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AMBULATORY RESOURCE ANALYSIS PROJECT
SYNOPSIS OF MAJOR PROJECT TASKS

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Task Order Proponent: Lieutenant Colonel Stuart W. Baker, M.S.

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Health Affairs
Three Skyline Place, Room 1507
5201 Leesburg Pike
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Birch & Davis Associates, Inc.
8905 FAIRVIEW ROAD
SUITE 300
SILVER SPRING, MARYLAND 20910
(301) 589-6760

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6. Report on Ambulatory Care Case Mix Reporting and Data Elements for the Ambulatory Resource Analysis Project
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**COMPARATIVE ANALYSES OF AMBULATORY
MORBIDITY IN FOUR PATIENT POPULATIONS**

**Contract Number: MDA903-88-C-0071
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Task Order Proponent: Lieutenant Colonel Stuart W. Baker, M.S.

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This document was prepared by Paul Mermelstein, Project Director; David Bodycombe, Project Manager; Scott Armstrong, Lead Project Analyst; and Jim Love, Project Analyst.

July 1, 1991



Birch & Davis Associates, Inc.
8905 FAIRVIEW ROAD
SUITE 300
SILVER SPRING, MARYLAND 20910
(301) 589-6760

EXECUTIVE SUMMARY

The following report represents an analysis of differences in patient ambulatory care visit frequencies within populations representative of the direct and non-direct components of the Military Health Services System (MHSS) as well as the private sector. The organization of this executive summary parallels that of the overall report and includes the following segments:

- Introduction
- Methodology
- Results
- Discussion

This report represents the first step in presenting an integrated view of the total morbidity experience of MHSS beneficiaries.

1. INTRODUCTION

At present, no integrated mechanism exists for the collection of ambulatory care patient data in the direct and non-direct components of the MHSS. In Military Treatment Facilities (MTFs), save for demonstration and research projects, data collection is confined to the completion of the patient medical record. Uniformed Services Treatment Facilities (USTFs) have instituted automated data collection for their entire patient population, but this only represents a small segment of the active duty personnel who are the primary mission of the MHSS. The Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) program, representing non-direct care, maintains an extensive patient data system that focuses on health care claims.

The MHSS Coordinated Care Program (CCP) is placing greater responsibility on local MTF commanders to provide for the total health care needs of all MHSS beneficiaries within defined catchment areas. It is critical to the success of the CCP that MTF health planners have accurate information on the case-mix of their patient population so that they can anticipate needs and make informed resource allocation decisions.

2. METHODOLOGY

Morbidity has been defined to represent counts of ambulatory care visits according to their principal diagnosis. This approach is based solely on patients and reflects characteristics of the users of MHSS services. Consequently, this report does not reflect the incidence and prevalence of disease in the total beneficiary population. Population-based data are important for the planning of preventive services.

Given the time-sensitivity of this study, we have focused on available automated data sources. Four data sources, all associated with patients, were available:

- CHAMPUS
- USTF
- PRIMUS/NAVCARE
- Ambulatory Care Data Base (ACDB)

Due to the small number of observations in the PRIMUS/NAVCARE database (n=1,294), no age- or sex-specific analyses were conducted in this population.

In addition, to provide a basis for comparisons with the civilian sector, we employed data from the National Ambulatory Medical Care Survey (NAMCS).

3. RESULTS

We examined the unique aspects of ambulatory care utilization in the military service population in terms of general visit frequencies and in terms of specific age and sex groups. Some of the more significant findings are as follows:

(1) General

- **Visit Frequencies in Databases With a Large Active Duty Personnel Contingent Tend To Be Lower Than Those That Are Civilian-Oriented**--Military personnel are selected for their good health and are required to maintain a constant state of good health to be retained on active duty.
- **CHAMPUS Data Demonstrate Low Visit Frequencies for Physical Exams and Refractions**--Physical examinations are not authorized under CHAMPUS and are required within the direct care system for the periodic assessment of fitness for active duty. Benefits for eyeglasses and lenses are generally excluded from CHAMPUS and offered by the direct care system.
- **CHAMPUS Data Demonstrate High Visit Frequencies for Mental Disorders**--Outpatient mental health services within the direct care system are limited and more than compensated for by a comprehensive benefit for these services in CHAMPUS.

(2) Age-Specific Differences

For the most part, age moderates the degree of differences in visit frequencies between patient populations but not the general trends in these differences. Thus, for example, while the frequency of physical exams within the USTF database is consistently higher across all age groups, the frequency is at least 50 percent greater in only three out of five age groups.

The importance of age in explaining variations in visit frequencies was demonstrated by controlling for its effects with age-specific visit frequencies applied to a standard population. When the effects of age were controlled, nearly half of the main differences between the NAMCS and three study databases dropped out.

(3) Sex-Specific Differences

Sex does not appear to strongly affect visit frequencies for the 14 general diagnostic categories that were examined. Most of the major differences were consistent across sex groups, i.e., if they were large in one sex they were also large in the other. Even where differences were not viewed as large in both sexes, they were always consistent in the direction of their difference, either greater or lower than the NAMCS.

(4) Age- and Sex-Specific Differences

Differences between the NAMCS and the three study databases are much more dramatic at this level of analysis. However, analyses at this level are also more sensitive to coding problems and small numbers of observations in specific diagnosis-age-sex groups. The results at this level are generally supportive of the higher-level analyses.

4. CONCLUSIONS

The results suggest that the military does, in fact, have a different ambulatory visit distribution than the civilian sector. While similarities outweigh differences when only major body systems are considered and when the effect of age is taken into consideration, these differences cannot be ignored. Further, data from the three military databases are heterogeneous--they are almost as different from each other as they are from the NAMCS.

The results point out unique attributes of the military patient population that need to be considered in developing and applying case-mix classification schemes. However, these results at best represent an incomplete picture of ambulatory patient morbidity within the military. With currently available data systems it is impossible to develop a complete picture of patterns of ambulatory care use among MHSS beneficiaries. Dependents and retirees are relatively free to move between CHAMPUS and the direct care system. With our fragmented patient data we were unable to consistently pick up all the care provided to a given population and some patient care is liable to have dropped through the cracks. With improved data systems that are capable of tracking individual patients it should be possible to develop a far more accurate picture of ambulatory care utilization.

