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THESIS

NAVY HEALTH CARE STRATEGIC PLANNING PROCESS:
A DRAFT FUNCTIONAL DESCRIPTION

by

Helen V. Thompson

September 1993

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Associate Advisor: Magdi Kamel

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This thesis explores the Navy Health Care Strategic Planning Process (NHCSPP) and attempts to apply the Department of Defense Automated Information Systems (AIS) Documentation Standard (DOD-STD-7935A) to develop a draft a functional description for the automation of the NHCSPP as module of the Navy Medical Executive Information System. The thesis begins with a discussion of Wartime and Peacetime Health Care Planning. This is followed by an in depth evaluation of the Navy Health Care Strategic Planning Process. The Navy Medical Executive Information System is then discussed, followed by the Functional Description Overview. The research indicates that Navy Health Care Strategic Planning is an extremely complex and intricate process and as such, traditional methodologies that emphasize capturing and representing users' requirements upfront, i.e. DOD-STD-7935A, are not appropriate for automating the planning process. Additionally, the health care planning process needs to be standardized across all branches of the armed services. It is further recommended that Navy Medicine create a workgroup of end-users and functional experts to develop a more detail functional description.

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Navy Health Care Strategic Planning Process: A Draft Functional Description

by

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Submitted in partial fulfillment
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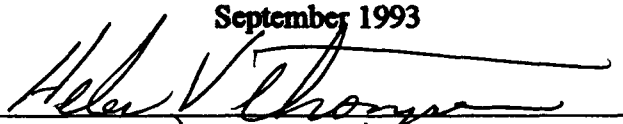
Author: 
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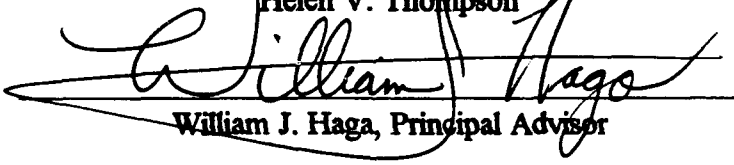
Approved by: 
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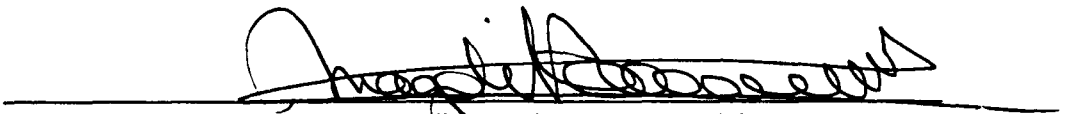
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ABSTRACT

This thesis explores the Navy Health Care Strategic Planning Process (NHCSPP) and attempts to apply the Department of Defense Automated Information Systems (AIS) Documentation Standard (DOD-STD-7935A) to develop a draft a functional description for the automation of the NHCSPP as module of the Navy Medical Executive Information System. The thesis begins with a discussion of Wartime and Peacetime Health Care Planning. This is followed by an in depth evaluation of the Navy Health Care Strategic Planning Process. The Navy Medical Executive Information System is then discussed, followed by the Functional Description Overview. The research indicates that Navy Health Care Strategic Planning is an extremely complex and intricate process and as such, traditional methodologies that emphasize capturing and representing users' requirements upfront, i.e. DOD-STD-7935A, are not appropriate for automating the planning process. Additionally, the health care planning process needs to be standardized across all branches of the armed services. It is further recommended that Navy Medicine create a workgroup of end-users and functional experts to develop a more detail functional description.

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I. INTRODUCTION

A. BACKGROUND

Rising health care costs and shrinking defense budgets prompted the Department of Defense (DOD) to reevaluate its method of delivery of health care to its beneficiary population. As a result, in October 1991, then Deputy Secretary of Defense, D.J. Atwood initiated the development of the Defense Health Program (DHP). [Ref. 1] Under the DHP, the services were tasked to provide high-quality health care while maximizing cost-effectiveness. [Ref. 1] In answer to this tasking, the Navy Medical Department developed the Navy Health Care Strategic Planning Process (NHCSPP).

B. OBJECTIVES

The objective of this thesis is to explore the NHCSPP and to attempt to develop a draft functional description for the NHCSPP module of the Navy Medical Executive Information System (EIS). The functional draft description developed in this thesis should be used as a basis for automating the NHCSPP.

C. THE RESEARCH QUESTION

Two main research questions addressed by this thesis are: how is military health care planning done and by what means is it possible to capture and represent the planning process requirements? These questions are investigated using existing documentation combined with interviews of key personnel currently involved with the NHCSPP, i.e., Navy Medical Department Executive Manager, Bureau of Medicine and Surgery staff analysts and Medical Treatment Facility planners.

D. SCOPE, LIMITATIONS AND ASSUMPTIONS

1. Scope

This thesis investigates the Navy Health Care Planning Processes conducted during war and in peace time. A draft functional description is also presented..

2. Limitation

The draft functional description developed in this thesis is to be presented to the Naval Medical Information Management Center (NMIMC), which has responsibility for the design and development of the complete Navy Medical EIS. Time and resource constraints did not allow for the development of a complete functional description.

3. Assumptions

The standard DOD Functional Description format requirements (Department of Defense Automated Information Systems (AIS) Documentation Standard DOD-STD-7935A) are used to prepare a draft functional description of Navy Medical Executive Information System NHCSPP module. This draft functional description will be reviewed by the Navy Medical Information Management Center Executive Information System Project staff for acceptance.

E. LITERATURE REVIEW

The following documents provided the initial research for the formulation of this thesis:

- Mission Element Needs Statement, Navy Medical Department Decision Support System, Naval Medical Information Management Center, MAY 7, 1988
- Navy Medical Executive Information System Migration Plan, Decision Systems Technologies, INC., OCT. 1992
- Department of Defense Automated Information Systems (AIS) Documentation Standard DOD-STD-7935A, OCT. 1988

- Total Quality and Productivity Management in Health Care Organizations, Vincent K. Omachanu, Ph.D., P.E., Institute of Engineers and the American Society for Quality Control, 1991

- Introduction to Managed Care , Health Maintenance Organizations, Preferred Provider Organizations, and Competitive Medical Plans, Robert G. Shouldice, Information Resources Press, 1991

F. METHODOLOGY

The draft functional description prepared for this thesis follows the Department of Defense Automated Information Systems (AIS) Documentation Standard DOD-STD-7935A, October 1988.

G. ORGANIZATION OF THE STUDY

This thesis begins with a discussion of war and peace time health care planning processes, followed by an in depth evaluation of the NHCSPP. The Navy Medical EIS background and general design theory are discussed, followed by the draft functional description.

This thesis is organized as follows: Chapter II discusses the Wartime Health Care Planning, Chapter III discusses Peacetime Health Care Planning and Chapter IV provides an analysis of the Navy Health Care Strategic Planning Process. Chapter V provides an overview of the Navy Medical EIS then Chapter VI presents the DOD standards for developing a Functional Description and applies these standards to develop a draft functional description of the NHCSPP module of the Navy Medical EIS. Chapter VII provides conclusions and recommendations for improvements to the Navy Medical EIS, NHCSPP and DOD documentation standards.

II. WARTIME HEALTH CARE PLANNING

Responsibility for wartime health care planning begins in the joint service environment with the Joint Chiefs of Staff (JCS). This responsibility is then passed to the Unified Commanders and then on to the Component Commanders. Wartime health care planning is done separately from peacetime health care planning and includes separate models and information system support. These models and information are used during wartime as well as during training exercises. [Ref. 2] The doctrine for joint operation is laid out in Joint Pub 4-02 [Ref. 3].

A. MISSION

During time of war, the mission of health service support system (HSS) is to minimize the effect of disease, injuries and wounds on the unit readiness, effectiveness and morale. This mission is accomplished through a phased health care system (echelons of care) that extends from those measures taken at the point of wounding, injury or illness to evacuation from a theater of operation for treatment at a continental United States (CONUS) hospital. The effectiveness of the system is measured by its ability to return patients to duty quickly and as far forward in the theater of operations as possible while minimizing morbidity and mortality. [Ref. 3]

B. OBJECTIVES

The objectives of wartime health care planning are as follows:

1. As delineated in the Joint Pub 4-02 [Ref. 3] the fundamental objective of the HSS is to conserve the combatant commander's fighting strength of land, sea,

and air forces. In joint operations, this objective is most effectively realized through the optimum use and integration of all available component command HSS resources.

