for case-mix differences in hospital output along the lines of : 1) Adjustments based upon the kinds of services a hospital can produce (such as the subsequently discussed Berry method); 2) Using a statistical composite measure; and 3) Adjusting patients or patient days (e.g., case-mix by service, diagnosis, etc.) The author selected three specific techniques; one was proposed by Feldstein, one by Lave and Lave, and the other was proposed by John Rafferty. She used data available from hospitals in Rhode Island to provide a comparison against the findings of the original investigators. She then discussed the three approaches in relation to ease of computation, data avialability and their reliability. Finally, she performed a stability analysis to demonstrate how hospital case-mix may change over time.

Basically, her first analysis concerned measures based upon eighteen diagnostic categories which were derived from the H-ICDA code wherein average percentage of patient and patient days for each was determined. Her second analysis looked at patient discharges wherein patients were grouped into five mutually exclusive categories for which the mean percentage of each category was again determined. The categories were based upon their particular service code (e.g., pediatrics, medical, surgical, obstetrics and newborn).

Her third analysis was that which was similar to Rafferty's. The basic purpose was to establish an index for comparing case-mix proportions between hospitals. The index depends upon the establishment of a weight and is defined by:

$$(4)\quad I_j = \left(\sum_i W_i N_{ij} \right) / \left(\sum_i W_i P_i \right) \times (100)$$

where N_{ij} = proportion of cases of hospital j in category i

P_i = proportion of cases of the base population in category i

W_i = weighting factor for category i

Several criteria for the weight in model (4) were suggested. Some include average cost per case-type, number and types of facilities needed for treatment, degree of need for admission, or a comprehensive list of complexity values. Roguski settled upon average length of stay for each case-type to define the weight. Whatever criteria is used, however, for selecting the weight, the practical value of the index depends upon the accuracy of the weight finally settled upon. Moreover, since the weights, and the resulting index itself, are dependent upon the base population, the true comparison becomes one of an individual hospital as compared to all hospitals comprising the base. It may not be favorable for hospital to hospital comparisons.

Her basic conclusions were that there is no definite "best case" for measuring hospital case-mix and that any approach will be limited due to the relative constraint of data availability.

3. CPHA Indicies Adjusting For Case Mix

The following two examples of indices designed to adjust for case-mix have been developed by the Commission on Professional and Hospital Activities (CPHA).[28] The first example is an application of the relative value principle to gross hospital charges and is entitled the Appendicitis Equivalent Value Index (AEV). The AEV is used primarily to assess the extent to which differences in case-mix account for the differences in average gross charges either between hospitals or from period to period in the same hospital. The construction of the AEV is conceptually quite simple. For purposes of definition an appendicitis patient is an operated patient under 20 years of age diagnosed as acute appendicitis without peritonitis. The average charge of all appendicitis cases so defined has an AEV of 1.00. If the average gross charge for an illness, specifically defined, was 160% of the average charge for appendicitis patients, then the AEV for such patients would be 1.60. The Commission on Professional and Hospital Activities (CPHA) has compiled a table for statistically normal charges for treatment in U.S.hospitals. This table, entitled the Study of Patient Charges (SPC) was compiled from 1.1 million case abstracts which were assigned to one of 3,510 cells, defined by 351 diagnosis groups, five age groups, and designated as operated or non-operated. The average charge for each 3,510 cells was then compiled. To build an AEV for a specific hospital, the hospital's patients are assigned a cell as defined above and each patient receives the AEV for that cell until all N numbers of patients have been assigned an AEV. The AEV's are then summed and divided by N. The result is the AEV index for that hospital.

The next example, also developed by CPHA, introduces

the 'Resource Need Unit' (RNU) which has application in isolating the effect of case-mix in comparisons of average charges between patient groups, hospitals, or time periods.[29] Resource Need Units are so named because they are designed to reflect the relative value of resources typically needed in treating given kinds of patinets as reflected in average charges. A RNU of 1.00 corresponds to the average charge for all patients in the data base. A RNU for a specific patient category, as defined by the Commission, is equal to the average charge of matched patients divided by the average charge for all patients in that data base. The actual index, the Resource Need Index (RNI), is constructed from the sum of all the RNU's for each patient in the desired grouping (may be hospitals) divided by the number of patients in the group:

$$(5)\quad RNI = (RNU_1 + RNU_2 + RNU_3 + \ldots + RNU_N) / N$$

4. Grouping Hospitals For Case Mix Adjustment

As final example, Ralph E. Berry, Jr., has approached case-mix adjustment by grouping hospitals.[30] Berry believes that perhaps the most significant analytical or empirical challenge in the context of hospital cost and production research is the problem of coping with product differences. Similar to the question addressed by Cohen, Berry attempts to discover what motivates and determines the specific quality and complexity of services that hospitals provide. His approach was to determine whether or not there is any pattern to the specific facilities and services that hospitals have when they have different levels of such facilities and services. If there is a pattern, can hospitals then be grouped according to the types of facilities and services they have? Finally, if such grouping

is possible, does it provide insight into the case-mix phenomenon? Berry's study seems to indicate a definite and systematic pattern to the expansion of facilities and services in short-term general hospitals. He concludes that there are definite groups beginning with what he terms a 'basic service hospital'. As the hospitals add facilities and services there is a tendency towards those services that will enhance quality, thus 'quality-enhancing' is the second category. The next grouping shows a tendency towards more complexity, hence 'complex' is the third category. The final stage of expansion occurs when hospitals add facilities and services that essentially transform them from inpatient institutions into community medical centers, and this was called the 'community' category. Berry found that by fitting hospitals into these specific groups according to their number of facilities and services, certain relationships began to emerge. For example, the average length of stay was found to increase according to the type of hospital. Mean stay was found to be shortest for the basic service hospital and longest for the community service hospital. Occupancy rates increased in a fashion similar to length of stay. There were also significant differences among the types of hospitals in terms of inputs (i.e., personnel, assets per patient day, capital/labor ratios etc.). For example, community service hospitals not only were found to employ more labor and capital than other groups, but they were also employing more capital per unit of labor. These differinces in input combinations were consistent with product differences implicit in the groupings (e.g. case-mix), according to Berry.

Finally, Berry found that cost per patient day was directly related to the category of hospital. Basic service hospitals had the lowest average cost, with each category increasing in cost as the groupings progressed. Presuming that different patients need a different level of care, and

noting the relationship between cost and level of care, Berry was led to his conclusion that the fundamental value in his analysis was how to determine the optimal mix of different types of hospitals rather than how to determine the optimal size of hospitals.

E. A SYNTHESIZED CASE AS A METHODOLOGY FOR MEASURING OUTPUT

As previously stated, a major complicating factor in the management control for the health care sector has been the lack of concensus regarding the proper definition of health care output. Due to the variability of hospital facilities and patterns of care, and the heterogeneity of their outputs, no methodology for defining health care productivity has been generally accepted even though there have been several attempts. One such attempt has resulted in the hospital product being identified as a 'Synthesized Case' (SC).[31]

The Synthesized Case is an attempt at developing a mathematical relationship between the factors which are believed to quantify the variability of inputs between hospitals and to provide a single product definition. In doing so it was posited that inter-hospital productivity comparisons could be made. Moreover, the methodology of the SC allows for the inclusion of ambulatory care which is often excluded in other hospital productivity measures.

The first step in developing the SC was to adjust for the effects of ambulatory care upon productivity. This was accomplished by first comparing average revenue of an outpatient visit with that of an inpatient visit. This was termed an 'Adjusted Case' (AC) and was defined as follows:

$$(6)\quad AC = C + (OPR / IPR) / (OPV / C) \times (OPV)$$
$$= C + [(OPR) \times (C) / (IPR)]$$
$$= C(1 + OPR / IPR)$$

where C = case (an admission)
OPR = outpatient revenue
IPR = inpatient revenue
OPV = outpatient visit

To aid in correcting for the dissimilarities among hospitals, the model employs a 'Service Index' which was developed from the cumulative growth in hospital services. The author felt that size alone was not an adequate means of identifying the differences to be expected from varying hospital services. Therefore, in order to provide for a finer adjustment of the products, or the output, Edwards adopted an approach which has been reported earlier in the literature.[32] Using established techniques, the original researchers developed an index which would reflect the cumulative effects of hospital services. This final index was termed the General Service Index (GSI) and was incorporated in the final model Edwards proposed. The GSI was based upon 19 of the 47 services listed in the American Hospital Association Annual Survey. These 19 services were arrayed according to a heirarchy in identification of the value to be assigned to the GSI. For example, a value of 1 was an indication that none of the 19 services were available (and therefore, none of the 47) while a value of 4 was given to the GSI if the hospital had an organized Physical Therapy Service. The assumption is, if a hospital has a given kind of service, it will also have certain other service capabilities. The approach in developing the GSI is not altogether dissimilar to Berry's method for grouping hospitals which was discussed earlier. Edwards used the findings of earlier research to justify the use of the GSI in his final model.

Next, factor analysis and stepwise regression analysis were used in order to develop the productivity measure. Three dependent variables were investigated: 1) Total expenses; 2) Expenses per admission or case; and 3) Expenses per AC as defined in equation (6) above. A host of independent variables were then used, moving from total expenses to the SC by using both linear and multiplicative or logarithmic models. Examples of the independent variables include the previously mentioned GSI; an Acute Care Index (ACI); an Outpatient Index (OPI); a Long-Term Care Index (LTCI) as well as such other things as size, location, training programs, etc. The indices were defined by the number of available services such as pharmacy, inhalation therapy, psychiatric services, etc.