**ASSESSMENT OF THE UTILITY OF AMBULATORY
VISIT GROUPS (AVGs)
AS A TOOL FOR AMBULATORY RESOURCE
ALLOCATION WITHIN THE UNITED STATES
MILITARY HEALTH CARE SYSTEM**

Contract Number: MDA903-88-C-0071
Task Order No. 6-89/90

Task Order Proponent: Lieutenant Colonel Stuart W. Baker, M.S.

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Birch & Davis Associates, Inc.

8905 FAIRVIEW ROAD
SUITE 300
SILVER SPRING, MARYLAND 20910
(301) 589-6760

August 6, 1991

EXECUTIVE SUMMARY

The following report represents an assessment of Ambulatory Visit Groups (AVGs) as a tool for ambulatory resource allocation within the Military Health Services System (MHSS). This is the first of three reports that focuses on alternative approaches to ambulatory resource allocation. The next two reports will focus on Episodes of Illness and Ambulatory Patient Groups (APGs).

The organization of this executive summary parallels that of the overall report and includes the following segments:

- Introduction
- Methodology
- Results
- Conclusions and Recommendations

1. INTRODUCTION

The MHSS Coordinated Care Program (CCP) is placing greater responsibility on local Medical Treatment Facility (MTF) commanders to provide for the total health care needs of all MHSS beneficiaries within defined catchment areas. It is critical to the success of the CCP that MTF health planners have the necessary tools to manage the allocation of health care resources effectively.

The DoD has already developed a resource allocation methodology based upon Diagnosis Related Groups (DRGs) for inpatient care. An analogous tool for outpatients must also be developed. This report presents results of an assessment of the potential utility of AVGs as the basis for allocating ambulatory care resources to facilities within the MHSS.

Although relative weights have already been developed by the Health Care Financing Administration (HCFA) applying the AVG classification system to Medicare data, the military and Medicare patient populations are very different. Therefore, three data sets representing different military population groups and facility types were used in our assessment of AVGs. The three data sets used were:

- Uniformed Services Treatment Facilities (USTF)
- Civilian Health And Medical Program of the United States (CHAMPUS)
- Ambulatory Care Data Base (ACDB)

Since AVGs are encounter based, input databases must be at this level as well. The ACDB was collected as an encounter database, but the CHAMPUS and USTF databases needed to be converted into encounter databases. Resource measures, representing our key dependent variables, were not consistent across all databases and were, in fact, missing entirely from the USTF. CHAMPUS contained charge information and the ACDB contained self-reported provider time. In order to give all three databases a common resource measure, the mean cost for each procedure in CHAMPUS was attached to the corresponding procedure in the USTF and ACDB databases. After these steps were completed, the resource data in the three databases were trimmed of abnormal or outlying values to enhance their distributional properties.

2. METHODOLOGY

The main objective of this study is to assess the utility of AVGs. For our purposes, the utility of AVGs as a basis for allocating resources was assessed according to the following:

- Ability of the groups to predict resource use
- Ability of the groups to measure case mix
- Reasonableness of the AVG weights
- Correlation of AVG weights for each database with each other

For relative weights to be developed, dependent variables that measure resource use were needed. For each of the three databases, these resource measures were as follows:

- USTF: CHAMPUS-based charge data
- CHAMPUS: charge data
- ACDB: CHAMPUS-based charge data and self-reported provider time

There are limitations associated with the three databases, most of which were mentioned previously, such as the lack of actual charge data in the USTF and ACDB databases. The most important limitation, though, is the lack of facility cost data from any source. The CHAMPUS charge data are professional services fees and not facility costs. Without the facility cost data, the study focuses on the statistical properties of the group data and cannot be extended to include analyses of the financial impact of AVG-based resource allocation at the facility and catchment-area levels.

The methodology used to assess the utility of AVGs consisted of the following steps:

- The distributional properties of each database's resource measure were determined for each AVG
- Relative values were determined from CHAMPUS procedure charges and ACDB time values for each AVG, for each database

3. RESULTS

The results of our assessment are based on data that were logarithmically transformed and trimmed at plus and minus three standard deviations. Our analysis fell under the following three headings:

- **Measures of Central Tendency**--Each AVG should display a pattern of clinical similarity and resource intensity so that the level of variation between patients in the group is known and predictable. The homogeneity within each group is measured by the coefficient of variation (CV), a standardized measure of the total variation. A low CV means that resource use is similar for cases within the case-mix group. The range of CVs for the three databases is as follows:
 - ACDB (cost): 28.21 to 92.00
 - ACDB (time): 31.16 to 116.01
 - USTF: 54.62 to 81.34
 - CHAMPUS: 22.65 to 128.17

The CV was used as an indicator of the homogeneity of groups in terms of resources. The CV is computed as follows:

$$CV = 100(\text{standard deviation/mean}) \%$$

A low CV, defined as percentages less than 100 percent, suggests that the grouping is reasonably homogeneous. Further, the ranges of CVs developed from 1988 Medicare hospital outpatient department billing data (31 to 130) and from CHAMPUS (22.65 to 128.17) are similar--supporting the validity of this approach. Where the CVs are high, such as for AVG 1700 (malignancy) there are broad variations in illness severity and, thus, resource use.

- **Relative Values**--The relative values appear reasonable because there is a fair amount of variance among the values, a logical procedure hierarchy is apparent, and, as one would expect, the expensive procedures/visits have high weights and the inexpensive procedures/visits have low weights.
- **Association Between Estimators Of Cost And Time**--The correlation between the estimators of resource use and provider time is low. This is due mainly to the fact that the time variable was self-reported and discrete.

4. CONCLUSIONS AND RECOMMENDATIONS

Our conclusions with respect to four attributes used in assessing the utility of AVGs are as follows:

- **Ability Of Groups To Predict Resource Use**--There was a high level of internal consistency within AVGs as measured by CVs. For example, a large percentage of the top 25 most frequent AVGs in each of the databases had CVs less than 100. Further, there was considerable variation in resource weights among AVGs, which suggests that the groups actually reflect variations in resource use.
- **Ability Of Groups To Measure Case Mix**--AVGs were able to capture considerable case-mix detail in the military populations that were studied. Each of the three databases was able to classify one or more visits into a large percentage of the 438 AVG-2.0-MIL groups. For example, 92.2 percent of the groups were used by CHAMPUS. Also, only 1.8 percent of CHAMPUS visits were ungroupable. For the USTF, 21.4 percent could not be grouped, and for the ACDB, 8.3 percent.
- **Reasonableness Of AVG Weights**--Although AVGs were developed for a somewhat specialized population, Medicare, the weights appear to have face validity. Their validity is supported by the relationship of relative values between AVGs. For example, in CHAMPUS, surgical procedures have higher relative values, on average, than medical procedures. The mean relative value for a sample of surgical AVGs is 9.46, whereas the mean relative value for a sample of medical AVGs is only 0.89.