2. Effective HSS enhances the combat strength of the joint force by maintaining physically fit, emotionally well personnel and by treating the sick, injured, or wounded in a manner that promotes their survival, recovery, and expeditious return to duty. Through application of the principles of HSS and use of the echelons of care discussed below, commanders can better retain acclimated and experienced personnel. In retaining such personnel, the requirements for replacements, patient evacuation, and additional logistics support are minimized.
3. In their inception, the echelons of care and principles of HSS did not specifically address joint or combined operations; however, their implementation is common among Service components and applies to HSS planning and execution by joint force commanders. HSS in joint operations requires continuos planning, coordination, and training to ensure a prompt, effective, and unified health care effort.

C. ECHELONS OF CARE

The HSS system is organized into five echelons of care that extend from the point of wounding, injury, or illness through the theater of operation to CONUS. (See Figure 2-1) Each succeeding echelon of care possesses the same treatment capabilities as those echelons forward of it and adds a new increment of treatment capability that distinguishes it from the previous echelon.

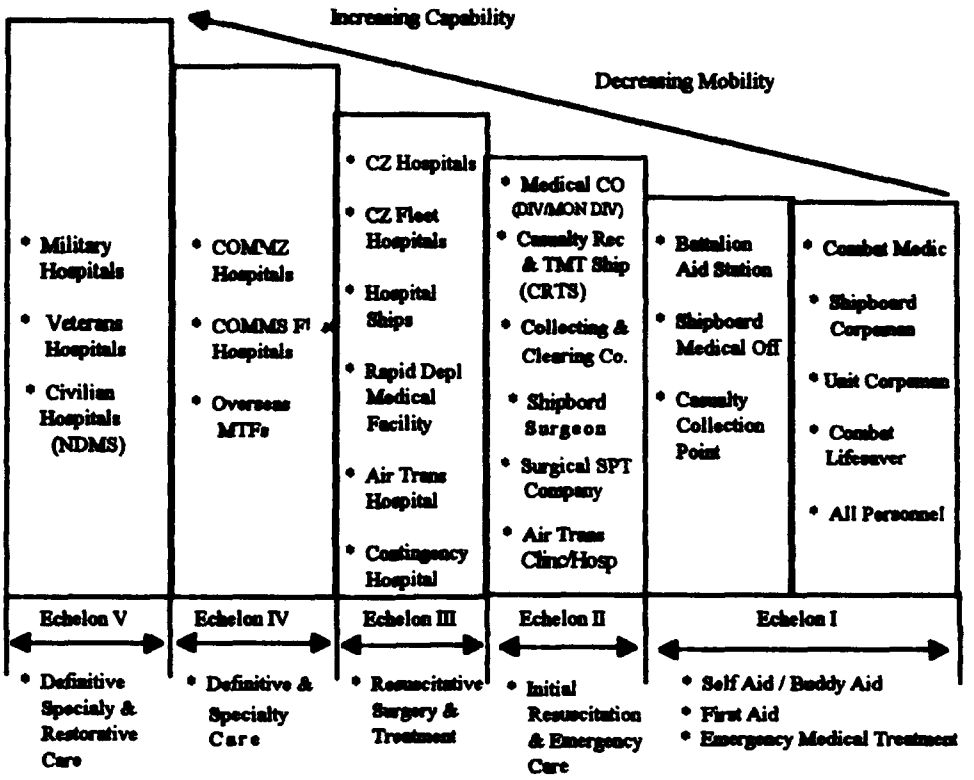

Figure 2-1. Echelons of Care

1. Echelon I

Care is rendered at the unit and includes self or buddy aid, examination, and emergency lifesaving measures such as maintenance of airway, control of bleeding, prevention and control of shock, and prevention of further injury. This echelon of care may also include an aid station that has a physician. Treatment at the aid station may involve restoration of airway by surgical procedure, use of intravenous fluids, antibiotics, and application of splints and bandages. These comprehensive elements of medical management prepare patients for return to duty or for transportation to a higher echelon of care.

2. **Echelon II**

Care is rendered at an HSS organization by a team of physicians and in some cases nurses, supported by a medical technician staff. This echelon of care includes basic resuscitation and stabilization and may also include surgical capability, basic laboratory, pharmacy, and temporary holding ward facilities. At this echelon, examinations and observations can be accomplished in a more deliberate manner than at Echelon I. The objective of this phase of treatment is the application of emergency procedures, such as resuscitation, prevention of imminent death, or loss of limb or body function. For those patients who require a more comprehensive scope of treatment, arrangements are made for surface or air evacuation to a facility that can provide the required treatment.

3. **Echelon III**

Care rendered requires clinical capabilities normally found in a medical treatment facility (MTF) that is staffed, equipped, and located in an environment with a low level of threat of enemy action. Care at this echelon may be the initial step toward restoration of functional health, as distinguished from procedures that stabilize a condition or prolong life. Unhampered by the crises aspects of initial resuscitative care, this echelon of care may proceed with a greater degree of deliberation and preparation.

4. **Echelon IV**

Care is normally provided in an MTF staffed and equipped for definitive care and normally includes surgical capability.

5. Echelon V

Care rendered is convalescent, restorative, and rehabilitative and is normally provided by military, Veterans Administration, and/or civilian hospitals in CONUS. This phase may encompass a period of minimal care and increasing physical activity necessary to restore patients to functional health and allow their return to duty or useful life.

D. PATIENT EVACUATION

Evacuation of patients in the combat zone or from Echelon I to Echelon II, from Echelon II to Echelon III and within Echelon III is normally the responsibility of component commands. Evacuation of patients from the combat zone to the communications zone or between Echelon III and IV, from the communication zone to CONUS or between Echelon IV and V, and within CONUS is normally provided by the component commands of the US Transportation Command.

E. PRINCIPLES OF HEALTH SERVICES SUPPORT

Each Service component has an HSS system that generally involves six health care principles:

1. Conformity

Conformity with the commander's strategic or tactical plan is the most basic element of effective HSS. The HSS planner can help ensure conformity by taking part in the development of the commanders plan of operation.

2. Proximity

The objective of this principle is to provide the HSS to the sick, injured, or wounded as close to the area of combat operations as the tactical situation permits.

Patients are evacuated to an MTF, or the facility is moved to the area where the patient population is the greatest.

3. **Flexibility**

The objective of this principle is to be prepared to shift HSS resources to meet changing requirements. Changes in tactical plans or operations make flexibility in HSS essential. Because all HSS units are used somewhere within the theater of operation and none are held in reserve, plans for redistribution of HSS resources are required.

4. **Mobility**

The objective of this principle is to ensure HSS assets remain close enough to support combat forces during operations. Through the use of organic and non organic transportation resources, commanders must be able to rapidly move HSS units to support combat operations.

5. **Continuity**

The objective of this principle is to provide optimum, uninterrupted care and treatment to the sick, injured, and wounded. Continuity in care and treatment is achieved by moving the patient through the progressive, phased HSS system, which extends from the forward area of the combat zone to an area that is as far rearward as the patient's condition requires, possibly to CONUS. Continuity is also achieved by providing required care during movement.

6. **Coordination**

The objective of this principle is to ensure that scarce HSS resources are efficiently employed and support the planned operation. Continuous coordination ensures that MTFs

are not placed in areas that interfere with combat operations. Additionally, continuous coordination guarantees that the scope and quality of medical treatment and care meet professional standards and policies.