The result of the analysis was a model specified in the general form cf a Cobb-Douglas function:

$$(7)\quad EPAC = [\,(2.303)(GSI)^{.023}(IP)^{.007}(ONPE)^{.364}(FTE)^{.608}(W)^{.009}(P)^{.029}(SMSA)^{.005}\,] \,/\, [\,SB\,]^{.009}$$

EPAC = expenses per adjusted case
GSI = General Service Index
IP = number of residency programs + 2
ONPE = other non-payroll expenses per adjusted case
W = wage rate
P = 3 if for-profit ownership; 2 if not-for-profit ownership SMSA = SMSA size code + 2
SB = statistical beds
FTE = fulltime equivalent personnel per adjusted case

The model was validated with data from short-term non-federal hospitals in Texas over three years and a sample of all U.S. hospitals. Correlation between the estimates and the observations ranged from a low of 0.9875 to a high of 0.9947.

Equation (7) above was then re-written to obtain the definition of a hospital product which results in a cost equation for Expenses Per Synthesized Case (EPSC) and the Sythensized Case (SC):

$$(8)\quad EPSC = [\,(2.303)(ONPE)^{.364}\,(FTE)^{.608}\,(W)^{.029}\,(SMSA)^{.005}\,];$$

$$SC = [Cases(1+OPR/IPR)\,(GSI)^{.023}\,(IP)^{.007}\,]/[\,(SB)^{.009}\,]$$

The authors of the model feel that it will capture the heterogeniety of hospital outputs sufficiently to provide for comparisons over time and levels of productivity. They further assume that volume of outpatient services, the number of services available, hospital size and the number of residency programs make the major contribution to the changing nature of hospital products while the other factors are a function of managerial style. Moreover, they feel that the model can be used for identifying gross areas of deviations of performance and can be applied to inter-hospital comparisons or for comparisons against other posited standards. It is suggested that their model is flexible in that some of the 'managerial' factors can be changed to reflect judgements of the users and also feel that a further breakdown of the ONPE would perhaps enhance the usefulness of their model.

F. KAISER-PERMANENTE COST CENTER ACCOUNTABILITY SYSTEM

The Kaiser-Permanente Medical Care Program (K-P) is a relatively closed system in the private health care sector that delivers health care services to an enrolled group of beneficiaries. Membership enrollement in the plan requires a prepaid fee which entitles the beneficiaries to a specific range and level of covered services. This enrollment fee, or capitation rate, is a primary source for supporting the costs of operating the system. The Kaiser-Permanente program, to be successful, must deliver acceptable services to its members at a competitive capitation rate. In order to offer a competitive capitation rate, the managers and providers in the K-P system must provide the required services effectively and efficiently.[33] Traditionally, the K-P program has used a historical workload approach in developing the forecast of the hospital facility budget which, in turn, is used to aid in setting the capitation rates for future periods. Historically, as a total system, they have been relatively successful.[34] Just the same, the K-P program is developing a pilot program to develop a Cost Center Accountability System (CCAS). There have been four reported objectives of the CCAS; 1) The development of standard performance measures; 2) The development of responsibility and control at the Department/Area level; 3) Establishment of an equitable resource allocation system; and 4) To aid in regional coordination and monitoring.[35]

It has been suggested that the CCAS will provide management information in at least the five critical areas of 1) Utilization; 2) Performance; 3) Membership; 4) Access (backlogs); and 5) Cost.[36] Since the CCAS is currently in the development stage, there is relatively little

information available regarding the probable structure or form which the pilot program will have, but an evaluation of the objectives may give some insight insofar as what top management in K-P may feel to be important elements of a successful capitation structure. First, it can be seen that K-P has suggested that a standard measure of performance is needed. Kaiser has used such measures as doctor office visits (DOV), bed-days per member, physician-membership ratios, physician-staff ratios, and others in the past. Whether these will continue to dominate in the Kaiser management control system in the future is a matter for conjecture. However, it may be reasonable to assume that whatever measures are used they will be standardized in both the collection procedures and the reporting procedures. Second, it can be seen that Kaiser is now expressing an interest in decentralization of responsibility and control in contrast to their traditional centralization of these management principals. Moreover, it may be reasonable to assume that the historical workload approach for allocating resources has been viewed by K-P as a less than equitable means for allocating resources within the system. Finally, although without much clarity, it may be seen that the coordination of services at the regional level has become an important objective for the top managers of Kaiser-Permanente. It is assumed that the development of the CCAS in relation to the stated objectives is to enhance an already relatively successful K-P in its effective and efficient delivery of health care services to its enrolled beneficiaries.

III. INSTITUTIONAL CHARACTERISTICS OF THE MILITARY HEALTH SERVICES SYSTEM

A. GENERAL CONSIDERATIONS

The concept of management control as it is being discussed here is only one of the several basic management functions.[37] For present purposes magement control is defined as:

> ...the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of an organizations objectives.[38]

As alluded to in the introductory section, effectiveness may be defined as the degree of contribution the output makes to the objectives of an organization. The greater the contribution, the more effective the organization. On the other hand, efficiency is the ratio of inputs to outputs (costs to units of production). Thus, the greater the amcunt of outputs produced per unit of input, other things being equal, the more efficient the organization. It is the latter aim which is the goal for the measurement tool being sought for the MHSS organization in this thesis.

When discussing the data to be used for evaluating either the effectiveness or efficiency of an organization, the organization's management control system may be discussed in at least two structures.[39] They are the prcgram structure and the responsibility structure. In an

organization which relies upon a Planning, Programming, and Budgeting System (PPBS), such as the Department of Defense, these two structures may be highly interrelated, but the basic purposes of each are discussed separately. The discussion of the program structure will relate more specifically to the planners and analysts wherein the full costs of carrying out programs are emphasized in determining which type of programs (and how much of a given program) will best accomplish the overall goals or missions of the organization. The discussion of the responsibility structure will relate more to the activities to be performed within the programs, and the coordination of the activities, wherein controllable costs of operations are emphasized. The interrelatedness of the two structures implys that each is interested in both effectiveness and efficiency, but the former has a main concern regarding effectiveness while the latter emphasizes efficiency. Moreover, the interrelatedness implys that the program structure may cut across the formal responsibility lines unless programs are designed around the responsibility structure. Thus, it follows that the program structure should be designed such that it serves the needs of top management. But Anthony and Herzlinger point out that:

> In designing a responsibility structure, the needs of the operating managers are paramount. Such a structure must be consistent with lines of responsibility, and this principle cannot be compromised to meet the needs of planners.[40]

Moreover, within the program and responsibility structures, a management control system must be considered such as that depicted in Figure 1. As pointed out previously, one of the basic assumptions for this model is that an incentive for efficient production exists. Since, by definition, the MHSS is not in the traditional market sector (e.g. it is a non-profit organization) a natural incentive for efficiency may not exist within the responsibility structure. Thus, it becomes paramount that the program and

responsibility structures must consider this lack of a natural incentive. If true efficiency in production is being sought, then the structure must be designed in such a fashion as to permit a full committment by the managers and providers to the goals of the organization. For example, Whipple, in the Capitation / Incentive Project reports, has delt at length with this matter through a more thorough discussion of goal congruence within an organization.[41] It may be that an adequate design of these structures may provide, or enhance, an incentive such that it will be more conducive for a full committment of the managers and providers to the goals of efficiency.

Thus, it will be the purpose of this section to present a brief review of these two structures as they may relate to the current MHSS and the way they might relate to the MHSS under a Capitation Budgeting scheme. The current MHSS will be discussed in an attempt to identify the strengths and weaknesses of the management control process as it may relate to measurement of inputs and outputs and the resulting incentives within the system. For contrast, a MHSS structure will be hypothesized with the aim of highlighting structural changes which will complement the management control process in relation to the incentive for efficiency which is being sought.

B. THE CURRENT MILITARY HEALTH SERVICES SYSTEM

1. The Authority And Responsibility Structure

First, the current MHSS structure will be examined. Figure 6, although a gross oversimplification, may be used to illustrate the current CONUS-based MHSS. (The scope of

this thesis does not permit a more detailed analysis of the MHSS authority and responsibility structures. However, we note that a more detailed analysis is being provided in a concurrent study at the Naval Postgraduate School by the BUMED Study Group.)