-
- **Correlation Of AVG Weights For Each Database With Each Other**--In terms of charges, the three databases show a high level of consistency. High correlation coefficients suggest that visit content is similar between databases. While we were disappointed in the correlation between the relative weights developed using charge data and the weights developed using provider time, as noted previously, the usefulness of the time variable is limited because it is self-reported and discrete.

In sum, AVGs show considerable promise as a tool for ambulatory resource allocation in the DoD. At this stage, however, it is impossible to establish whether or not AVGs are superior to other available tools. There are several advantages to AVGs. The AVG technology is mature, the data requirements are minimal, and the AVGs are simple. There are also disadvantages, which include the failure to address referred tests/procedures and, very important, the fact that the Health Care Financing Administration favors APGs, which will be assessed in a forthcoming report. Before a final judgment can be made regarding AVGs, the relative merits of AVGs versus other case-mix classification strategies need to be assessed in an actual or simulated effort to establish MTF-level resource requirements.

**ASSESSMENT OF THE UTILITY OF EPISODES OF ILLNESS
AS A TOOL FOR AMBULATORY RESOURCE ALLOCATION WITHIN
THE UNITED STATES MILITARY HEALTH CARE SYSTEM**

**Contract Number: MDA903-88-C-0071
Task Order No. 6-89/90**

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Birch & Davis Associates, Inc.
8905 FAIRVIEW ROAD
SUITE 300
SILVER SPRING, MARYLAND 20910
(301) 589-6760

August 9, 1991

EXECUTIVE SUMMARY

The following report represents an assessment of the utility of episodes of illness as a tool for ambulatory resource allocation within the Military Health Services System (MHSS). The organization of this executive summary parallels that of the overall report and includes the following segments:

- Introduction
- Methodology
- Results
- Discussion

This report presents results of an assessment of the potential utility of episodes of illness as the basis for allocating ambulatory care resources to providers within the MHSS.

1. INTRODUCTION

The MHSS Coordinated Care Program (CCP) is placing greater responsibility on local Medical Treatment Facility (MTF) commanders to provide for the total health care needs of all MHSS beneficiaries within a defined catchment area. It is critical to the success of the CCP that MTF health planners have the necessary tools to manage the allocation of health care resources effectively. The DoD has already developed a resource allocation methodology based upon Diagnosis Related Groups (DRGs) for inpatient care. An analogous tool for outpatients must also be developed.

Episodes of illness can encompass a time period over which a patient experiences symptoms or signs that are perceived as sickness or ill health. Given that our ability to define an episode is limited to data on the provision of health care services, we have chosen to focus on episodes of care that represent sequential and temporally associated health care services that were either requested by the patient or provided to treat a specific illness. Using this definition, an episode could represent a single office visit for an acute condition such as influenza or multiple visits for a chronic condition such as hypertension. For the former condition, the beginning and end points of the episode are distinct. In the latter, the time period would be predefined, e.g., one year. Resources could be allocated in terms of the norm associated with a particular episode or in accordance with clinical standards. Special resource allocation provisions may be instituted to reflect specific episodes that exceed standard levels of care.

2. METHODOLOGY

This assessment of episodes is based upon available DoD databases, specifically:

- Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) Database
- Uniformed Services Treatment Facilities (USTF) Database

These data sources have been used with success in our prior assessment of the utility of Ambulatory Visit Groups (AVGs)¹, one of the prevailing ambulatory case-mix classification methodologies. Unlike such mature technologies as AVGs, episodes of illness are still very much in a conceptual stage of development. A review of the literature revealed no successful attempt to exhaustively categorize ambulatory care into discrete episodes. Our intent is to determine whether episodes of care can be derived from the available data. In the process of developing episodes for one or more illnesses, we expect to uncover some of the problems that will need to be addressed in future more comprehensive efforts. To facilitate these efforts, we will identify strategies to aid in the resolution of the problems that are identified.

To test our ability to develop episodes of care using the CHAMPUS and USTF databases, we selected several candidate diseases, as defined by Ambulatory Visit Groups (AVGs), for which to create episodes. This method narrows the analysis to a clearly defined set of cases. The assumption is that, if episodes can be created and used to allocate resources for treatment of the candidate diseases, with further research it may be possible to create episodes for more diseases or conditions.

Criteria for selection of candidate diseases/conditions were established as follows:

- Importance for the DoD (high volume or resource intensive)
- Well-defined symptom(s)
- Standard and accepted course of treatment(s)
- Limited duration, preferably less than one year
- Discrete begin and end points

Use of the above criteria and a review of our previous assessment of AVGs² led to the final selection of AVG 806 (Wound, Fracture of Arm, Lower Leg, Shoulder) for analysis.

Due to the likelihood of multiple, nonrelated health problems and other complicating issues, we established bounding rules for defining these episodes:

- Candidate AVGs will be considered trigger AVGs that indicate a possible episode of care.
- Presence of unrelated care before the first occurrence of a trigger AVG indicates the definite start of an episode.
- Absence of unrelated care prior to the first occurrence of a trigger AVG indicates a *possible* start of an episode.
- The end of an episode is determined by the presence of unrelated care after the last treatment associated with the AVG.

¹Assessment of the Utility of Ambulatory Visit Groups (AVGs) as a Tool for Ambulatory Resource Allocation within the United States Military Health Care System, B&D/Solon, August 6, 1991.

²Ibid.

The presence of multiple problems within an episode could complicate resource allocation for care. Thus, assuming diagnosis and procedure coding is sufficiently complete to allow for identification of concurrent problems, such cases will be excluded from the analysis. If episodes are determined to be a viable option for resource allocation, methods for handling multiple problems within an episode will have to be developed.

3. RESULTS

All encounters for an individual who had at least one trigger AVG were examined. Our analysis concentrated on AVG 806 (Wound, Fracture of Arm, Lower Leg, Shoulder) as a trigger AVG. We chose AVG 806 in order to represent an episode of illness requiring multiple encounters, yet whose time span might not exceed the period of the data sets (CHAMPUS: one fiscal quarter; USTF: one year). We were able to successfully define and recognize episodes for AVG 806 in both data sets.