F. GENERAL HSS PLANNING CONSIDERATIONS

Effective and timely planning and coordination are essential to ensure adequate and sustainable HSS in a theater of operations. Joint HSS planning is a continuous process; the joint forces command surgeon must remain sensitive to the demands for HSS based on constantly changing operational requirements. Proper planning permits a systematic examination of all factors in a projected operation and ensures interoperability with the theater campaign plan. The organization of the HSS system is determined to a great extent by the mission of the joint force, the medical threat, medical intelligence about the theater evacuation policy, and hospitalization and evacuation requirements.

1. Medical Threat

The medical threat is the composite of all ongoing or potential enemy actions and environmental conditions that might act to reduce the performance effectiveness of the joint force through wounds, injuries, diseases, or psychological aspects of the combat environment.

2. Medical Intelligence

Medical intelligence is threat intelligence produced from the collection, evaluation, and analysis of information concerning the medical aspects of foreign areas that have immediate or potential impact on policies, plans and operations.

3. Medical Evacuation

Timely medical evacuation plays an important role in the carefully designed treatment sequence from front to rear. As the echelons of HSS become more sophisticated from front to rear areas, so do the means of patient evacuation. Patient evacuation involves planning routes, controlling movement, and locating evacuation facilities. The evacuation of patients in a theater of operations will be by aircraft when air transportation is available, feasible, and the patient's condition permits. However, all available forms of transportation must be considered together with the details of patient handling. Requirements may exist for surface medical transportation such as field and bus ambulances, trains, and ships.

4. Exceptions

As an exception to the practice that component commanders provide for medical evacuation in their area of operation, guidance for medical evacuation of formerly captured or detained US forces, civilians accompanying US forces, enemy prisoners of war (EPW), civilian inters, and other detainees may be issued by the joint forces commander.

G. THE HSS ESTIMATE OF THE SITUATION

The purpose of the estimate is to collect and analyze HSS information pertaining to enemy intentions and friendly capabilities, limitations, courses of action, and potential consequences associated with a contemplated operation. The estimate may be written or oral.

The HSS estimate will consist of HSS facts, assumptions, and deductions that can affect the operation. In this logical and orderly examination of all the HSS factors affecting mission accomplishment, the command surgeon must be familiar with the joint force

commander's concept of operations and obtain medical intelligence about the area of operations from indigenous sources, the supporting intelligence activity, the Armed Forces Medical Intelligence Center, and national intelligence agencies. The command surgeon should conduct a thorough evaluation of the enemy situation, friendly situation, and the area of operations from the standpoint of the effects on the health of the joint forces and HSS operations.

Analysis of the HSS estimate is the logical comparison of the medical threat and the HSS capabilities to determine vulnerabilities and estimated requirements of the joint force. Patient estimates are calculated for numbers, distribution of time and space, areas of density, possible mass casualties, and evacuation. The joint force command surgeon consults experience tables to assist him/her in determining requirements for the operation. From this data, hospitals estimates and other support requirements are derived.

Having determined the HSS requirements, the command surgeon considers the resources that are readily available to meet the requirements. Maximum use of the available personnel, supplies, and equipment and joint use of facilities promotes overall effectiveness of the command's HSS. Taking into consideration all support requirements and resources available, the command surgeon determines which proposed course of action can be supported from the HSS perspective.

H. HSS PLANNING FACTORS

In addition to coordinating joint force HSS requirements, basic planning for HSS in *joint operations can involve several major considerations:* coordinating HSS requirements with other combatant commands as required and coordinating with allied and other friendly

forces. The primary tool used in HSS planning is the Joint Operation Planning and Execution System (JOPES) Medical Planning Module (MPM). The MPM is an automated application program that takes the joint force provided casualty figures and projects the impact an operation will have on the HSS system. It also provides estimates of requirements for such things as medical evacuation assets and number of beds.

The theater patient evacuation policy is established by the Secretary of Defense, with the advice of the Chairman, Joint Chiefs of Staff, and the recommendation of the joint force commander. The policy prescribes the maximum number of MTF bed days for a patient within the theater. However, a patient is not required to be held in the theater of operation for the entire period stated in the theater evacuation policy. Any patient who is not expected to be returned to duty within the number of days expressed in the theater evacuation policy is evacuated as soon as medical officers have determined that travel will not aggravate the patient's condition. Shorter time periods within the theater of operations before patient evacuation reduces the theater MTF bed requirements and increases the number of beds required elsewhere. In addition, shorter time periods before evacuation also increases evacuation requirements. The time period stated in the theater evacuation policy determines when a patient is admitted to the first MTF (mobile or fixed). The total time a patient spends in all MTFs in the theater of operation for a single episode of illness, injury or wounding should not exceed the number of allowable days of noneffectiveness outlined in the theater evacuation policy. This policy is flexible and changes as the tactical situation shifts to ensure that nonfixed MTFs retain mobility and the capability to accommodate anticipated surges of patients.

The estimate for theater MTF bed requirements is based on empirical data accumulated for each Service for the two major categories wounded-in-action (WIA) and disease, non-battle injury (DNBI). The empirical data are adjusted to take into consideration such factors as the theater evacuation policy and the necessity for segregating patients by gender or nature of contagious disease. The formula for calculating theater MTF bed requirements is shown in Figure 2-2. The terms and formulas are discussed below.

	Admission Rate		Population (000)		Accumulation Factor		Dispersion Factor		Beds Required
WIA	_____	X	_____	X	_____	X	_____	=	_____
DNBI	_____	X	_____	X	_____	X	_____	=	_____
							Total Beds		

Figure 2-2. Calculation for Theater Bed Requirements

1. **Admission Rate**

A numerical expression of the relative frequency with which patients are admitted to MTFs from a specified population over a designated period of time. The Service components use different methods for computing admission rates. The command surgeon will use the admission rates provided by the component command to formulate joint force requirements. The admission rates are usually expressed as the number of admissions to an MTF per thousand average personnel strength per day.

2. **Population**

The number of personnel in the operation to be supported by the HSS system.

3. **Accumulation Factors**

The rate patient population increases in MTFs under specified evacuation policies. Two methods are normally used. One method indicates how many patients will have been accumulated at the end of specified periods of time based on a constant admission of one patient per day and a constant fixed evacuation policy. The other method shows, for the number of patients admitted on any one day, the proportion that will remain at the end of each specified period.

4. **Dispersion Factors**

A factor applied to the number of anticipated patients to make allowances for several difficult to control factors, such as the movement of MTFs that is often required in combat, segregation of patients based on gender, separate wards for contagious diseases, and the requirement that complete MTFs must be furnished for all units that operate some distance from the main body of forces.

This allowance provides a cushion of additional empty beds against surges in patient flows.

Figure 2-3 is an example of the total bed requirements calculation.

	Admission Rate		Population (000)		Accumulation Factor		Dispersion Factor		Beds Required
WIA	0.2	X	500	X	0.4	X	0.2	=	8
DNBI	0.1	X	500	X	0.2	X	0.2	=	2
							Total Beds		10

Figure 2-3.

The numbers used in figure 2-3 are hypothetical and in no way represent real wartime conditions. The total beds is per thousand personnel in theater per day.

This approach to HSS planning is used in all wartime situations from high intensity conflict to low intensity conflict. This encompasses HSS for special operations, in riverine environment, and combat search and rescue operations. This process of HSS planning is only used in a wartime environment or during training for a wartime environment and is not applicable to peacetime health care planning. Therefore, this process will not be factored in as a requirement in the functional description of the Navy Health Care Strategic Planning Process Module of the Navy Medical Executive Information System. The next chapter discusses heath care planning during peacetime.

III. PEACETIME HEALTH CARE PLANNING

This chapter discusses peacetime health care planning and the development of the NHCSPP. Also included in this chapter is an introduction to the NHCSPP and a discussion of the Coordinated Care Program.

A. PEACETIME HEALTH CARE PLANNING BACKGROUND

The following information was gathered during a interview with Commander (CDR) Diane Ledonne, Nurse Corps, United States Navy, from the office of the Assistant Chief for Plans, Analysis and Evaluation, Bureau of Medicine and Surgery (BUMED). [Ref. 5] CDR Ledonne is considered to be a subject matter expert in the area of peacetime health care planning. She has been involved with Navy Health Care Planning since its inception in 1981.