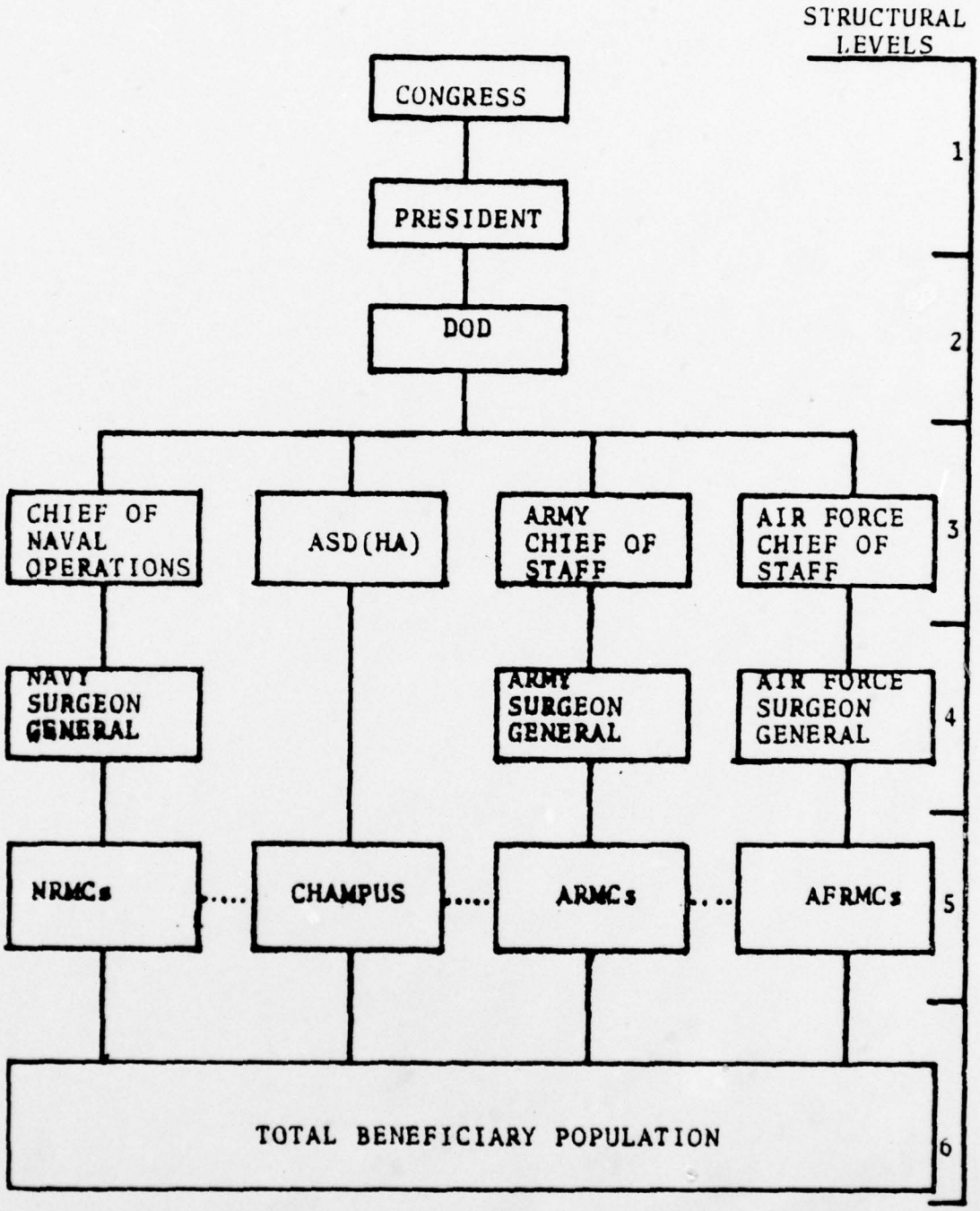


Figure 6 - CURRENT CONUS-BASED MHSS

In a broad sense, Figure 6 is used to to depict both the flow of resources and the flow of authority and responsibility. Moreover, it will be used to identify the coordination of activities performed within the responsibilitiy structures and over geographic regions. Also, it will be used to discuss the information systems wherein the data used for the PPBS and management control is collected and reported. Within these contexts the endogenous incentives for efficiency will be discussed.

The flow of authority and responsibility within DOD and the MHSS ultimately begins at Level 1 in Figure 6. Congress, as a body, and the Constitution, provide the legal basis for operating the component elements within DOD identified as the MHSS. Moreover, the President's Federal Budget, a significant portion of which is the DOD budget, is approved and authorized by Congress; thus, it is from Congress that the MHSS costs of operations are initially funded. Between Levels 2 and 3 of Figure 6, the chain of authority and responsibility for the MHSS as a total system becomes fragmented. For example, each Surgeon General has the responsibility for programming the majority of the health care resources for their respective uniformed service. These programs are included as a part of their respective Line Commander's (e.g. CNO) total package request which is submitted to DOD to be ultimately included in the president's budget request to Congress. Moreover, the Assistant Secretary of Defense for Health Affairs (ASD-HA) programs resources for the Civilian Health and Medical Program of the Uniformed Services benefit plan (CHAMPUS). Between Levels 3 and 4, in the programming process, there is no coordination between these programs, nor is there a requirement for such.[42] Between Levels 3, 4 and 5, within each individual service branch, the lines of authority and responsibility are, once again, clear cut and easily

identified. But the final result is that, at Level 5, there are basically four separate autonomous components within the MHSS which are responsible for delivering health care services to the eligible beneficiaries within Level 6. The dotted line connecting the four components at Level 5 are intended to represent the presently existing "cooperative" coordination effort which has been implemented. As pointed out by the MHCS, this coordination of efforts, to date, has been relatively ineffective in attaining its full potential.[43] These four separate components result in a fragmented programming and budgeting process for the MHSS as a whole. This is further complicated by the fact that the health benefit plan as currently implemented allows, with minor exception, the eligible beneficiaries in Level 6 to seek care from any of the four components of Level 5. For example, in some specific locations within CONUS, all four components may be available as a source for care to the beneficiaries within that area. Although research data has not been reviewed in this area which would reveal the magnitude in which this freedom of choice may impact upon utilization, the MHCS indicates that the relative lack of control of this demand hampers the planning for and allocation of resources. Thus, not only may the MHSS be identified as fragmented in its programming and budgeting process or structure, it may be that there are areas of overlap for providing certain health care services to the patients of the system. The MHCS documented the effects of the current arrangement when they pointed out that over-programming of beds has occured, along with underutilization of certain types of services. Thus, from a total system view, at least, there may be no endogenous incentive and/or mechanism for seeking the optimal mix of facilities and/or services between the four separate components within the MHSS which would provide for a greater efficiency of operation. Moreover, in the absence of a measurement technique for identification of the optimal mix

of facilities, such as was found in Berry's proposal, facility distribution both within and between the four separate components of the MHSS may be further hampered. Moreover, due to the lack of a technique, such as proposed by Lee, the optimal sizing of hospitals or facilities may also be hampered. Therefore, it may be seen that a performance indicator which aids in the identification of these relatively more efficient combination of health care services would perhaps aid in the management control process.

The programming process which takes place within each component is based upon historical workload as previously pointed out. Future resource needs are not determined by a projected demand for health care services.[44] This is particularly true at Level 3 within the structure. The basic unit of measurement upon which historical workload is measured is the CWU. As has been discussed, this CWU provides an ineffective , or at worst a perverse, incentive at Level 5 within the MHSS. Since the individual facilities are separately and automatically budgeted, there is no endogenous incentive to seek the optimal mix for delivering the health care needs to Level 6.

Moreover, since the CHAMPUS component is not a part of the local manager's budget at Level 5, there may be an incentive for him to use CHAMPUS as a subsidy. That is, under certain circumstances or conditions, eligible beneficiaries may be authorized to use CHAMPUS even though the particular health care services are available from a military facility. In these circumstances it might be to the local manager's advantage to encourage beneficiaries to use CHAMPUS as a source for care and thereby supplement his own budget with this "free to him" factor input.[45]

The budgeting process at Level 5 within each

component may not be as well coordinated with the programming process at Level 4 as it could be. The entire PPB process at Level 4 and above begins several months prior to the fiscal year (FY) for which the resources are to be budgeted. However, facilities within Level 5 may not request their next FY budget early enough to permit inclusion in the total package request which is submitted above Level 4. Thus, the historical workload data upon which Level 4 operates may not be directly related to the workload data upon which Level 5 formulates its budget request. The incentive at Level 5 may become one which motivates the responsible manager to request as large of a share of the Level 4 budget that he can justify. This justification is based, once again, upon the CWU as well as discretionary costs (costs for which the optimum amount is not known, and, often, not knowable). These discretionary costs may constitute a relatively large fraction of the Level 5 budget request. Since there is no "scientific" way of estimating the amount of discretionary costs, budget allocations from Level 4 to Level 5 must be determined through a form of negotiation. This amounts to the local manager in Level 5 convincing the central manager in Level 4 that he "needs" the amount initially requested. This latter interaction between Level 4 and 5 may result in another incentive which interferes with efficiency goals. Since moral suasion is the basis for justifying that share of the budget (discretionary share), the local manager in Level 5 may perceive the need to maintain his creditability with the central manager in Level 4. Therefore, in order to maintain the creditability, the incentive may be end-of-period spending of any excesses. That is, the local manager may approach the end of the budget cycle with an excess of operating funds which have not been obligated or utilized. Since he was forced to use moral suasion in obtaining the funds initially, he may feel that, unless he uses all of the funds, at the next cycle's confrontation (budget request) his arguments may not be

credible to the central manager. Thus the Level 5 incentive may be percieved as "spend it or loose it" the next time around. Thus, it is posited that the current CONUS-based MHSS structure is such that there may be several operative mechanisms which may allow the effects of perverse endogenous incentives.

Implicit within the concept of management control is the concept of "control". It was stated at the outset that the responsibility structure will be more prone to emphasize controllable costs in relation to efficiency. Although the following may not be explicitly revealed in the structure as presented in Figure 6, it appears that, when discussing efficiency, it may be appropriate to discuss "control" directly. When talking about cost of operation, costs may be identified in a variety of ways (e.g. Fixed, variable, indirect, controllable and non-controllable, etc.). Of these, two concepts of cost will be used to demonstrate an additional mechanism which, when viewed in relation to incentives, may have additional perverse effects upon incentives. It is similar to the "spend it or loose it" incentive discussed above.