Once it was clear that episodes could be located in a given data set, the key problem was determining when an episode had begun and ended, i.e., whether the apparent episode was complete. Since broken bones, and broken arms in particular, require less than six months to heal, knowing that the initial visit was more than six months from the end of the data implied that we had a complete episode. However, as the episode may have been completed elsewhere, we could not rely on this as an indicator for either of the two data sets. Therefore, we considered two alternatives:

- Use CPT-4 codes to define episode begin and end points
- Use AVG codes to define episode begin and end points

In considering of the first alternative, there are specific codes for setting a bone and removing a cast. However, these codes were not routinely recorded for encounters in the two data sets. We then examined the second alternative of using the presence of unrelated AVGs before and after encounters for AVG 806 to define complete episodes. This second alternative proved feasible.

Using AVG 806, we were able to create a series of episodes that appeared to make clinical sense in that the procedures seemed appropriate, the intensity of resource use appeared to diminish over time, and the interval between visits grew as the case resolved. However, while the chosen cases exemplified the process required to create illness episodes, they were also exemplary of some of the types of problems likely to be encountered in such efforts, including the:

- Inability to consistently identify definitive start and end points
- Need for complete and accurate diagnostic and procedure data
- Potential lack of clinical specificity in the AVGs
- Need for clinician input

The analysis was also limited by the types of data that were available. The USTF database was constrained in its procedural detail and the CHAMPUS data was constrained in terms of its time period--three months.

4. DISCUSSION

Several important conclusions regarding episodes of care can be drawn based on this analysis:

- AVGs alone are not useful in developing episodes. They group together body systems (arms and legs) that, while similar for a single visit, require quite different patterns of care. When multiple procedures are performed during a visit, AVGs are still assigned using only the diagnosis and principal procedure. If a secondary procedure, related to the episode in question, this information would not be included in the analysis files.
- An episode of care's begin point should be based on a specific event, such as a specific CPT-4 code, though other indicators can be used for research purposes.
- Specific episode delineations need to include at least patient age. Clearly, older patients require much more rehabilitative care for at least some conditions than younger people. A broken leg may be quite serious for an elderly adult, but not for a child.

Perhaps most important, this work raises the issue of the basic strategy that should be employed in considering episodes of care. Two strategies are possible. The first strategy used the DRGs (and the AVGs) as the basic model. Here the definition includes all services within the episode even when certain services are provided only to some of the individuals involved. For example, if one were to define "broken leg" as an episode, then whirlpool treatment would be included in this definition at some fractional allocation rate because this is provided to older people with broken legs but not to younger people. This particular problem can be handled by using age as one of the classification dimensions.

However, how should an expensive yet necessary test, performed for one in one thousand cases, be handled? This problem requires a different strategy such as the APGs "partial visits" approach. In this case, one could define clinically coherent episodes of care that would be applicable to the bulk of care provided. In addition, one would provide additional resources for unusual cases where special tests (etc.) were needed. This stratagem incorporates potential resource utilization outliers into the process of defining the categories, rather than adjusting the system later with allocation policies. This would greatly simplify the problem of defining specific episodes since unusual cases can be included while preserving their uniqueness.

The benefits of adopting an episode case-mix classification approach for enhanced clinical management and resource allocation are very large, and one does not need to cover 100 percent of the cases in order to reap these benefits. In terms of utility to the DoD coordinated care initiative, episodes are of particular interest in that they are more inclusive, and thus potentially more applicable to capitation, than other potential case-mix classification schemes that have been considered. They are not a panacea; depending on the design of the resource allocation mechanism, they may induce providers to draw greater distinctions between visits in terms of diagnoses in order to get credit for the more resource intensive episodes, as well as possibly reducing efficiencies realized in the treatment of multiple conditions during one visit. Nonetheless, episodes of illness warrant further pursuit as a potential clinical management and resource allocation tool for the future.

**ASSESSMENT OF THE UTILITY OF
AMBULATORY PATIENT GROUPS (APGS)
AS A TOOL FOR AMBULATORY RESOURCE
ALLOCATION WITHIN
THE UNITED STATES MILITARY HEALTH CARE SYSTEM**

**Contract Number: MDA903-88-C-0071
Task Order No. 6-89/90**

Task Order Proponent: Lieutenant Colonel Stuart W. Baker, M.S.

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Birch & Davis Associates, Inc.
8905 FAIRVIEW ROAD
SUITE 300
SILVER SPRING, MARYLAND 20910
(301) 589-6760

September 3, 1991

EXECUTIVE SUMMARY

The following report represents an assessment of Ambulatory Patient Groups (APGs) as a tool for ambulatory care resource allocation within the Military Health Services System (MHSS). This represents the last in a series of three assessments of case-mix classification approaches that included Ambulatory Visit Groups (AVGs) and episodes of illness.

This executive summary parallels the structure of the main report and, thus, includes the following sections:

- Introduction
- Methodology
- Results
- Conclusions and recommendations

1. INTRODUCTION

The MHSS Coordinated Care Program (CCP) is placing more authority and responsibility for health care delivery management decisions on local Military Treatment Facility (MTF) commanders. In order to manage care effectively, MTF commanders will need additional tools to support the allocation of health care resources. Case-mix classification methods facilitate the definition of products of health care that are like other commodities, permitting the use of market-oriented models that have long been used successfully elsewhere in the economy. In general, such methodologies group together certain provider visits or procedures that can be expected to require similar levels and types of resources.

Resource allocation for inpatient care within the DoD relies on Diagnosis Related Groups (DRGs), a method for case-mix classification that is widely used elsewhere in the Federal Government (e.g., Medicare and Medicaid) as well as throughout the private sector. An analogous tool for outpatients must also be developed. This report presents an assessment of one such tool, Ambulatory Patient Groups (APGs), that is likely to be adopted by the Health Care Financing Administration (HCFA) for the Medicare prospective payment system.

APGs classify patients that are expected to require similar resources in terms of both professional and facility costs into clinically meaningful groups. APGs are visit based and classify both surgical and nonsurgical outpatient care in all ambulatory settings, including physicians' offices, hospital or freestanding outpatient clinics, hospital emergency rooms, and ambulatory surgery centers. There are three types of APG: (1) procedure, (2) ancillary service, and (3) medical.

A key attribute of APGs is that more than one may be assigned to a given patient visit depending upon the types of health care procedures that are undertaken. In some instances, these procedures may occasion the assignment of a separate APG. In other instances, procedures may be bundled within a particular visit and not warrant a separate APG.