1. The Beginnings

It was not until early in the 1980s, that health care planning within Navy Medicine actually began. The driving forces for health care planning were technical and monetary developments within the civilian health care sector, cost effectiveness questions from the front line commanders, and a rapid growth in medical billets required by the greater emphasis placed on Navy Medicine. As such, the focus during this period was cost-based. Also there was added focus on Medical Treatment Facility (MTF) staffing requirements. Some of the major milestones developed during this time were the development of the first "Health Care Delivery Plan" at Naval Hospital Philadelphia, Pennsylvania and the creation of a new BUMED code, designated Regional Operations Division. Navy Medicine, in an

effort to keep pace with the afore mentioned changes, began to design innovative heath care delivery options which included: health care finders, ambulatory surgery, and outside contracting for health care services. These developments required a renewed emphasis on quality credentialling of health care providers and professionals. [Ref. 5]

2. The Endorsement

From the end of the 1980s and into the 1990s, Navy Health Care Planning received even further endorsement from the Navy Surgeon General and the line commanders. The driving forces behind this new direction became: cost-effectiveness and efficiency expectation from the Navy/Marine Corps line communities, the active involvement of the Navy/Marine Corps line communities in Navy medical administration, further growth in Navy Medical billets and mission, and a lack of confidence in civilian health care providers. The Navy Medicine planners focused on cost, efficiency, staffing requirements, billet allocation, and quality of care. Some of the major milestones included:

- Secretary of the Navy Webb, established six (6) goals for Navy Medicine, one of which was Health Services Planning
- the formulation of proposals to do strategic health care planning
- the completion of the "Strategic Plan" for Navy Medicine
- the Blue Ribbon Panel Report requires Navy Medicine to do peacetime health care planning
- a BUMED code created to do peacetime health care planning
- the development of the "managed care" concept
- the development of models for planning and utilization

- the start of population analysis for health services requirements
- the Navy Medical Department begins the development of a "business plan"

Peacetime health care planning is becoming increasing important as budgets are cut and the Navy right-sizes. [Ref. 5]

3. **Design and Development**

By 1992, Navy Medicine was deeply involved in the design and development of a peacetime health care planning process. This process was designated the Navy Health Care Strategic Planning Process (NHCSPP). The driving forces had become: the Blue Ribbon Panel requirement for an organized program for health care planning and evaluation, Government Accounting Office and Inspector General inquires into Navy Medicine planning methodologies, and the Office of Assistant Secretary of Defense, Health Affairs Coordinated Care Program. The focus is now population/need based planning, sophisticated planning methodologies, the use of information systems to support planning, and the use of models to aid the field and headquarters level planners. The major milestones include:

- active Coordinated Care Program in the Tidewater Virginia area
- Health Care Planning Workgroup creates the Navy Health Care Strategic Planning Process
- Navy Medicine issues its "Strategic Plan"
- development of experts in field-level peacetime planners

- identification and design of information systems to support peacetime health care planning
- design and test of the tools and methods for peacetime health care planning

In the face of base closures, force right-sizing and budget cuts, Navy Medicine is moving closer and closer to having the tools necessary to meet the needs of it's customers whether they be patients or Congress. [Ref. 5]

4. Empowerment and Implementation

During 1993, the intensity of base closures, force right-sizing and budget cuts escalated. For Navy Medicine, the importance of peacetime health care planning has come to the fore front. Navy Medicine is empowered to begin to implement peacetime health care planning. The driving forces are now: reduced resources, competition with the Navy Line community for resources (dollars and billets), health care reform initiatives, reorganization in the civilian sector and a shift from specialization and inpatient services to primary care and ambulatory services. The emphasis now is on rational logical use of standard models and information systems in an integrated effort by field and headquarters planning staffs. The milestones are:

- the creation of BUMED code 08, Assistant Chief of Plans, Analysis & Evaluation
- decision relating to naval hospital closures and migrations of Navy and Marine Corps personnel
- establishment of the BUMED Base Realignment and Closure Commission (BRAC) Action Organization
- the first ever peacetime health care planning workshop

- completion by the BRAC-affected MTFs of a Health Care Capabilities Assessment
- the design of the Mihara Model [Ref. 5]

Since the beginning of 1993, the two (2) most important milestones, addressed by this thesis, are the Coordinated Care Program (CCP) and the development of the Navy Health Care Strategic Planing Process. The CCP program is important because the NHCSPP is the foundation for CCP; therefore, the CCP bears discussing. These two milestone are discussed in more detail below.

B. COORDINATED CARE PROGRAM

In an October 1,1991 memo, Deputy Secretary Of Defense D. J. Atwood [Ref. 3] discussed the requirements for the strengthening of medical functions within the Department of Defense (DOD). Mr. Atwood cited the tightening constraint on national defense budget as justification for the pursuit of the aggressive actions necessary to execute the DOD's vital medical missions more effectively. He directed the implementation of the CCP. Mr. Atwood indicated that the CCP would be critical in the strengthening of DOD's ability to perform its medical mission with centralized authority and responsibility but decentralized implementation by the Military Departments. He directed the Assistant Secretary of Defense for Health Affairs to implement a program to ensure coordination within appropriate geographical areas of the provision of medical care in DOD facilities with the provision of medical care through the Civilian Health and Medical Program of the Uniform Services (CHAMPUS). The stated objective of the program is to maximize cost-effectiveness in the delivery of high-quality health care in keeping with the Department's medical mission. In this same memo, Mr. Atwood appointed the Assistant Secretary of the Defense for Health

Affairs (ASD(HS)) as the DOD officer responsible for the effective execution of DOD's medical mission. Mr. Atwood declared [Ref. 1] the medical mission of the DOD to be:

- to provide and maintain a readiness to provide medical and support services to the armed forces during military operations and
- to provide medical and support services to members of the armed forces, their dependents, and others entitled to DOD medical care.

The CCP is a DOD initiative designed to provide MTF commanders the tools, authority and flexibility necessary to better meet the medical mission. [Ref. 4] CCP should enable the DOD and the Medical Departments to better accomplish the medical mission by improving beneficiary access to and control costs of health care, while at the same time ensuring quality care to all Military Health Services System (MHSS) beneficiaries. [Ref. 4] Central to the CCP will be the local health care delivery systems or "networks" based on arrangements between military and civilian health care providers and organizations. These networks are to be locally managed by the MTF commanders who are responsible for resource management and the delivery, cost, and quality of health care services provided to beneficiaries in their service areas. CHAMPUS eligible beneficiaries are offered three options for receiving health care:

- CC-PLUS in which beneficiaries enrolled receive all health care from facilities of the uniformed services and civilian network providers
- CC-EXTRA in which beneficiaries use the civilian preferred provider network on a case-by-case basis or
- CC-BASIC in which beneficiaries remain in the standard CHAMPUS benefit plan.

The guiding principles for the design and implementation of the CCP are:

- serve beneficiaries to provide a combat-ready force
- be based on decentralized execution
- have local accountability with centralized direction and monitoring
- achieve greater equity
- be flexible and easy to administer and
- optimize use of MHSS resource

The CCP encourages decentralized execution and accountability coupled with centralized direction and monitoring by the Services and the ASD(HA). The following system-wide improvements will be implemented to support and complement local health care delivery networks:

- reforms of CHAMPUS provider payment methods
- establishment of Specialized Treatment Facilities (STF) to provide high-technology /high-cost health care services in the most cost-effective manner
- new approaches to contracting for health care services
- the establishment of participation agreement with civilian providers to accept CHAMPUS and Medicare assignment
- improvement in the efficiency and accuracy of claims processing and
- eventually, a centralized claims processing system [Ref. 4]

The implementation of the CCP is to be accomplished over a three (3) year period. This phased approach is due to the scope, size and complexity of the MHSS, the extensive CCP

reforms and the need to minimize any detrimental effects on readiness or on beneficiaries [Ref. 4].