First, the local manager in Level 5 is given an annual operating budget which includes both controllable and non-controllable costs. Although he is charged with the responsibility for seeking efficient operations and reducing the cost of operations, the rewards generated from such behavior may not be strong enough to elicit that same behavior. However, an opposing responsibility is one which is prescribed by federal statute. Section 3679 of the Revised Statutes, as amended (31 USC 665) explicitly prohibits any officer or employee of the United States to make or authorize the expenditure or obligation of any appropriation or fund for which sufficient resources are not available.[46] Such an action is punishable under law. This

law and its consequences are applicable to the local managers in Level 5 in relation to their operating funds. Due to the seriousness of such a violation, a local manager may find that his greatest interest (thus incentive) is one of trying to avoid incurring a "Section 3679" violation. Therefore, it may be that subordinate managers are more interested in avoiding the "penalty" of "not overspending" than they are in obtaining the "rewards" of being "efficient". The conclusion, it is posited, may be that efficient performance within the system is not sufficiently, if not truly, rewarded. Thus, the local manager may only seek to control cost insofar as an "overspending" does not occur. This incentive, coupled with the "spend it or loose it" incentive, may in fact operate to such a degree that true efficiency of operations may not be sought by the local managers.

Anthony and Herzlinger, in their text on management control in the non-profit sector, provide a sound basis for the logic of the following argument. They have suggested that, on occasions in the past, managers within the federal sector may view certain personnel resources as "free".[47] The logic for the argument may be thus. First, federal funding may require separate appropriations for operating funds for personnel costs. Thus, in determining overall personnel needs, centralized management may program for the total system as well as budget for the specific responsibility center. In doing so, the central manager might determine both the quality and quantity of the personnel mix. This then being the case, personnel costs, for an operating manager (e.g. local manager at Level 5) may be perceived as being non-controllable especially in the short run. Thus, since central management both determines allowable costs for personnel and authorizes these costs, local managers may view them as "non-controllable", and therefore not a true cost to their operation. For the MHSS

this concept or argument may be strengthened by such things as Civil Service regulations such that it extends beyond the short run period. For example, suppose a local manager determines that he can accomplish a task more efficiently than it has routinely been performed with Civil Service workers by adopting technological improvements. In doing so, however, he must abolish a position which is filled by a worker who, over the years, has accumulated sufficient fringe benefits such that the local manager will be required to expend personnel funds in that employee's behalf after he has been separated. Perhaps this could extend beyond the normal short range period (e.g. as defined by the budget cycle). This then being the case, the local manager would realize that to adopt long run cost saving measures could perhaps require a greater expenditure of funds in the short run. Since he is evaluated only on his performance in the short run (e.g. a budget cycle) the reward system may force him to perceive short run controllable costs as being "non-controllable".

It is posited that the latter arguments actually demonstrate another concept which is not directly or explicitly acertainable from Figure 6. It is the concept of centralized management. Using the above discussion as supportive argument, it will now be suggested that a perverse incentive may exist due to the degree of centralized decision making which occurs for the MHSS. That is, since the local manager may perceive that his role is really one of custodial duties (e.g. not overspend) because the central manager actually controls the major and marginal decisions (e.g. personnel ceilings), his true interests may be to supervise operations to insure that they continue to provide for and sustain the system during current operations as well as in the future rather than have a true committment to efficiency.

2. The Accounting And Reporting Structure

In addition to the problems discussed with the endogenous incentives (or their lack) within the above structure, there may be problems associated with input measuring for reporting and comparing productivity. A fundamental problem may be created due to the information system and accounting structure in which data regarding costs and revenues are collected. In the private health care sector there are general guidelines set down by the Financial Accounting Standards Board, the American Hospital Association, and other outside bodies and agencies who possess the power or authority to influence a specific hospital's accounting practices. It is generally difficult to find two hospitals who perform this administrative function in exactly the same fashion.[48] Such a diversity gives rise to the difficulty in tracing the cost of inputs to the units of production, both directly and indirectly. Therefore, this quagmire of confusion further complicates the evaluation or measurement of performance for comparative purposes. The MHSS is similarly plagued with procedural problems resulting in a diversity among facilities both across a given uniformed service and between the three branches.[49] As pointed out by the MHCS, there are broad guidelines set forth to aid the military components in performing the accounting functions. These guidelines are often subject to local interpretation which eventually leads to the differences in the way costs are collected and reported between most facilities at the activity level. The consequence is that, even if costs were collected by units of output (which they are not), there would still exist a degree of non-comparability of the units between facilities.

In the MHSS's accounting system costs are not

collected according to any precise scheme in which either the direct or indirect costs associated with a unit of output (e.g. any given inpatient or outpatient) can be readily identified, if at all. In the non-federal sector, there is a motivation for identifying the costs associated with the individual recipients of health care services. In general, the health care facilities recover the cost of resources consumed by charging a fee which is payed by the client or a third-party payer acting on the client's behalf. Thus, in order to more equitably fix rates, the motivation is to structure the accounting systems in a manner such that it more nearly reflects the costs for the individual patients. This same motivation is not paralleled in the MHSS. Since the beneficiaries of the system are not required to reimburse the system for resources consumed (there are nominal flat rate charges for boarding in direct care facilities for several categories of beneficiaries), the need for an accounting structure which traces costs to the individual patient has not previously existed. Instead, costs are collected according to a defined cost center and in an aggregate fashion. Examples include patient care services such as Medical and Orthopedic Services; ancillary services such as Pharmacy and Laboratory Services; and supportive services such as Maintenance and Patient Affairs Divisions.

Although the direct costs at these levels are collected relatively accurately and with precision, the assignment or allocation of the overhead or indirect costs may be relatively arbitrary at the various activities within the MHSS. The overall result is an inability to identify accurately the full costs associated with an individual client, clinic, or service, and a non-standard cost collection system which leads to variability between facility reporting.

Moreover, the MHCS has pointed out that the collection and reporing of workload performance data varies across the four components in the MHSS. For example, they point out that, in the four autonomous medical information systems, inpatient data collection and coding varies. CHAMPUS uses three digits of the ICDA while the military components use four digits. Although broad guidlines for direct care workload collection are issued by DOD, some key areas are not addressed. They include definitions for such things as discharge reporting data and what constitutes an outpatient visit. Thus, there is a variability between the four components regarding measuring and reporting procedures at the facility level due to inconsistent interpretation of the guidelines. Moreover, even if they were consistently collected and reported, the specific measures employed are questionable regarding their validity as true output measures. The measures which are used are usually one dimensional measures such as admissions and discharges or numbers of service units produced. The use of such measures requires the assumption that reported units are equivalent from facility to facility when they are used for comparative purposes. The assumption may not be valid, however, as it may be clearly seen that a CBC produced by an automatic blood processing machine is not equivalent to one determined manually, or that an appendicitis operation is equivalent to an influenza case in two different hospitals. Thus, it should perhaps be apparent that, not only may current measures vary because of non-standardization, but also they may not accurately reflect relative productivity.

C. AN HYPOTHESIZED MILITARY HEALTH SERVICES SYSTEM STRUCTURE

1. Authority And Responsibility Structure

After having discussed the current CONUS-based MHSS, Figure 7 is introduced below to provide the framework for discussing a proposed structure for the MHSS when it is operating under a Capitation Budgeting scheme:

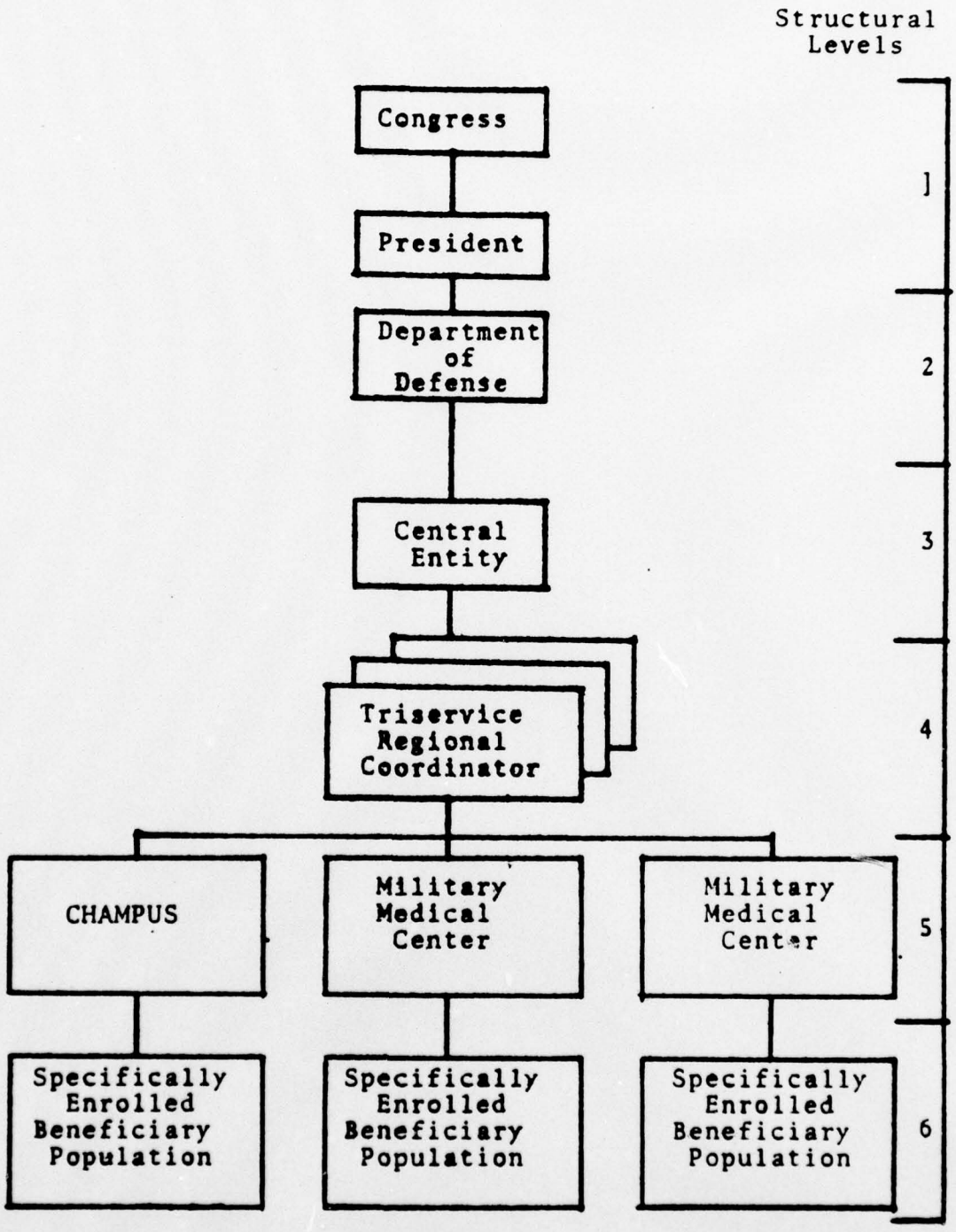


Figure 7 - HYPOTHESIZED CONUS-BASED MHSS

Prior to discussing the management control implications it may add clarity and authenticity for the proposed structure in Figure 7 above if the appropriate recommendations made by the MHCS are presented. The MHCS made three specific recommendations which may have implications regarding the responsibility structure at Levels 3, 4 and 6. (Again, it is pointed out that the scope of this thesis does not permit a more thorough analysis of the full implications of these recommendations. However, a concurrent study addressing this structure is being performed at the Naval Postgraduate School by the BUMED Study Group.)

First, Recommendation Two of the MHCS implys that a Central Entity should be created within DOD. The study did not (nor does this thesis) try to define the Central Entity, but they did suggest that it should have a strong mandate for coordinating resource allocations within the CONUS-Based MHSS. However, a memorandum dated 28 Dec 1976 from the Secretary of Defense Office established a DOD Health Council which was to be composed of the following: 1) ASD(HA), who is to serve as chairman of the council; 2) The Surgeon General from each of the Military Departments; 3) One representative each from the Organization of the Joint Chiefs of Staff and the Uniformed Services University of the Health Sciences.[50] Partial responsibility of the Defense Health Council which was outlined in the memorandum included excercising oversight of regional health care programs and the planning, programming and evaluation of peacetime health care delivery operations including CHAMPUS, as well as coordination of PPBS actions. Thus, for the purposes of this thesis, it is assumed that a Central Entity within a new structure could be operative at an equivalent to Level 3 of Figure 6. Next, the MHCS proposed Recommendation Three, which suggests that a Regional Coordinator be created to

oversee specific geographic regions within the CONUS system. This recommendation carried minority opinions regarding the definition of the proposed regional coordinator, but it is assumed that, upon implementation of Capitation Budgeting, resource allocations will be made through a Regional Coordinator who has the authority to decide between alternative uses of the funds at an equivalent to Level 4 in Figure 6. For example, two or more facilities within a region may have the potential for providing a specific service, say OB-GYN services. At the same time, beneficiary demand is not sufficiently large to economically justify the provision of these services at each facility. Then, the determination of which facility would be the one to provide the OB-GYN services for that area's population would be a decision for the Regional Coordinator to make. His decision might be based, in part, upon which facility could provide the services most efficiently, other things being equal. The MHCS's sixth recommendation is directed to Level 6, or the beneficiary population, and, with this, the MHCS suggests a form of enrollement for the eligible users of the system. Although the specific form of enrollement to be adopted is not being recommended here, it is envisioned that the implementation of an enrollement concept will reduce the beneficiary member's freedom of choice once he has opted to enroll in a specific plan.

It may appear that these recommendations have avoided Level 5 of Figure 6 and 7, but it is suggested that the necessary interactions between the level 3 and 6 components will force the structure to resemble that of Figure 7. Therefore, its implication regarding the management control system as related to the ensuing incentive mechanisms will be discussed.

If it can be accepted that Figure 7 may in fact resemble a structure which could be adopted for the MHSS

under Capitation Budgeting, then it is suggested that the MHSS could then be viewed as a "total system" rather than four separate and distinct health care delivery systems (e.g. CHAMPUS, Air Force, Army, and Navy). This new structure, or total system, could provide the foundation wherein a performance indicator could be most productively applied. The performance indicator, when tied to the resource allocation structure, could create the necessary vehicle for a resulting incentive for the managers at Level 5 as well as for the system as a whole. However, there may be a number of assumptions which must be made for such a total system to be operative.

First, it seems necessary to assume that total system requirements would be determined from a projected resource need rather than from historical workload data. The implication of this assumption is that the resource programming and budgeting processes would necessarily need be initiated within Level 5 as related to the enrolled components within Level 6. That is, from the demographic data of the enrolled population in Level 6, the local managers within Level 5 would form the basis for projecting their resource requirements.[51] This, in turn, would imply that the local managers are actively involved in the preparation and formulation of their budgets. This requires the assumption that the local manager will be provided the necessary guidance for preparation of his budget. It is suggested that the form of the guidance may be in the specific capitation rate which is to be set. Although it is beyond the scope of this effort to actively pursue an appropriate capitation rate, it is felt that it should be recognized that the basis or level for setting capitation rates may be a complex issue. For example, there may be at least three levels for which capitation rates could be set. First, the capitation rate could be set at Level 5. This of course may imply that rates could vary between facilities.

This would perhaps be true due to the difference in the scope of the missions of the various facilities and/or the demographic characteristics of the enrolled population. In the first case, it may be necessary to recognize the difference in costs of a teaching hospital as compared to a non-teaching hospital. In the second case, enrolled populations may not necessarily be normally distributed according to the demographic characteristics which define the level and intensity of care. The next level for which a rate might be established would be Level 4, wherein it would be assumed that the rate could vary between geographic regions. Again, regional missions as well as demographic characteristics may vary. It then naturally follows that the final level for which the rate could be set would be at Level 3, and this requires the assumption that a single, overall average cost per beneficiary for the total MHSS could be accurately determined. However, for the structure as proposed in this thesis, it is being assumed that the capitation rate will be set at Level 5. This rate, then, would become, in part, the guidance upon which the local manager would develop his budget.

Next, it may be necessary to assume that, beyond military contingency requirements, the Level 4 managers would have the authority to define the optimal mix and/or location of health care services to be provided within his geographic region. That is, it is expected that unique and specific military requirements may require that certain functions or activities be performed. These will necessarily be centrally determined. However, beyond these requirements, Level 4 managers would have the capability of deciding in which specific facility a certain health care service would be provided. These determinations would also provide additional guidance for budget formulation at Level 5. Then, based upon the aggregate needs or budgets of all facilities within a Level 5 region the total regional coordinator's

needs would be partially determined which, in turn, would help define the Central Entity budget, or the CONUS-based MHSS's portion of the total DOD military health care budget.[52]

Next, it may be necessary to assume that the local managers within Level 5 will have a broader scope regarding the management of the controllable elements of cost. It is recognized that there may be certain functions or activities that, although marginally controllable in nature, will be necessary to complement the overall effectiveness of the MHSS in serving the needs of the Operational Commanders. But beyond these, if a local manager is to be charged with the responsibility for seeking the efficient delivery of services, then he must have the ability to influence certain short range or controllable costs. A major implication of this assumption may be the control of personnel costs. An example of this has been provided in the Capitation/Incentives Project reports.[53] In the report, Whipple has demonstrated how a local manager could influence short range cost through the control over the quantity and quality of personnel, such as with the use of physician extenders to replace higher cost physicians in certain areas of primary care.

Another assumption which may be necessary is that a reward system is defined and operative in such a fashion that both the providers and managers within the MHSS can perceive and realize the effects of their efforts. Again, it is beyond the scope of this thesis to discuss what specific forms these rewards may take, but the concept has been treated more completely by Whipple in the above project reports. However, it is suggested that if both the managers and providers can realize a vested interest (e.g. Whipple's goal congruence) in efficient performance, then the likelyhood that this behavior will be elicited will be

increased. The underlying assumption for the above is that performance can be evaluated and compared. Moreover, it may be necessary to assume that this performance evaluation will encompass only those costs which are reasonably within the control of the responsible individual. Moreover, it may require the assumption that management efforts designed to influence long range efficiency which will create an increased operating cost in the short range will not adversly reflect upon the evaluation of performance. As an example, consider again the civil service worker who was displaced by changing technology after having accumulated substantial benefits. Perhaps a fund within Level 4 could be made available wherein the cost of the accrued benefits could be paid. Or else, in evaluating performance, these costs would be disregarded. Moreover, it may be necessary to assume that the use of projected resource requirements as contrasted to historical workload budgeting will negate the "spend it or loose it" incentive discussed earlier. However, in a practical sense, it may require a stronger reward over that which will be gained from particapatory management to fully negate this latter "incentive".

There are perhaps other assumptions which are necessary, but it is felt that a structure similar to the above, along with the identified assumptions, at least, may be necessary for the effective implementation of a Capitation Budgeting system for the MHSS. This may be especially true if the intent is to create additional endogenous incentive mechanisms which motivate the managers and providers toward the efficient production of health care services for the eligible beneficiaries of the MHSS.