2. METHODOLOGY

The following three data sets representing different military population groups and facility types were used in this assessment:

- Uniformed Services Treatment Facilities (USTF)
- Civilian Health And Medical Program Of The United States (CHAMPUS)
- US Army Ambulatory Care Data Base (ACDB)

Resource measures were not available consistently from these data sets. CHAMPUS contained charge information and the ACDB contained self-reported provider time. In order to give all three databases a common resource measure, the mean cost for each procedure in CHAMPUS was attached to the corresponding procedure in the USTF and ACDB databases.

The utility of APGs as a basis for allocating health care resources was assessed according to the following criteria:

- Ability of the APG to measure case-mix
- Ability of the case-mix groups to predict resource use
- Reasonableness of the APG weights in reflecting real differences in terms of medical service intensity
- Correlation of APG weights for each database with each other

The computation of relative values for comparing resource use between case-mix groups was complicated by the fact that more than one APG could be assigned per encounter. A method of discounting was adopted to minimize the duplication of fixed costs across visits.

The following four-step process governed the assessment:

- Step 1--Determine, for each APG, the distributional properties of each database's resource measure. Trim values that occur at the extremes of the distribution.
- Step 2--Compute relative values associated with each encounter for which only one APG was assigned.
- Step 3--Repeat step two for all visits with two nonbundled APGs and compute the discount.
- Step 4--Correlate the relative values developed from each of the three databases.

3. RESULTS

The principal results are as follows:

- **Ability To Categorize DoD Case-Mix**--All visits were classified into one of the three main APG groups (medical, significant procedure, ancillary procedure). The CHAMPUS and ACDB case-mix was similar, with a relatively high

percentage of medical visits. The USTF, with its somewhat older and more chronically ill patient population, had a very high percentage of ancillary-procedure-only visits.

- **Assessment Of The Validity And Homogeneity Of Cases Within Each Case-Mix Group**--The distribution of APGs reflects the population demographics and known morbidity represented by the databases. For example, given the relative youth of the CHAMPUS population as well as the high frequency of visits known to be associated with mental illness,¹ we would expect and, in fact, find the most common APGs to include childhood illnesses, injuries, and mental problems. The ACDB population, also relatively young and active, shares a lot of APG traits with the CHAMPUS population. The most important APGs generated from the USTF database demonstrate a different illness pattern, including more chronic illness and tests, that reflects the fact that it is an older patient population.

The homogeneity of encounters within APG categories as measured by the coefficient of variation (CV) was found to be fairly high for the most common and most frequent APGs in each database.

- **Presentation Of APG-Specific Relative Values (RVs)**--The relative value expresses the cost of a particular APG in terms of the CHAMPUS cost of the average visit or in terms of the provider time of an average visit for the ACDB. The relative values show considerable face validity across all databases. Those types of visits that are likely to be more service-intensive do tend to require more resources. For CHAMPUS, relatively large RVs were associated with psychotherapy, orthopedics, injuries, and diseases of the central nervous system. Among financially important APGs in the USTF, some very high RVs were found associated with complex tests (e.g., diagnostic endoscopy) as well as cataract procedures. ACDB results share a lot of features with CHAMPUS.
- **Examination Of The Association Between Estimators Of Cost And Time**--The correlation between our estimators of resource use and provider time was 0.159. This is extremely low, an indication that there is little association between the relative values. In contrast, the correlation between CHAMPUS and ACDB charges is 0.839, a reasonable value but one that is expected since ACDB costs were derived from CHAMPUS procedure costs. Provider time does have limitations in that it was self-reported and reported in five-minute intervals.

4. CONCLUSIONS AND RECOMMENDATIONS

This preliminary assessment of APGs suggests that they should serve as a useful tool for resource allocation within the DoD. DoD health care visits proved to be categorizable in terms of their case-mix, and the resultant APGs appear to represent a wide range of clinical practice. Further, the derived groups appear to make sense in terms of the amount of resources that would be expected for particular visits and to differ meaningfully between APG categories.

¹*Comparative Analyses of Ambulatory Morbidity in Four Patient Populations*, B&D, March 1991.

The results are not conclusive regarding the merits of APGs. The numerous data-related problems that were encountered suggest that the adoption of APGs will necessitate much more rigorous coding standards in the MHSS. The lack of correlation between cost and provider time is troublesome and warrants further analysis. Revisiting this issue using the Hsiao resource-based relative values weights will be useful. The fact that HCFA has just implemented a new fee schedule for Medicare based on the Hsiao weights adds weight to this argument. In addition, the data used for this project, while adequate for the tasks at hand, are not adequate for setting allocation rates since they do not reflect the provision of care throughout the MHSS, cover different time periods, are incomplete, and are potentially error-prone. The data will not support the kind of catchment area analysis that will be necessary for MTF commanders to make informed decisions under the Coordinated Care Initiative. Unfortunately, complete and accurate ambulatory care data are unavailable and are likely to remain so for the near term. In the absence of these data, an effort should be made to simulate catchment areas based upon these existing data sets so that the impacts of adopting alternative case-mix classification systems may be better appreciated.

LINKING INPATIENT AND OUTPATIENT RELATIVE WEIGHTS

**Contract Number MDA903-88-C-0071
Task Order Number 6-89/90**

Task Order Proponent: Lieutenant Colonel Stuart W. Baker, MS

Submitted To:

**US Department of Defense
Office of the Assistant Secretary of Defense
Health Affairs
3 Skyline Place, Room 1507
5201 Leesburg Pike
Falls Church, VA 22041-3201**

This document was prepared for Birch & Davis Associates, Inc., by Paul Mermelstein, Project Director; David Bodycombe, Project Manager; Scott Armstrong, Lead Project Analyst; and Jim Love, Project Analyst; for Solon Consulting Group, Ltd., by James Vertrees, Senior Research Analyst; and K.C. Mitchell, Research Analyst.