C. NAVY HEALTH CARE STRATEGIC PLANNING PROCESS

In the past, Navy Medicine health care planning was accomplished using supply driven historical workload data. The health care planning process was more an exercise in allocation than in actual planning. The Navy Surgeon General recognized a need and an opportunity for changing the way Navy Medicine conducted health care planning. On 15 July, 1992 the Navy Surgeon General chartered the Planning Task Force. The Planning Task Force's mission was to develop a peacetime health care requirements planning methodology. The group consisted of multidisciplinary members from BUMED, MTFs, Center for Naval Analysis, and Corporate Information Management. The development of a health care planning process was a full-time job for the core group, while functional experts where called in to augment the core group. This Planning Task Force developed the Navy Health Care Strategic Planning Process (NHCSPP). This process is discussed in a detail in the following chapter.

IV. ANALYSIS OF THE NAVY HEALTH CARE STRATEGIC PLANNING PROCESS (NHCSPP)

The new Navy Health Care Strategic Planning Process (NHCSPP) represents a major shift in the health care planning process, by changing the basis for planning from supply to demand. The NHCSPP is in line with the principles of Total Quality Leadership by allowing for catchment area input and variation. A catchment area is a forty (40) mile radius around the MTF. The NHCSPP provides a framework for evaluating changes in manpower, money and material in the direct support of the Program Objective Memorandum/Program Planning and Budgeting System (POM/PPBS). The NHCSPP allows the health care planner to evaluate the total health care requirements for MHSS beneficiaries in the local catchment area.

The NHCSPP is a generic, issue driven process. Issues being defined as problem areas identified within the MTF and its local civilian provider networks. The NHCSPP focuses on the customer and is the foundation of the Coordinated Care Program (CCP) (see chapter 2 for an explanation of CCP). The NHCSPP is evolutionary in nature and modular in design. This process is iterative and may be entered at any point during the process and also allows for the repeat of any step as desired. Figure 4-1 is a graphical representation of the NHCSPP. This process can be used from the top down by the system-wide planners at BUMED or the Health Service Organizations (HSO) as well as from the bottom-up by the

MTF health care planners. The following sections discuss each step of the NHCSPP in some detail.

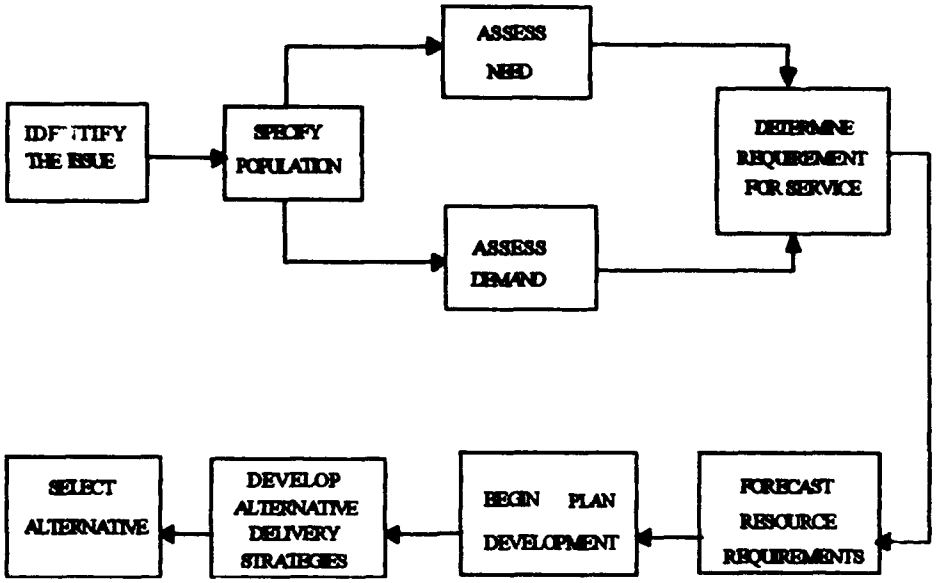

Figure 4-1

Navy Health Care Strategic Planning Process

A. IDENTIFY THE ISSUES/PROBLEM

This is the first step in the process. When identifying the issues affecting his/her facility, the health care planner must consider the mission, benefit, goals and objectives, existing guidance, environment and opportunity. Issues being problem areas identified within the MTF and its local civilian provider networks. These issues can be isolated by the use of customer questionnaires or by staff and support personnel of the MTF. An issue could be the need for an Ears, Nose and Throat clinic or the starting of a OB/GYN practice in house

or a need to see the entire catchment area population for this MTF. The addition of a specialty doctor could offer the possibility of opening a specialty clinic in the MTF and possibly reducing the cost of the service.

To begin the process, the health care planner must consider the MTF's mission, the health care benefit, goals and objectives of the issue and existing policy guidance. The health care planner must look at the MTF and its catchment area from the "customer side", review the historical data both from the MTF and CHAMPUS, and scan the environment for events that influence the beneficiary populations. The iterative nature of the process allows the planner to enter the process at the demand point and review the historical demand for services and the related costs from both the MTF and CHAMPUS, and, therefore, locate the opportunities for improving the allocation of resources. For example, a health care planner reviews the historical Level II CHAMPUS data and finds the oncology cost to be high. Then the planner would review the hospital staffing and locate three (3) oncology doctors. At this point, the issue becomes the possible opening of oncology clinic within the facility

B. SPECIFY THE POPULATION.

After a clear understanding of the issue facing the health care planner, the population of interest must be identified. Geographical boundaries have been established for each MTF. The area within the established boundary around the MTF is called the catchment area. Normally, this catchment area is a forty (40) mile radius around the MTF. In some cases, there are geographical obstacles that would need to be considered. This includes a major water way, ocean bay, toll bridge or a mountain range as they impact the

beneficiary's ability to gain access to the medical facilities. As coordinated care concepts are applied to the MHSS, a regionalized approach is to be taken when defining the catchment areas. Where multi-service MTFs have overlapping catchment areas now under the 40 mile radius rule, health care delivery is now managed from a tri-service standpoint [Ref. 6]. This approach affects the population of interest as well as changes in the economy, homeport changes, training schedules and the arrival and departure of the fleet. A demographic profile of a catchment area must consider factors such as race, age, gender and zipcode. The result of this step will be a solid demographic profile of the entire beneficiary base.

C. ASSESS THE NEED.

To discuss the assessment of need, a clear definition of need must be established. This discussion is about "Medical Need" which are services required to attain or maintain health. This part of the process module contains a mathematical model, commonly called an actuarial model, which can forecast morbidity for the population of interests. This model forecasts morbidity for the population in question based on historical information from a similar population. Before the need can be established , a desired level of health must be determined for the population. Sources of data will include the Epidemiological Data, Health Promotion Guideline and Proxies. Once the level of health has been established, the morbidity data can be turned into services required to meet the need. Examples of the services projected during this step in the NHCSPP are number of expected live births, number of appendectomies, and/or the number of tonsillectomies.

While wartime medical planners have traditionally dealt with medical need in terms of morbidity [Ref. 1], peacetime health care planners have been limited in their ability to fully address medical need. As a result, addressing need will not be an easy task. The Navy Medical Department has begun to assemble a body of literature, data sources, and information on models available, as well as, tools that will allow the health care planner to accomplish this process.

D. ASSESS THE DEMAND

Once a sound demographic profile has been developed, the planner can begin to access demand. Demand consists of three components: met demand, customer expectation and where the care is being provided [Ref. 6]. Met demand is that level of care currently being provided. Customer expectations are what the customer expects from the health care system. Where the care is being provided factors into the question of where to establish the different health care services. Once the met demand and the customer expectations are identified, then the difference between these two values can be calculated. This variance should be analyzed to identify differences between met demand and expectations, like barriers to access previously mentioned or other constraints on availability. The analysis of variance will allow the planner to reach an estimate of the services required to meet the actual demand for health care services.

E. DETERMINE THE REQUIREMENT FOR HEALTH CARE SERVICES

Now that the planner knows what services are necessary to meet the medical need and the demand, he/she must compare the two, through an analysis of variance. The analysis of variance during the different step of the process is very important. It enables large

bodies of data to be condensed into useful information. It also stresses using data to make decisions with the objective of getting the process "in control". Once the reason or reasons for variance(s) is identified, the planner may then use this information to determine how to estimate the total requirement for health care services. After needs and demands have been carefully examined, smoothing techniques may then be applied dependent upon the population of interest.