2. The Accounting And Reporting Structure

In adopting all of the above conclusions under a

Capitation Budgeting scheme, it is imperative to address the accounting structure in its existing form. As discussed earlier, the current accounting structure does not provide the required degree of commonality or comparability of the data as it is collected in the four MHSS components. This inhibits meaningful cost and performance comparison among the various facilities whithin the MHSS. This problem has been recognized and presently there are ongoing efforts for corrective action. As pointed out in the Comptroller Notes issued by the Bureau of Medicine and Surgery (BUMED) in January 1977, the Special Assistant to the Secretary of Defense has Recommended the development of an Uniform Resource and Performance Accounting System for implementation during Fiscal Year 1978.[54]

The development efforts have included those of a group comprised of representatives of the three branches and the Office of the Secretary of Defense (OSD) whose aim is the development of a prototype operation in Fiscal Year 1979. According to the BUMED Comptroller Notes a Uniform Chart of Accounts (UCA) is being developed. The objectives of the UCA are as reproduced below:

> Develop a standardized Tri-Service chart of accounts (cost accounts) which encompasses common data elements, definitions for required performance (workload), costs, and manpower utilization supporting the health care system.
>
> The chart of accounts structure, insofar as is possible, will provide commonality of data elements among the military departments and should facilitate comparison with cost and performance data in the civilian health care sector, to include the CHAMPUS.
>
> Differences in areas where commonality is difficult or precluded by Service or Defense unique considerations will be identified and methodology devised to account for and modify the data elements for the optimum possible comparability.
>
> The structure must accomodate, with minimal

changes, existing Service systems either in an automated or manual mode.

Develop concepts and procedures to distribute or allocate in a common manner overhead, base support, ancillary support and similar costs incurred in health care delivery that are not directly costed to the inpatient and outpatient function.

Design a standard structure to accomodate or enhance on-going priority management needs for information and MHCS recommendations, to include:
-Per-Capita budget concept
-Marginal cost capability
-Standardized cost and performance accounting systems
-A tri-service Resource Management System.[55]

As noted above, one of the objectives is to develop an accounting structure or system such that cost data and performance data will be standardized. Since the Uniform Resource and Performance Accounting System is in the development stage, only certain assumptions regarding what this new structure will be can be addressed at this time. There are, perhaps, some basic considerations which may be essential changes for a successful structure to be compatable with a sound performance measuring and reporting system.

First, as explicitly set out in the above objectives of the UCA, standardization of termonology, definitions, and methodology is essential. Without these, any meaningful comparisons between facilities cannot be made. The General Accounting Office (GAO), on 23 AUG 1976, reported the results of a survey of the accounting and information systems currently in use by the military hospitals.[56] Their survey examined four hospitals (two Army, one each Navy and Air Force). It focused attention on three functions: food services, dental services, and radiology services. Their conclusion was that:

...these systems lack uniformity ... and as a result information is not available to DOD which

could be used to compare and evaluate hospital budgets, costs and workloads.[57]

This, of course, also has a major implication regarding the definition of a performance measure or indicator for the MHSS. Therefore, in development of a measure, a reliable standardization among the four components is essential.

Next, in considering the structure of the system, it would seem necessary to be able to identify the full costs associated with each cost center. This will require the ability to identify all of the direct costs associated with each center as well as devising the system such that, to the extent feasible, the indirect costs are appropriately allocated. Although estimating indirect costs may provide an adequate basis for certain levels of planning, it is felt that full costing of inputs to the control center or cost center is needed if a meaningful cost per unit, however defined, comparison is to be made. Moreover, it is envisioned that under a Capitation Budgeting scheme, the use of transfer prices in the reimbursement for services between facilities may be used. For example, within a given region, two facilities may exist such that their relative proximity does not warrant one facility having a capability for a certain kind of service, even though it is responsible for all of the health care needs of its enrolled members. One way for the hospital to obtain those services for their clients would be to "purchase" them from the other military facility having the needed service. Thus, the referring hospital would be required to reimburse the second hospital for the resources consumed by the patient. Therefore, in order to establish equitable transfer prices, a full cost accounting structure may be needed. While this full costing system is needed, the structure should also be able to separate controllable elements from the non-controllable elements. This may be indicated in order to interrupt the previously discussed endogenous incentive within the current

structure.

Finally, as a consideration, it would be ideal if the costs of care could be traced to the identifiable individual groups of patients who receive the care. This should facilitate the management control process at all levels as well as provide excellent planning information for the allocation of resources. Initially, it may be that the complexity and costs associated with such a system might appear prohibitive. But upon implementation of Capitation Budgeting and enrollment of the beneficiaries, a system with this capability may later be a natural evolution. For example, based upon the analysis of the sparce information available frcm Kaiser, it may be hypothesized that the more narrowly defined the cost collection unit, the more useful the management information becomes. Therefore, insofar as possible and practical, the cost accounting structure should define a relatively small cost objective for collecting and identifying costs.

IV. DEFINING A MHSS PERFORMANCE MEASURE

A. GENERAL CONSIDERATIONS

At the outset it was posited that the adoption of Capitation Budgeting as a method for allocating resources in the MHSS will certainly not obviate the need for an effective management control system. Moreover, it was posited that an effective management control system within the MHSS will require a measure of performance, an indicator, whereby the appropriate subset of inputs-outputs of the system can be measured and then the result be applied within an incentve structure such that it motivates the managers and providers to seek efficiency in their operations.

It should perhaps be clear by now that if the MHSS operated in a manner such that it resembled a typical production process in the traditional non-health care market sector, the task at hand would be relatively simple. For example, an adequate performance indicator could perhaps be constructed by starting with the ratio below:

(9) Inputs/Outputs

Since the primary concern is one of efficiency, and since efficiency is defined from the relationship of the

amount of inputs expended per unit of output, the above is a primary requirement. To evaluate or compare performance, however, there would be the requirement of a standard. The most basic standard would be the expected amount of inputs per unit of output, however derived, expressed as in the ratio in (9). Then, a statement of performance could perhaps be reflected in the following manner:

(10) Actual/Expected

In model (10), the Actual would be defined by the relationship previously established in model (9). The Expected in model (10) would be the relationship determined in the specification of the standard. Then, model (10) would become a basis for comparing a hospital to itself over time, or for comparing one hospital to another.

In the first case, performance which proved to be as expected, all other things equal, would result in a ratio of one. As performance varied from the expected (the standard), the less efficient performance would result in a ratio greater than one, while more efficient performance would be less than one. For inter-hospital comparisons then, it would be a simple task of identifying the relatively efficient performer by ranking the hospitals according to their index value. The more efficient performance would be reflected in a lower index value. Although this simple approach would provide the basis for evaluating productivity, it does require that the structure in which it is applied provide the basic incentive for efficient production, for the measurement itself does not contain an inherent or endogenous motivating factor. In the traditional market sector, the motivating factor is provided

in the form of the reward and penalty system of profit.

Although the above is not directly adaptable within the MHSS, the basic logic underlying the analogy is. However, as the review in the previous sections has demonstrated, there are three basic categories of problems to be addressed before such an approach could be adopted in the MHSS. The categories are the measurement of inputs, the measurement of outputs in relation to the inputs, and the application of the resulting measurements in an incentive structure. Therefore, it will be the purpose of this section to directly address these problem areas with the intent of identifying an acceptable performance indicator.

Prior to discussing a specific indicator or measure of productivity, however, it may be more appropriate to discuss the incentive structure. It has been demonstrated that, in the private health care sector, one method for circumventing the absence of an incentive for efficiency is to tie the reimbursement for services rendered by a hospital, in some fashion or another, to that hospital's relative efficiency (or a demonstration of a desire for efficiency). The reimbursing agencies were, in general, applying the reward and penalty approach with the intent of reducing or containing total cost (or the cost per patient illness). In theory, it seems the basic attempt was to force the individual facilities to seek their optimal input-output combinations such that they would be operating at the output level which would minimize their LRAC. Although there were questions raised regarding the equity of such an approach and the difficulty of implementing such an approach, at least one researcher's evidence suggested that the reward and penality approach of reimbursement may in fact favorably influence the long run average cost (or efficiency) of an institution.[58] And, for the MHSS, if it can be assumed that when each individual facility is operating on the

minimum point of its LRAC curve, then the MHSS, as a whole, will be operating on the minimum point of its LRAC curve, then there may be adequate justification for creating an endogeneous incentive structure which operates on a reward and penality system whose sanctions depend upon efficiency.

From a total system perspective, however, there may be occasions when higher management (e.g. at Level 3 or higher) will have to consider suboptimization in a component or facility in order to optimize the overall effectiveness of the total system (e.g. contingency requirements and/or specific operational requirements of the Line are perhaps examples which would require the addition of a function or service at a given facility which would be the constraining factor). Therefore, it is being suggested that: 1) Total system efficiency must be that which is considered within relevant constraints; and 2) The reward and penalty system should operate such that it will recognize the constraints requiring suboptimization.

When considering implementation of a reward and penalty system in order to provide an incentive for efficiency, it can be seen that there may be structural changes which are necessary. The examination of the current CONUS-based MHSS has revealed that the present historical workload budgeting approach for allocating resources along with its related authority and responsibility structure, may preclude implementation of an adequate reward system. Moreover, due to the fragmentation which exists within the structure, the implementation of an effective management control system which would allow seeking total system efficiency (e.g. such as intra-component trade-offs wherein the optimal mix of facilities and the optimal mix of services within a given facility are goals) would be difficult. Moreover, due to the relative degree of centralization which could exist, a total committment by the Level 5 managers and providers to the

objective of efficiency may be difficult to attain. Therefore, because of these inherent structural and management implications, a framework within which an incentive mechanism could be established was hypothesized. This hypothetical structure (see Figure 7), it is posited, could provide the basis for reducing the fragmentation and, in a large part, the ensuing difficulties. Thus, it is suggested that, due to the management process itself, no measure of performance, regardless of how accurately it reflects true operations, will be an effective management tool in and of itself. On the contrary, perhaps a less accurate performance measure may in fact be a more effective management tool if it is adopted and applied consistently with sound, basic management principles. This is contrasted with a "perfect measure" being used but where basic management principals are violated or ignored. Therefore, it is now suggested that: 1) A performance indicator must be, above all else, compatible to the structure within which it is to be applied if it is expected to elicit efficiency as well as reflect efficiency; and 2) The more accurate the performance indicator, the more effective it will be as a management tool. Therefore, the following discussion will address performance measurement within the MHSS given these two perspectives, assuming a structure relatively similar to that hypothesized in Figure 7.