Birch & Davis Associates, Inc.
8905 FAIRVIEW ROAD
SUITE 300
SILVER SPRING, MARYLAND 20910
(301) 589-6760

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EXECUTIVE SUMMARY

The following report presents a methodology for relating inpatient and outpatient relative weights for resource allocation within the Military Health Services System (MHSS). The organization of this executive summary parallels that of the overall report and includes the following segments:

- Introduction
- Methodologies
- Conclusions and Recommendations

1. INTRODUCTION

The MHSS Coordinated Care Program (CCP) is placing greater responsibility on local Medical Treatment Facility (MTF) commanders to provide for the total health care needs of all MHSS beneficiaries within defined catchment areas. It is critical to the success of the CCP that MTF health planners have the necessary tools to manage the allocation of health care resources effectively. The DoD has already developed a resource allocation methodology based upon diagnosis related groups (DRGs) for inpatient care. An analogous tool for outpatients must also be developed. Once this tool has been developed, it must be integrated with the current inpatient care resource allocation methods. This report presents a discussion of the methods proposed for the relation, or linking, of inpatient and outpatient weights as the basis for allocating health care resources to providers within the MHSS.

2. METHODOLOGIES

The design of the current Ambulatory Work Unit (AWU) system was limited by the clinical and procedural detail available at the single-visit level. However, this limitation should soon cease to be a factor since significant improvements to MTF data systems are currently planned. On behalf of the DoD, Birch & Davis Associates, Inc., and the Solon Consulting Group, Ltd., have jointly evaluated the potential utility of two current outpatient care classification systems, Ambulatory Visit Groups (AVGs) and Ambulatory Patient Groups (APGs). These systems are being considered for implementation DoD-wide to support resource allocation efforts and will entail enhanced ambulatory data capture.

At present, we have developed preliminary weights for each of these outpatient classification systems. However, these weights have been scaled so that the average visit has a weight of 1.0. While this is convenient for exposition, it does not allow the inpatient and outpatient weights to form a single consistent series appropriate for workload measurement and resource allocation for facilities as a whole.

These preliminary AVG and APG weights are based on either reported billed charges (CHAMPUS) or self-reported provider time (ACDB). In addition to these weights, it is important to note that Medicare will implement a new set of weights in January of 1992. These weights, developed by William Hsiao, PhD, at Harvard University School of Public Health,¹

¹*Medicare Program; Fee Schedule for Physicians' Services, Federal Register--Proposed Rules, Vol. 56, No. 108, June 5, 1991, pp. 25792-25862.*

reflect the resources (physician work, practice and malpractice expenses) required for a particular procedure, and are known as Resource-Based Relative Value Scales (RBRVS) for physician services. Since the RBRVS are developed from different data and reflect a different resource representation method, these relative values would likely need to be rescaled to form a consistent inpatient-outpatient series. The methodology described in Chapter II may apply to any set of inpatient or outpatient relative values, as long as both are to be applied to the same cost centers.

The scaling of outpatient weights such that an outpatient visit is expressed in terms of an inpatient disposition is relatively straightforward. Indeed, the principles applied in our methodology have not altered the basic approach currently being used by the DoD.² This approach entails converting the outpatient visit weights to a set of weights additive to the inpatient weights. This is done by multiplying the outpatient visit weights by the ratio of the average cost per outpatient visit to the average disposition cost. Once converted, both an outpatient and inpatient weight of value one represent the cost of the average disposition. The five basic steps to derive the final adjusted weights are described in Chapter II, as is an alternative method using multivariate regression analysis.

3. CONCLUSIONS AND RECOMMENDATIONS

We have presented a straightforward methodology for linking any outpatient relative weight to inpatient weights. We did not alter the basic approach as presented by Optenberg et al. in 1990.³ While a few possible refinements are discussed, these cannot be properly evaluated without actual visit-level MTF data. We have included techniques to allow for separate or combined inpatient and outpatient peer groups. We have also presented an alternative to peer groups--a regression function--that might possibly prove more useful than peer groups by simultaneously considering the effects of multiple variables.

In the future, it may be desirable to consider two additional policy issues. First, the approaches in this report do not inherently provide incentives favoring outpatient over inpatient care. Instead, they are neutral in this regard. Given a lack of inpatient capacity or a significant cost-benefit of outpatient care, providing these incentives may be desirable and could be implemented by scaling the workload values appropriately. Second, under our current allocation scenarios the MTF commanders rely upon allocation methodologies based on average costs, not marginal costs. Alternatively, activities could be funded a base amount to cover the basic MTF operating costs, and then funded for services provided at marginal cost plus a small amount. This would give the commander an incentive to purchase services available for a lesser amount. This practice should lead to the acquisition of services from the most economical sources in a given market. Since the DoD may be considered a small purchaser in most civilian markets, particularly in foreign countries, hospitals and clinics should be willing to sell services at a price slightly above their marginal cost. Health maintenance organizations (HMOs) implicitly use this concept in negotiating rates for their enrollees.

²Optenberg, Coventry, Baker, "A Specialty-Based Ambulatory Workload Classification System," *Journal of Ambulatory Care Management*, 13(3), July 1990, pp. 29-38.

³Ibid.

**REPORT ON
AMBULATORY CARE CASE MIX
REPORTING AND DATA ELEMENTS
FOR THE AMBULATORY RESOURCE
ANALYSIS PROJECT**

**Contract Number: MDA903-88-C-0071
Task Order No. 6-89/90**

Task Order Proponent: Lieutenant Colonel Stuart W. Baker, M.S.

Submitted To:

**U.S. Department of Defense
Office of the Assistant Secretary of Defense
Health Affairs
Three Skyline Place, Room 1507
5201 Leesburg Pike
Falls Church, VA 22041-3201**



Birch & Davis Associates, Inc.
8905 FAIRVIEW ROAD
SUITE 300
SILVER SPRING, MARYLAND 20910
(301) 589-6760

May 1, 1991

EXECUTIVE SUMMARY

This report presents results of research and analyses performed for the Department of Defense (Health Affairs), Resource Analysis and Management Systems (RAMS) office, regarding trends in ambulatory care data collection, standard record development, and reporting. The organization of this executive summary includes the following segments:

- Introduction
- Methodologies
- Results
- Conclusions and Recommendations

1. INTRODUCTION

The activities performed in this assessment addressed three tasks that are a part of the Ambulatory Resource Analysis Project (ARAP), and are indirectly related to the Coordinated Care Automation Initiative. ARAP tasks addressed here are:

- Identify Potential Case-Mix Report Requirements
- Provide Input to the Department of Defense Standard Ambulatory Data Record (SADR)
- Study Relationships Between DoD and Civilian Ambulatory Care Reporting

This material is not intended to represent system design specifications or requirements, but a general statement of requirements and features that define a concept of operational capabilities for ambulatory care support within MHSS.