F. FORECAST THE RESOURCE REQUIREMENT

Now that the planner has an idea of the total health care services required to meet the needs of the specified population, it is possible to match resources to those services and forecast the total resource requirement to meet the medical need. Resource requirements include manpower, money and material. The planner, using specified staffing and costing standards and guidelines developed with the assistance of BUMED, will be able to forecast a total resource requirement.

An initial effort has been made on the issue of staffing standards and costing modes with the development of clinical specialty plans, the efficiency review process and health care requirements matrix. Care must be taken because these efforts have been "one dimensional" in that they have primarily addressed manpower. There is a need to update and expand these efforts. The location of the care to be provided and the actual means by which the care will be delivered are discussed in a later in the chapter. These changes require the planner to look outside the traditional paradigm of providing care in his/her own facilities.

G. BEGIN THE PLAN DE OPMENT

Once the total resources required to meet the entire health care need for the particular catchment area are determined, the health care planner can begin developing a plan to provide that care. The planner must identify all the available resources. Specifically, the planner must identify the providers and the support staffs, the dollars and facilities available and any external such as exiting partnerships and contracts that may be of use The dollars here consist of these for direct care and for CHAMPUS provided care. This inventory is then compared with the resource requirement, and the difference represents the unfunded or unmanned requirement. The factors of cost, quality and access must be analyzed with catchment area managers and priorities determined for the deployment of resources.

H. DEVELOP ALTERNATIVE DELIVERY STRATEGIES

In developing alternate delivery strategies, the planner must use the tools provided by the BUMED Strategic Planners. The question facing the planner is how can the resources available (dollars, material and manpower) be better used to meet more of the medical need. The health care planner must use standard staffing and costing models to estimate the cost for setting up alternative delivery strategies. The planner, then will use an environmental assessments and catchment area capabilities assessments to develop a list of alternatives based on the established priorities. The environmental assessment tool forces a catchment area planner to look at all factors external to the health care system which may impact the way services are provided. The catchment area capabilities assessment causes the planner to take a hard look at all means of health care services delivered in the catchment area, whether under the direct control of the catchment area manager or not. This is

a complete assessment of providers, facilities and health programs in the catchment area. This step is critical, in that it recognizes the direct and indirect influences of all health care alternatives in the catchment area system. It is important to note that the use of these tools is part of a planner's first duty in planning, along with the establishment of a baseline for internal and external resources developed from a thorough examination of the environment. While this information may not be actually used in the planning methodology, this baseline reference will be continuously updated and improved with use. This demonstrates the iterative nature of the model, and the fact that the planner is not tied to one particular starting point.

Following the consideration of internal and external factors influencing the allocation of available resources to meet the forecasted health care services requirements, the planner will develop alternatives addressing the total requirement. Make-Buy models will help the planner in developing and comparing costs of any delivery alternatives. The ability to cost out delivery alternatives will allow the planner to identify the marginal cost of health care services. The result of this process is a set of alternatives of varying cost and benefit that meet the totality of the requirement.

I. SELECT THE ALTERNATIVE FOR IMPLEMENTATION

The catchment area manager is positioned to examine comparable alternatives, each having been developed by a common process. This process can then consider a complete examination of all relevant factors, without prejudice of site, of care, or source of provider. An alternative can be selected and implemented with the knowledge that decisions have been made using the best information available, and that future evaluations will highlight

opportunities for improvement. At the local level, a primary objective of the process is to address cost, quality, access factors affecting health care delivery and to identify local alternatives that may increase the effectiveness of the system. Thus, the first responsibility of the local commander will be to seek ways to reprioritize and to seek local solutions. Failing this, a further product of each alternative is the identification of any unfunded requirements. This provides a multiplicity of valuable information that may be used in support of the planning, programming and budgeting cycle.

The NSHCPP represents a major paradigm shift in both our attitude and approach to planning. It has shifted from a supply-side medical system, driven by what Navy Medical can provide, to a requirements-based system, driven by our customers' health care needs and desires. This top-down, bottom-up process embraces the philosophy of Total Quality Leadership by demanding a clear statement of the issue, basing decisions on objective analysis of common data and allowing for local flexibility to meet unique requirements. Finally, the planning process forces Navy Medicine to identify the total requirement for health care services, and to seek the most cost-effective and beneficial means of delivery, using the marginal cost approach. In an environment of steadily declining resources, identification of the total health care requirement is essential in providing Navy and DOD leaders with the information they require to make the decisions on how best to meet the health care requirements of their beneficiaries. The next chapter discusses the Navy Medical Executive Information System.

V. THE NAVY MEDICAL EXECUTIVE INFORMATION SYSTEM

The Navy Medical Executive Information System (EIS) is a system designed to provide timely and accurate information to Navy Medical executives and managers who make major decisions concerning the allocation of resources and the operation of health services facilities. The Navy Medical EIS currently supplies health care executives, analysts and facility managers with information pertaining to workload, cost, and personnel in both graphic and report formats. These varied formats may then be used for analyzing current, historical and projected capabilities of organizational operations. The design of the EIS is based on twelve major business functions identified as critical for the successful management of the Navy health care delivery system. The Navy Medical EIS incorporates standard performance measurements defined by BUMED and DOD. These performance measurements are used to track successful resource allocation, as well as identify possible problem areas. The twelve business functions are:

1. Conduct Health Care Planning
2. Manage Human Resources
3. Manage Finances
4. Manage Education and Training
5. Provide Health Care Support to Operation Forces
6. Provide Health Care Though Fixed Facilities

7. Manage Department of the Navy Medical and Dental Quality Assurance (QA) Program
8. Manage Information Resources
9. Provide Medical Administrative Services
10. Provide Procurement and Contracting for Clinical Services
11. Manage Physical Resources
12. Perform Medical Research and Development [Ref. 7]

Each of these twelve (12) business functions are separate and distinct modules of the EIS with separate functional users. Therefore, each module has its own unique style of output, performance measures and uses. As a result, the following discussion will remain generic in regards to the outputs, performance measures and uses. Below is a discussion of each of the twelve (12) modules [Ref. 8]:

1. Navy Health Care Strategic Planning Process. This module is designed to be used by the health care planner. It provides assistance in the following areas: make-buy evaluation of alternative health care delivery sources, assessment and comparison of need and demand, analysis of population and forecasting resource requirements. In addition, this module contains actuarial and staffing models to support the decision making process. This module is being address in this thesis.
2. Human Resources. This module is designed to assist in the management of the military and civilian personnel. It assists in the development and management of manpower allowances, status of Medical Department personnel (location, end-strength, recruitment, accessions, retirements, releases, qualifications, privileges, certifications, education, etc.), civilian personnel programs, career planning programs, physical qualification standards, medical boards and temporary active duty assignments. This module also provides assistance the maintenance of flag and general officer medical records. This module is underdevelopment.
3. Manage Finances. This module is designed to be used by comptrollers. It assists the comptroller in the development of the budgets, distribution and control of funds and

funds collection programs. Additionally, this modules provides financial management procedures, and provides a method of monitoring budget execution.

4. Education and Training. This module is designed to assist in the management of the education and training programs. These programs include Graduate Medical Education, Out-Service Training, Leadership and Management Education and Training (LMET) and other specialized training programs. Additionally, it assists with the assignment of course quotas and the maintenance of training records. This module is currently in the design phase.

5. Health Care Support, Operational Forces. This module is designed to provide operational support to the fleet and United States Marine Corps (USMC) units (includes personnel, technical information, identification of medical research and development needs and logistics support). It is designed to assist in the management of medical readiness, contingency and mobilization activities. Additionally, it assists with the coordination of medical intelligence and international standards and is used to the develop Navy Medical Doctrine.