B. THE MEASUREMENT OF INPUTS

It may be elementary to mention that a first crucial step in the measurement process is the identification and measurement of the inputs to the system. No measure which fails to address this issue can be expected to accurately reflect absolute or relative efficiency for comparative purposes. Both the MHCS and the GAO have demonstrated the

nature of the existing problems facing the MHSS at the time of their analysis in regard to the measurement of inputs. Basically, the MHSS did not have a compatable system in which costs could be adequately compared. Therfore, the first step in identifying a performance indicator will be the standardization of the accounting and reporting systems within the four separate components of the MHSS. Without a common data base from which cost (and productivity) is to be measured, an effective comparison of the performances within the MHSS cannot be made. As discussed earlier, this problem has been recognized and a solution is being sought. Therefore, it will be necessary to assume that the accounting structure will provide the necessary standardized data. Moreover, in order to relate the performance indicator to an incentive system, it is being assumed that the appropriate costs (e.g. controllable costs) can be segregated and traced to an appropriate set of cost objectives or centers. Although managers at all levels will retain an interest in the total cost of operation, when they are interested in efficiency they should perhaps be able to concentrate their attention to the area of controllable costs. Since managers or producers cannot in fact control the "non-controllable" cost of operations (e.g. those costs which were discussed within the context of suboptimization), they should neither be rewarded nor penalized for these costs. Because of the possible adverse effects upon incentives in the system which may be realized from failure to separate these costs elements, it may be indicated that the new accounting structure provide a standard methodology for making this distinction. A corresponding concept is, that for the controllable costs, responsible managers and providers should be held accountable for the costs. Moreover, in being held accountable, they should have the authority to control the elements of input which generate the cost. Then, based upon efficiency, adequate justification would exist for applying sanctions. Although

this may appear obvious, it is being suggested that for an incentive mechanism to be functional, a manager and provider must have the ability as well as the motivation to reduce the total amount of controllable costs within his realm of authority.

C. THE MEASUREMENT OF OUTPUTS

Again, it is elementary to point out that the next crucial step will be relating the inputs to the outputs of the system. As was stated earlier, there is no generally accepted methodology for measuring the output of any health care system. Therefore, due to this lack, the MHSS will be forced to resort to surrogate measures for output when creating a performance indicator. This, of course, is a major complicating factor in constructing an adequate measure of productivity. If true output was easily measurable, then an adequate indication could be determined by starting from the ratio in the proposed model (9). The development of this model depends upon output specification. Thus, it is essential that a surrogate measure for output be identified. But in the selection of surrogate measures, there may be several problems. For example, Anthony and Herzlinger have pointed out that, in the selection of a surrogate, caution must be exercised to insure that the surrogate does not become an objective in and of itself.[59] As has been seen, the CWU, as a surrogate for output, can become an objective for the managers in Level 5. That is, in order to justify future operating funds, the local managers may attempt to maximize their CWU and thereby relegate the objective for efficiency to a lower priority. Also, it has been seen that the Newhouse and Taylor suggestion for a VCI may operate similarly. That is, when the VCI is used to classify a given hospital into an expense rating group, the

manager could seek to improve his hospital's position and in doing so ignore efficiency. Under given conditions, managers could allow cost to rise and, as a result, improve their standing in relation to other hospitals. Therefore, because of the possibility that a surrogate measure can become an objective which is in conflict with the objective of efficiency, it is important that the surrogate be free as possible of characteristics which would allow manipulation by managers.

The traditional one dimensional measures, such as patient days, occupied bed days, admissions and discharges may contain an inherent problem if used for comparative purposes. That is, in comparing the admission of patients, it must be assumed that they are equivalent admissions. It should be apparent that this assumption may be invalid. Therefore, because of this lack of homogeniety, any surrogate which is selected should provide a basis for adjusting for the differences among the output of facilities. Because hospitals may vary according to both their inputs (e.g. quality) and the demands (e.g. case mix and complexity of cases), several methodologies for adjusting were examined. Basically, the methods centered around either grouping hospitals according to some scheme or else adjusting through the use of some statistical measure, or both.

Grouping hospitals according to some scheme relys upon the assumption that similar inputs imply similar outputs (e.g. case mix and complexity are similarly distributed in the facilities). Moreover, grouping usually assumes that as hospitals add services and additional capabilities, the nature of the output may vary. Moreover, grouping is usually accomplished according to a scheme of size (e.g. beds), teaching status or affiliations, and/or by kinds of services available. The necessary assumptions may not be

consistently valid. For example, a given MHSS hospital may not have a service capability identified in its formal organization or service classifications (e.g. Inhalation Therapy). Yet, even in the absence of this formal "capability", a hospital might be able to provide a limited quantity of this kind of output. Therefore, the grouping of hospitals, as a singular methodology, may not be an appropriate solution for the MHSS for adjusting case mix and complexity. Even in light of this, it may still be indicated to rely upon grouping facilities according to some scheme. For example, it is being assumed that within Level 5 there may be some relatively isolated ambulatory care facilities which may be required to provide a substantial amount of rather comprehensive outpatient treatment. These facilities, although dependent upon a major treatment facility for complex care, may be required to provide such services since it would be most convenient for the patient. That is, perhaps a patient requires only Physical Therapy treatments which would otherwise require admission if not available at his local dispensary. Due exclusively to the patient's own convenience, the facility might be required to maintain the capability for that kind of service. Yet, perhaps another set of circumstances might find the patient residing near a dispensary and the hospital at the same time. In that case, it would neither benecessary to admit the patient nor to require the local dispensary to maintain the capability of the service. Thus, when comparing the two dispensaries respectively, it could be expected that the overall or average cost for providing outpatient care would be higher in the first situation, other things being equal. This same logic could perhaps be applied to hospitals as well, due to expected savings (efficiency) from the economies of scale. By recalling the analogy which contrasted a CBC being performed manually versus by automation, it may be suggested that there will be circumstances such as this which, due to cost-effective consideration as a result of volume, will

perhaps allcw one hospital to be more cost-effective due to economies of scale. Therefore, because of these type of circumstances, it may still be necessary to group facilities in some fashion for the purpose of adjusting the particular circumstances and not just case mix.

However, since a grouping methodology alone may not be expected to make all of the necessary adjustments, it may still be necessary to employ a methodology which will further aid in discriminating by case mix and complexity. In assuming model (9) as the essential relationship to be developed, it is suggested that the output measure must be addressed in two ways: 1) First, the specific measure which is to reflect output (the surrogate) must be identified; 2) Then, the specific approach for adjusting must be selected. For example, in looking at the proposal offered by Edwards, an approach which incorporates the adjustment factors (e.g. case mix, size, teaching status, etc.) while defining the surrogate for output has been reviewed. One major advantage to be found in the Edwards' model, the Synthesized Case (SC), is that the hospital product incorporates ambulatory care. This is often ignored by other measures such as has been the case with all other methodologies which were reviewed, except for the CWU. If overall efficiency is being sought, then the measure for productivity should reflect ambulatory care. Since it is generally accepted that the cost of delivering ambulatory care is relatively less expensive than hospitalization, the measure should provide an incentive to deliver health care at the most appropriate level. And in the case of the military, Whipple has demonstrated that a combination of factor substitution and ambulatory care could provide an area for significant savings in the delivery of health care services to the MHSS beneficiaries.[60] But with incorporating ambulatory care in the output proxy, we have seen that the CWU provided a perverse incentive. This might be the case with the Edwards

SC model. By recalling his model (8), it can be seen that there may be an incentive to allow outpatient revenue (OPR) to rise. This incentive may be contrary to the intent. For example, since OPR is generated from ambulatory care, it may be assumed that there would be a direct impact upon inpatient utilization (e.g. upon C or IPR). That is, by treating more patients in the ambulatory care mode, OPR would rise relative to IPR, assuming that an increase in ambulatory care would mean a decrease in total admissions. Although this may be the case, it is not necessarily so. On the contrary, it is suggested that a manager, in order to improve the evaluation of his productivity (e.g. relationship of inputs to outputs), might have the incentive to allow the average charge of an outpatient visit to rise while holding all other factors constant. This would improve his hospital product in that it would reflect a higher output. Then, holding total cost constant, relative productivity would improve in that it would appear that the unit cost per hospital product would decrease. Thus, the incentive becomes one of raising outpatient charges and not necessarily that of seeking a less expensive mode for delivering care. Although the MHSS would be required to use average cost instead of average charge or revenue, the use of the SC as an output surrogate might not provide an adequate measure for indexing productivity. For example, by allowing total cost to rise proportionally to outpatient cost, while holding all other factors constant, a hospital manager could maintain a stable productivity index. That is, as outpatient costs rise, SC will rise proportionally to total cost. The resulting ratio between the inputs (total cost) and the outputs (SC) would be a constant, other things equal. Therefore, even if it may be an improvement over the CWU in that the perverse incentive disappears, there may be a lack of an incentive for controlling the cost of ambulatory care. This latter, it would appear, may not be compatable with an incentive for factor substitution in the

ambulatory care mode. Moreover, several of the variables used by Edwards may be questionable. For example, the use of SMSA and the profit classification of a hospital may not be applicapble to the MHSS. Therefore, to adopt his model would require a thorough validation based exclusively upon MHSS data. Thus due to the questionable varables and possibly the inherent manipulability, the SC may not be an adequate methodology for specifying output for developing a prcductivity index for the MHSS.