2. METHODOLOGIES

Data and conclusions presented in this report are the result of a data collection effort that included literature searches, interviews with key DoD representatives, interviews with private sector representatives, surveys of selected private sector organizations, reviews of selected software vendors, summarization and analysis of data, review of initial findings by DoD representatives, and the modification or clarification of findings and conclusions based on comments received from reviews of our initial findings.

3. RESULTS

The composite view of ambulatory care systems support identifies a lack of consistency in data collection, the inability to effectively monitor services and activity, and a disparity between systems supporting care provided to individuals on an ambulatory basis. Ambulatory care data are not uniformly collected and workload reporting presents only a high-level indication of services provided--typically identifying only the number of patients seen. While patient scheduling and clinical systems are used, there is virtually no integration of data, which is critical to successful management and control. These shortcomings in critical areas typify both military treatment facilities and private sector organizations and facilities.

4. CONCLUSIONS AND RECOMMENDATIONS

The key element in providing efficient and effective ambulatory care support into the future is support system flexibility, flexibility in analyses performed, flexibility in computational algorithms, and flexibility in reporting for all levels of an organization. Additionally, data collection efforts must not adversely affect the health care providers' delivery of care. Specific to DoD system support, data collected by DoD and private sector facilities must be compatible to allow support and evaluation of MTF, USTF, and CHAMPUS programs. Our report identifies five types, or classes, of reports that will provide information needed for effective ambulatory care management into the future:

- Patient/visit counts that enumerate the number of patients and visits
- Encounter Reports that expand on basic counts to identify the number of encounters with health care providers during a visit
- Service Usage Reports that provide information on the usage of services such as laboratory
- Workload Reports that provide case-mix information
- Cost/Change Reports that will facilitate analyses of costs and charges associated with services provided

In terms of data records, we found that the current Standard Ambulatory Data Record (SADR) presents a data set that will support efforts to increase effective control of ambulatory care programs. Additional elements are suggested to further capabilities for both the short- and long-term.

COMPARATIVE ASSESSMENT OF SIX CASE-MIX CLASSIFICATION SYSTEMS WHEN APPLIED TO SIMULATED DoD POPULATIONS

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Task Order Proponent: Lieutenant Colonel Stuart W. Baker, M.S.

Submitted To:

U.S. Department Of Defense
Office of the Assistant Secretary of Defense
Health Affairs
Three Skyline Place, Room 1507
5201 Leesburg Pike
Falls Church, VA 22041-3201

This document was prepared by Paul Mermelstein, Project Director; David Bodycombe, Project Manager; Scott Armstrong, Lead Project Analyst; Jim Love, Project Analyst; and Anthony Avers, Project Analyst.



Birch & Davis Associates, Inc.
8905 FAIRVIEW ROAD
SUITE 300
SILVER SPRING, MARYLAND 20910
(301) 589-6760

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EXECUTIVE SUMMARY

The following report presents the results of a comparative analysis of six case-mix classification systems when applied to a simulation of DoD patient populations. This represents the culmination of a series of reports that assessed each of the case-mix classification schemes.

This executive summary, which parallels the structure of the main report, includes the following sections:

- Introduction
- Methodology
- Results
- Conclusions and Recommendations

1. INTRODUCTION

The purpose of this effort was to assess which of six case-mix classification methodologies was most effective as a tool for allocating ambulatory care resources within the DoD. The following case-mix classification schemes were tested using simulated Medical Treatment Facility (MTF)-level data:

- Ambulatory Work Units (AWUs)
- Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) visit charges
- Ambulatory Visit Groups (AVGs) based on CHAMPUS charges
- AVGs based on the Resource-Based Relative Value Scale (RBRVS)
- Ambulatory Patient Groups (APGs) based on CHAMPUS charges
- APGs based on the RBRVS

In order to facilitate a comparative assessment of these competing classification schemes, we created 12 "simulations." Of these 12 simulations, six represent the ambulatory patient case-mix of MTFs derived from the demographic profiles of actual facilities and morbidity data from three study databases. An additional six simulations were created to test the sensitivity of the various case-mix classification schemes to patient population extremes.

The objectives of this present effort were to (1) simulate the health care utilization of actual as well as demographically unique MHSS service populations, (2) conduct a comparative assessment of alternative case-mix classification methodologies in describing ambulatory care resource use within simulated service populations, and (3) use the RBRVS as a substitute for CHAMPUS dollars in computing resource use.

2. METHODOLOGY

In order to facilitate the comparison of the case-mix classification schemes, we created 12 simulation databases containing 2,000 patients and a year's worth of their encounter data. The first six simulations were based on actual MTF demographics, while the second six represented special scenarios.

2.1 Creation Of Simulation Patient Records

In an effort to provide diversity, the decision as to which MTF facilities to simulate was made based on the following:

- MTF demographics taken from Deers/RAPS
- The need for a mix of Army, Navy, and Air Force facilities
- The need for a mix of Medical Centers and Community Hospitals

In order to highlight the reactions of the classification schemes to specific populations, the following six special scenario simulations were developed:

- Children (Age<15)
- Adults (Age 45-64)
- Active Duty
- Complex Case-Mix Visits
- Women of Childbearing Age (Age 18-44)
- Over 65 Years of Age

To create the simulation databases, we took the following steps:

- We created a patient selection list based upon the unduplicated patients found in our three study databases (1) the Uniformed Services Treatment Facilities (USTF) database, (2) the CHAMPUS database, and (3) the Ambulatory Care Database (ACDB).
- We randomly selected 2,000 patients from the simulation patient selection list for each of the scenarios to be simulated based upon stratum (age and sex) and beneficiary status (active duty or other), except for the complex case-mix simulation, which was based on visits with high relative values.
- For the selected patients, we retrieved all of their encounters from their respective databases.
- Based upon each record's source, we attached a weighting variable to create an approximation of one year of data.
- We then used an algorithm to add procedures to visits that did not have them.

There was one deficiency that could not be effectively addressed in this five-step process. The databases (i.e., ACDB, CHAMPUS, and USTF) failed to adequately reflect pregnancy visits because these visits were often bundled with data for the actual delivery. Therefore, we took the following extra steps in creating the simulation for women of childbearing age:

- Patient data were randomly adjusted to reflect age-specific fertility rates provided by the National Center for Health Statistics.
- Standard initial and follow-up prenatal care visits were constructed based upon guidelines of the American College of Obstetrics/Gynecology, the American Public Health Association, and the opinion of a medical records expert. (See Appendix B for the specifics on these visits.)
- The number of visits assigned to each "pregnant" woman was then decided probabilistically for a one-year study period. In other words, each pregnancy could have occurred fully or partially during the one year of inquiry and, thus, the number of prenatal care visits was varied to reflect the interval within the study period.