6. Health Care through Fixed Facilities. This module is designed to assist in the management of alternative health care delivery sources, occupational health and safety programs, medical and dental programs (e.g., Blood program, HIV, Family Advocacy, Drug and Alcohol Abuse and Dental Insurance) and Disaster Preparedness. Additionally, it is used to provide assistance with the assessment of performance, accreditation of MTFs, development and enforcement of medical and dental care standards and delivery of health care to all eligible beneficiaries. This module is under development.

7. Medical and Dental Q/A Program. This module is designed to assist in the development of medical and dental quality assurance (QA) policies, procedures and programs for the Department of the Navy (DON). It is used to provide assistance in monitoring the status of medical and dental QA programs for DON and medical and dental QA activities at MTF/DTF and other fixed facilities. Also this module provides technical medical and dental QA advice to DON components. This module is under development.

8. Information Resources. This module is designed to assist the Management Information System (MIS) personnel. It provides assistance with the management of information resource programs as well as the development and implementation of information systems. Additionally, this module assists the MIS personnel with the operation and maintenance of existing information systems. This module is under development.

9. Administrative Services. This module provide assistance with correspondence control both internal and external Additionally, it assists in the management of inspections,

internal review and control maters, public affairs program, legal services, as well as the Morale, Welfare and Recreation (MWR) program.

10. Procurement and Contracting. This module is designed to assist the procurement and contracting personnel. It provides assistance with the development of contractual statements of work and evaluation plans and the monitoring of existing contracts. Additionally, it provides technical expertise in procurement and contracting areas. This module is under development.

11. Physical Resources. This module is designed for facility managers as well as the logistician. It provides support with the coordination of medical logistics and material support to the operating forces. Also, this module assists in the design, acquisition and maintenance of medical and dental facilities and management of biomedical and dental equipment and supplies. This module is under development.

12. Research and Development. This module is designed to assist the research, development, testing and evaluation manager. It provides assistance with the review, definition, priorization and monitoring of research and development programs and requirements. Additionally, this module assists in the review of operational information for medial research and development (R&D) implication as well as the participation in inter-service medical R&D and standardization programs.

The Navy Medical EIS objective are:

- To provide a single source of information that is reliable, timely and accurate concerning health care delivery from BUMED to the facility level.

- To provide the non-technical executive a PC-based system which provides rapid, user-friendly access to information pertaining to performance, resource utilization and critical success factors.

- To display information on a color monitor in report and/or graphic format.

- To build the system around the following design concepts:
  - Exception based reporting
  - Commercial-off-the-shelf (COTS) software (buy vs. build)
  - Phased implementation through rapid prototype development and deployment
  - Maximized return on investment
  - Electronic distribution of updated information

- To provide support to the Coordinated Care Program (CCP) initiative by developing a Make vs. Buy Model utilizing Civilian Health Care and Medical Program of the Uniformed Services (CHAMPUS) and other resources and workload information to assist commanders in providing cost effective, quality health care in a prompt manner. [Ref. 7]

The functional requirements of the Navy Medical EIS are:

- To provide top level executives with rapid reliable information on key performance indicators and critical success factors to aid in the determination of effective use of resource allocation and management. As such, provide a mechanism to measure goal attainment in support of Total Quality Leadership (TQL) in the CCP environment.
- To present information in a user-friendly, non-technical, easily accessed PC-based environment.
- To present information in both report and color graphic formats with drill down and modeling based capabilities. [Ref. 7]

The immediate benefit of the Navy Medical EIS is its ability to provide managers of all functional areas within the Navy Medical Department with information and analytical tools necessary to make informed decisions concerning the allocation and management of scarce resources. It enables health care executives, analysts, planners and managers to more readily identify, understand, and track issues, performance measures, problems and opportunities in a timely manner without volumes of paper reports. The EIS provides issue-oriented information which supports better communication and coordination for tighter control, timely intervention and informed decision making. This system allows the Navy health care manager to analyze historical data as well as current trends in order to estimate future resource requirements required to support management goals, strategies and objectives. The system may also be used to aid in the evaluation of "cause and effect" relationships of

both past and proposed decisions. The successful implementation of Navy Medical EIS will position the Navy health care providers in a leading position for transition into the new DOD environment of Coordinated Health Care. [Ref. 7]

The Navy Medical EIS will provide the users direct access to data generated from a single source for the twelve major functional areas of responsibility for the executive managers of the Navy Medical Department. Anticipated benefits of the Navy Medical EIS include:

- Improved management effectiveness
- Reduced CHAMPUS costs
- Better use or controlled growth of existing Navy hospitals and clinics
- Improved readiness
- State-of-the-art quality health care
- Improved beneficiary services
- Potential tri-service application to support the CCP through a standardized interoperable information management system. [Ref. 7]

The real value of the Navy Medical EIS comes from the synergy provided by the incorporation of the twelve functional area modules and their defined performance measures, resulting in a wealth of integrated, issue-oriented management information. This system offers a fundamental change in the way health care services may be managed in the Navy. The advantages of an executive information system such as the Navy Medical EIS will be realized by permitting health care managers to identify opportunities, manage benefits and

measure patterns for successful delivery of services. Executives, analysts, planners, and managers can access a wide range of reports and graphic displays showing status, trends and exceptions, to both monitor and forecast organizational performance. As the EIS is implemented, it will provide a basis for health care planning and an opportunity for improved delivery of health care services. As such, it will provide the foundation for centralized control and decentralized execution. [Ref. 7]

A. HARDWARE ARCHITECTURE

The current Navy Medical EIS requires the use of an IBM-compatible processor (Amdahl 3090/190E). Data required for reporting and modeling is stored within the EIS mainframe COTS software. This data is transferred into the EIS from existing Navy and other medical information management systems external to the EIS, (i.e., Medical Expense and Performance Reporting System (MEPERS), Quality of Care Evaluation System (AQCESS), Composite Health Care System (CHCS), Defense Eligibility Enrollment Reporting System (DEERS)). User access to the mainframe data/reports and models is provide via the Medical Open Architecture (MED-OA) network. User PC/Workstation with COTS application software components are tightly coupled to the COTS mainframe-based application software components of the EIS, as they are vendor specific and communicate in an application to application dialogue.

B. OPERATING SYSTEM

The current Navy Medical EIS host supervisory and utility software is the IBM MVS and VM operating systems and are provided by IBM. The PC/Workstation operating system is Microsoft's DOS, provided by the PC supplier. Minicomputers and LAN servers

throughout the MED-OA network used by the Navy Medical EIS are controlled by a UNIX operating system.

C. COMMUNICATION SYSTEMS

The Navy Medical EIS host interface includes both local and remote LANs networked by DDN and/or Navy Host Concentratory (NAVNET) upgrades in addition to local and remote dial-up. Use of DDN and NAVNET dial-up as a replacement to remote dial-up is under investigation

The Navy Medical EIS user interface is provided by a local and remote (dial-up) PC or a LAN-based PC/Workstation. The COTS software is DOS-based and is used in both stand-alone and host-attached modes. Batch file transfer (reports, screens, models) and interactive modes are required. Though not currently used, the capability for users to generate SQL-based requests for data to remote locations is available.

The Navy Medical EIS host system runs many applications in a multi-user, multi-programming MVS environment, and requires additional communication access software and hardware. The primary host-based software is Virtual Telecommunication Access Method (VTAM), which provides a single point of telecommunications access management, and Network Control Program (NCP) which provides the VTAM access to the network control. Additional units of software and hardware, external to the host, are required to provide necessary protocol conversions, gateways and switching controls.

D. DATA SOURCES

The Navy Medical EIS uses data sources from within and external to the host. Various standard Navy and DOD Medical systems collect, process and store data within the host's

ADABAS Data Base Management System (DBMS). The two languages used to extract data from ADABAS are Natural and Supernatural. For data located at other locations a multiplicity of automated and manual means are used to transport data to the NMIMC.

E. APPLICATION SECURITY

Navy Medical EIS users and developers must first provide an authorized system level identification code and password for access to the NMIMC systems. Access to documents within the Navy Medical EIS (reports, graphic screens, etc.) are also controlled by a User ID. The EIS System Administrator is authorized to assign and manage EIS functions by User ID. The Navy Medical EIS PC/Workstation also has the ability to lock the keyboard which requires the user to see the System Administrator to regain access.