Other measures have relied upon selected weights or statistical composites in adjusting the case mix factor. For example, recall that Roguski reviewed three approaches wherein diagnostic category, hospital service, and diagnostic indices were used. The diagnostic category method dependended primarily upon simple averages of patient days while the hospital service approach depended primarily upon the simple average of patients (discharges) for each service. Neither of these approaches seem to offer an adequate specification of output for the MHSS. The diagnostic index approach, however, might provide a reasonable approach in specifying output if the measure included ambulatory care, which it does not. Since the specific weight chosen was ALOS, it seems reasonable to assume that it would be difficult to include ambulatory care in the model. This, again, would appear to limit its usefulness for the MHSS.

The CPHA proposal for an AEV and a RNU both depend upon an information system that can trace charges to individual patients or disease categories. For the MHSS, a methodology using this approach would require the ability to trace costs to individual diagnostic categories or patients. Although the capability of the cost accounting structure being developed at this time is unknown, the new system may provide this capability. But, even with assuming this

capability, the CPHA proposal is still deficient in that it too ignores ambulatory care. Moreover, using an average costing method, regardless of the surrogate output measure selected, contains an inherent difficulty in that it does not provide a true standard from which a productivity index, such as model (10), can be constructed. That is, as previously discussed, all hospitals could maintain a relatively stable ranking from the productivity index by allowing their average costs to rise proportionally to each other. Moreover, this relative comparison of hospitals essentially assumes that the overall average cost derived from the base is an optimal cost. That is, in the absence of a pre-set standard against which the overall average can be evaluated, there is no way to determine if this overall average is a "high" average or a "low" average.

D. A RECOMMENDED METHODOLOGY

Therefore, based upon these arguments, it is suggested that the above methodologies may not be entirely satisfactory for defining an index which is to depict productivity within the MHSS. However, there may be another approach for developing the model (10). The approach, which is to be described below, will depend upon the capability of answering the basic question: Given a particular set of observed activities occured at a hospital during a relevant period, what should that hospital have spent in performing those activities?

In its most simple form as ACTUAL COST/EXPECTED COST, an index is created which provides an answer to the basic question while at the same time: 1) Provides a standard (the Expected Cost); 2) It will adjust for case mix; 3) Provide a measure of relative efficiency of a hospital to itself and

to other hospitals; 4) Provide, as based upon the standards, planning information for all levels of management; and 5) If tied to a reward/penalty system, provide an incentive for seeking efficiency.

The major problem of the proposal to follow is the complexity inherent in identifying "expected cost" of the activities to be evaluated. It perhaps should be made explicit that expected cost as herein defined is not necessarily interchangable with "budgeted funding". The expected cost of the denomenator is actually determined from the various activities performed by the facility during the relevant period. For clarification consider the following:

STEP ONE

The first step would be to identify the range of possible activities that could be performed in any military hospital. The total range of activities might be specified as as the vector $X = (X_1, X_2, \ldots X_n)$, where X_i is the number of units of care in activity group i performed in the target hospital in a specified period. For capitation budgeting versus workload budgeting these units would be based on the catchment population characteristics and size and not on the maximum number which were performed. For management purposes, these activities could be grouped into categories as necessary (e.g. those associated with military requirements which are felt to be non-controllable, those relevant to the treatment of the enrolled beneficiaries, and those asscciated with training, etc.).

STEP TWO

Once the full range of possible activities has been specified, it would be necessary to identify the expected

cost associated with one unit of each individual type of activity. Although this may appear to be a highly complex process, it is being assumed that this capability will exist within a Capadation Budgeting information system. It is clear that the data necessary to implement the standards will have to be developed. However, it is envisioned that a Capitation Budgeting system which depends upon projected workload derived from demographic characteristics of an enrolled population would perhaps ultimately consider the cost associated with the various activities necessary to deliver health care services. Therefore, it may be reasonable tc assume that this data could be available in the future. Once the expected cost is determined, it would become the coefficient to be applied against the respective X_i. That is the cost of producing one unit of any X_i would be a function of the cost of the inputs needed to perform that activity. The total range of unit costs could be specified as $Y_i = Y_1, Y_2, \ldots Y_n$.

STEP THREE

Once the range of possible activities along with the standard or expected cost of performing one unit of the activities has been identified, then the denominator of the proposed index could be determined. That is, the total expected cost for a given hospital over a relevant period would be the sum of the products of the expected cost times the number of units of each activity performed, or:

$$(11)\quad \text{Expected Cost} = Y_1 X_1 + Y_2 X_2 + \ldots + Y_n X_n$$

STEP FOUR

The final step would be relatively simple. In forming the numeratcr of the ratio, the total expenses under consideration would be accumulated. Then the measure of productivity becomes:

$$(12)\quad PI = ACP/Y_i X_i ;$$

where Y_i = Unit Cost

X_i = Unit Activity

ACP = Actual Cost of the Period

PI = Productivity Index

There are perhaps several qualities regarding this approach which will further enhance its attractiveness. To begin, with adequate specification of the standards, the measure is relatively easily constructed. Since it depends upon a discrete category of activities which have been performed, it is suggested that it will provide a relatively easy data collection effort. Moreover, it will be just as easily understood by the managers and providers, and it will provide them with information for comparing their individual performances. That is, since the activities can be traced to individual departments or services, a set of internal indices can be formed and thereby provide the local manager with a tool for evaluating his own operations. Moreover, depending upon the speed of the accounting and reporting system, relatively timely feedback can be provided for monitoring current operations. Another area in which it is favorable is that it will not be easily manipulated. That is, since there is a set of standards from which the index

is created, unjustified variance from the standards will be highly visible. The greatest area for abuse will probably appear at the initial data collection stage. However, this is an area for management of personnel, and this area will be subject to inaccuracy regardless of the methodology selected. Moreover, with the specification of the activities which are considered "non-controllable", it will be relatively easy to remove those from the measure, with the assumption that they met the standard. Moreover, specification of the standards will enhance planning and budgeting at Level 3, 4, and 5 in the hypothesized MHSS structure.

Even with the above recognized advantages, it is anticipated that there may be valid arguments raised concerning the approach. For example, beyond the inherent difficulties associated with the complexity in identifying the standards, using a constant coefficient (Y_i) assumes a linear relationship over all ranges of output, when in fact there may be economies of scale such that the expected cost for a given activity might be more properly expressed as a non-linear relationship between the Y_i and the X_i, such as $(Y_i)(X_i)^a$. That is, the average cost per unit of output might decrease as volume of output increases. Therefore, it may be necessary to rely upon a scheme for grouping hospitals or facilities according to some peer grouping plan, such as the Berry method. Moreover, although providing for case mix adjustment, the approach may not be able to discriminate individual case complexity. Since it is possible that justified deviations from the standard may in fact occur, other methods for identifying this might be sought. This justification, it is suggested, would have to

come from outside the model. Another problem which may be encountered is that there may be no incentive to reduce the number of activities performed. Since the incentive is constructed such that it induces the managers and providers to perform an activity efficiently, there is no natural incentive to prevent the manager or provider from performing a "mountain of efficiency". Therefore, it may be necessary to depend upon a second measure to insure that "what was performed is what should have been performed". This measure could be determined from the per capita cost associated with the enrolled population. For example, it is assumed that Capitation Budgeting implies that a given amount of resources per enrolled beneficiary will be funded. Then, based upon the amount of total cost for the relevant period, a local manager's variance from the expected per capita cost could be determined. This would provide the second measure which will contain the necessary incentive for containing or reducing total cost. The ratio would be defined as:

(13) PCI = ACC/BCC;

where PCI = Per Capita Index
ACC = Actual Cost Per Capita
BCC = Budgeted Cost Per Capita

The final measure upon which the reward/penalty sanctions would be based would then be a combination of the PI index and the PCI index which were developed in the ratios in models (12) and (13), or:

(14) PM = (PI) x (PCI);

where PM = Performance Measure

This final measure (PM), it is suggested, contains the inherent incentives such that, when they are employed under a reward system structured within a MHSS as hypothesized from Figure 7, there will tend to be a motivation for the managers and providers to seek the efficient modes of delivering health care services to the eligible beneficiaries within the MHSS.

V. CONCLUSION

It is clear that the adoption of Capitation Budgeting within the MHSS will (still) require an effective management control system. Moreover, for an efficient system to exist, there will be a need to create an incentive system for efficient delivery of care, and then provide a basis for rewarding efficient performance. This requires an effective method for identifying productivity, but since output measurement of health care is difficult, management must rely upon input or process measures. The use of these as surrogates provides a challenging problem which has been addressed in multitude of approaches by health care economists. Since there appeared to be no completely compatable solution which could be directly adopted by the MHSS at this time, a rather complex proposal has been suggested. The proposal itself is not perfect, but it appears to capture the essential elements necessary for measuring relative productivity and provide the incentives which will motivate efficiency. Because of its several advantages, it is recommended as one of perhaps several workable solutions for the problem.

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