2.2 Development And Attachment Of Resource Measures

After the patient encounter information had been compiled for each simulation, steps had to be taken to attach the different case-mix classification weights to each visit, so that an analysis of the effects of the various simulations could be performed. These steps were:

- Develop AVG and APG relative values based on Hsiao's RBRVS
- Group all visits and attach each of the resource measures--mean CHAMPUS billed charge, CHAMPUS dollar-based AVG and APG relative values, RBRVS-based AVG and APG relative values, and AWU weights

2.3 Analytical Approach

There were two steps taken in analyzing the simulation data. First, for each simulation, the top 10 diagnoses, procedures, AVGs, APGs, and Uniform Chart of Account (UCA) codes were compiled along with a graphical representation of the demographics. (This information is provided in Appendix D.) These characteristics were then analyzed to assess the face validity of each simulation. Second, standardized weights for each case-mix classification scheme were calculated for each simulation, so that the results could be compared across simulations as well as allocation schemes.

2.4 Limitations Of The Simulation

The limitations of this simulation, for the most part, stem back to the three source databases (ACDB, CHAMPUS, and USTF) and have been documented in past reports. Since we were able to overcome almost all of the data limitations that we encountered, the results of the simulation showed excellent face validity and should prove to be useful to the DoD in choosing a case-mix classification system.

3. RESULTS

3.1 Characteristics Of Each Simulation

Before we could undertake any analyses regarding the case-mix classification schemes, a thorough assessment of the validity of each simulation was performed in terms of selected population characteristics.

3.1.1 Facility-Specific Simulations

All of the facility-specific simulations are numbered in order to ease the presentation of results, as follows:

- Simulation 1--Community Hospital
- Simulation 2--Medical Center
- Simulation 3--Medical Center
- Simulation 4--Community Hospital
- Simulation 5--Community Hospital
- Simulation 6--Community Hospital

The demographics of these simulations were tailored to reflect the service populations of actual MTFs and, therefore, show good face validity. Also, since the populations are not radically different, it would be expected that the top 10 diagnoses for each of the facility-specific simulations should be very similar. This was indeed the case.

3.1.2 Special Scenario Simulations

The simulation numbers and the special scenario that they represent are as follows:

- Simulation 7--Children
- Simulation 8--Active Duty
- Simulation 9--Women of Childbearing Age
- Simulation 10--Adults
- Simulation 11--Over 65 Years of Age
- Simulation 12--Complex Case-Mix

These simulations yielded case-mix patterns that were commensurate with their age distributions.

3.2 Results Of Analyses Of The Case-Mix Classification Schemes

Analyses of the results of applying the six case-mix classification schemes to each of the simulations provided some insights into the characteristics of each allocation strategy.

3.2.1 Facility-Specific Simulations

The results of our analysis of the case-mix classification schemes as applied to the facility-specific simulations are shown in Exhibits III-1, III-2, and III-3. The most prominent results of this analysis were the following:

- There was a relatively high degree of homogeneity between allocation methodologies in terms of resource intensity. However, the effect of choosing one alternative over another could change the level of a resource budget by plus or minus 8 percent.
- AWUs were the least sensitive to facility-specific differences in case-mix.
- Measures based on CHAMPUS-billed charges are most sensitive to facility-specific differences in case-mix, as one should expect, because of the overall greater dispersion of raw CHAMPUS dollars.
- RBRVS-based measures show a constrained variation more comparable to AWUs, because the raw RBRVS weights do not vary as much as raw CHAMPUS dollars.

3.2.2 Special Scenario Simulations

The results of applying the case-mix classification schemes to the special scenario simulations are shown in Exhibits III-4, III-5, III-6, and III-7. The most prominent results of this analysis were the following:

- As with the facility-specific simulations, the following results were once again evident.
 - AWUs were the least sensitive to facility-specific differences in case-mix.
 - Measures based on CHAMPUS-billed charges are most sensitive to differences in case-mix, as one should expect.
 - RBRVS-based measures show a constrained variation more comparable to AWUs.
- There was high face validity in terms of expected behavior of the case-mix methods.
- Excluding the complex case-mix simulation, the Over 65 Years of Age simulation is highest in resource intensity regardless of the case-mix system employed.
- Alternatively, the simulation of Children had the lowest indices of resource intensity.

- Neither APGs nor AVGs offered any resourcing advantages regarding Active Duty Personnel. This may be because AWU weights are based upon all population segments in each clinic. Since active duty personnel generally represent the healthier segment of a population, their visits usually require fewer resources than average in each clinic.
- Only RBRVS-based APGs were not advantageous to Women of Childbearing Age.
- AWUs were by far the least sensitive to the complex case-mix simulation.
- The simulation of complex case-mix visits yielded the highest resource values of all the simulations, regardless of the case-mix system.

4. CONCLUSIONS AND RECOMMENDATIONS

The results of our analysis do not conclusively point to any of the case-mix classification methodologies as being clearly superior. Each of the systems has its merits and its drawbacks, although none of the systems has a weakness that is serious enough to completely exclude it from consideration.

For measuring resources, we feel that the RBRVS is better than CHAMPUS dollars because it:

- Represents a more comprehensive approach to costing, that considers three dimensions of physicians' charges: (1) physician time, (2) technical overhead (office staff, rent, and supplies), and (3) malpractice insurance.
- Eliminates distortions in current RVs.
- Mitigates differences by Specialty.
- Encourages "cognitive" medicine.

Given that none of the specific systems has deficiencies that would make them unusable, the selection of one method should reflect the DoD's desired incentives. Based on our analysis, we feel that APGs is the best case-mix classification system for use by the DoD. We based this decision on the following factors:

- Since HCFA will be adopting APGs, we feel that the DoD should also adopt them in an effort to maintain consistency. CHAMPUS providers will be using APGs with their Medicare patients as a result of the HCFA move and will not want to have to use two different systems. Also, if the DoD wants to be able to compare their data with the rest of the country in future studies, APGs will allow for this comparability.
- Based on the full list of criteria in the matrix (Exhibit IV-1), APGs come out on top of both AWUs and AVGs.

-
- APGs are the next generation of AVGs and are more flexible due to procedure bundling.
 - AVGs are no longer under development, whereas APGs continue to be studied and refined.