F. APPLICATION SOFTWARE

The commercial-off-the-shelf (COTS) software used for the Navy Medical EIS uses inter-linked licensed modules from Comshare, Inc. Ann Arbor, Michigan. Comshare's primary business is EIS software and they are one of the leading vendors of this type of software. Comshare's mainframe components provide data management, model management and workstation management functions. Systems builders use an internal Application Definition Language (ADL) to initiate, automate and control EIS functions.

Additional mainframe components utilized by the Navy Medical EIS include an IBM compatible DBMS and an E-Mail system. Currently, ADABAS from Software A.G. (running under the MVS operating system) and PROFS (running under the Virtual Machine (VM) operating system) from IBM provide these functions.

Navy Medical EIS users are provided an off-line PC/Workstation capability to review briefing books containing reports and/or graphics (prepared in advance, automatically updated at the mainframe and sent to the PC/Workstation monthly via user-initiated update process) and import or export files to other locally used PC software. While connected to the mainframe, the user can analyze and review (in report and/or graphical format) different views of up to a nine dimensional model.

G. USERS PROFILE

The Navy Medical EIS primary focus is to serve the needs of the top three (3) levels of the Navy Medical Organization, (1) Top level Navy executives, (2) Bureau of Medicine and Surgery (BUMED) and Heath Service Organization (HSO) health care analysts, and (3) facility managers. User personnel at each of these organizational levels are line managers, functional managers, executive assistants, and functional analysts. The EIS can specifically tailor information for each individual user, and users can also create and save "personalized" informational views to meet his/her specific needs.

VI. FUNCTIONAL DESCRIPTION OF THE NAVY HEALTH CARE STRATEGIC PLANNING PROCESS

A Functional Description (FD) is normally prepared for any system that requires a basis for mutual understanding between the development group and the user group of the proposed system. It defines the system as well as the system requirements and provides the users with a clear statement of the operational capability to be developed. If the scope of the FD is changed at any point, the FD should be updated and user concurrence received. [Ref. 9]

The FD is a tool for use by both computer and noncomputer-oriented personnel. It should be written, as much as possible, in noncomputer-oriented language, since many elements of the document will be subject to review by staff personnel who do not necessarily have a computer background. The following sections discuss the layout of the FD based on reference 9, after which an actual draft FD of the NHCSPP is presented.

A. FUNCTIONAL DESCRIPTION REQUIREMENTS

When developing a FD that meets the requirements of the DOD, the DOD Standard for Automated Data Systems Documentation (DOD-STD-7935A) [Ref. 8] is used as the basis for development. DOD-STD-7935A requirements are outlined in the following sections.

1. General

This section contains general information concerning the system to be developed and is made up of the following sub-sections.

a. Purpose of the Functional Description

This sub-section describes the purpose of the FD, as required by DOD-STD-7935A [Ref. 8] is:

> This Functional Description for (Project Name) (Project Number) is written to provide:
>
> - The system requirements to be satisfied which will serve as a basis for mutual understanding between the user and the developer.
> - Information on performance requirements, preliminary design, and user impacts, including fixed and continuing costs.
> - A basis for the development of system tests. [Ref. 8]

b. Project References

This sub-section provides a brief summary of the references applicable to the history and development of the project. The general nature of the computer programs (tactical, inventory control, war gaming, management information, etc.) to be developed shall be specified. The project sponsor, user and operating center(s) that will run the completed computer programs shall be identified.

The following documents, when applicable, are required to be specified by author or source, reference number, title, data and security classification:

- Project request, a copy of which must be included as an appendix.
- Previously developed technical documentation relating to this project.
- Significant correspondence relating to the project to include formal agreements to the requirements contained in the FD.
- Documentation concerning related projects.
- Other manuals or documents that constrain or explain technical factors affecting project development.

- Standard or reference documentation, such as:
  - Documentation standards and specifications
  - Programming conventions
  - DOD or Federal standards (data elements, programming languages, etc.)
  - Hardware manuals, support system documentation, etc., if necessary, for an understanding of the FD.

When applicable, specific reference should be made to the provisions of these documents in subsequent sections of the FD.

c. Terms and Abbreviations

This sub-section should contain a listing to include an appendix of terms, definitions, or acronyms unique to this document and subject to interpretation by the user. This listing will not include item names or data codes.

2. System Summary

This section provides a general description, written in noncomputer terminology, of the existing system and of the requirements for the proposed system. This section includes the following sub-sections:

a. Background

Included within this paragraph, as necessary, will be any information concerning the background of the uses and purposes of the system to orient the reader. Reference must be made to higher order and parallel systems when needed to enhance the general description. Relationships between the project and other capabilities to be developed concurrently shall be described.

b. Objectives

Statements of the major performance requirements and goals of the proposed computer system must be included. These statements should be concise, quantified if possible, and may include examples. When applicable, related events, such as exercises or impending military operations, may be discussed. Any anticipated operational changes that will affect the system and its use shall be identified and the provisions within the system for including them shall be explained.

c. Existing Methods and Procedures

This sub-section shall provide a brief description of the current methods and procedures being employed to satisfy the existing information requirements. A chart must be included depicting the existing data flow through the functional system from data acquisition through its processing to eventual output. This chart may be complemented by an explanation or another chart showing the sequence in which the operational functions are performed by the user and pointing out the support provided by the present system for decision making. Additionally, the following information at a minimum should be include in the description:

- Organizational/personnel responsibilities
- Equipment being used
- Inputs and outputs including volume and frequency
- Deficiencies, including limitations, such as time delays

d. Proposed Methods and Procedures

A description of the proposed methods and procedures will be presented in this and following sub-sub-sections. The description, written in noncomputer terminology, should explain how the proposed system will interact with the functional processes of which the automated system will be supportive. When other functional and automated systems will be used with or will become part of the proposed system, they will be referenced in this description.

A chart depicting the proposed data flow should be provided to present an overall view of planned capabilities. If the proposed system eliminates or degrades any capabilities in the existing system, these capabilities must also be described as well as the reasons for their elimination or degradation. Alternative methods and procedures that have been considered may be included. A chart showing the major functional processing steps and a chart showing the interacting organizations should be included within the following paragraphs whenever they best complement the narrative:

(1) Summary of Improvements. This sub-sub-section provides a qualitative and quantitative summary of the benefits to be obtained from the proposed system. A comparison of the deficiencies identified in the "Existing Methods and Procedures" and the identification of any additional capabilities required, along with appropriate explanations, may be provided. The required capabilities that will be satisfied by the proposed system must be explicitly identified.

When improvements to existing methods and procedures are a requirement, the extent of the anticipated improvements must be stated. This discussion may include:

- functional improvements (new capabilities)
- improvements of degree (upgrading existing capabilities)
- timeliness (improved response time)
- the elimination or reduction of existing capabilities that are no longer needed

(2) Summary of Impacts. This and the following sub-sub-sections shall describe the anticipated impacts and associated costs the proposed system will have on the organizational and operational environment of the user. Impacts on the user during the development of the system shall also be noted.

(a) User Organization Impacts. Organizational impacts may include the modifications of responsibilities and the addition or elimination of responsibilities that will be necessary to use the proposed system. Any personnel eliminated will be identified and a discussion provided of the possibilities for retraining. Requirements for the number and skills of additional personnel will be identified. Included will be changes in authorized strength, location and position identifier, if known.

(b) User Operational Impacts. The operational impacts on the organization during the use of the proposed system will be included. This discussion will consider the proposed interface between the user and the computer operating center; the impacts on the user to change from the current operational procedures, new data sources, quantity, type, and timeliness of data to be submitted for use in the system; data retention requirements; and modes of user operation based on peacetime, alert, and wartime conditions. Also

included will be proposed methods for providing input data if these data are not already available.

(c) User Development Impacts. Development impacts will include a discussion of all user efforts that will be required prior to implementation of the system. Such as training and the manpower required to develop or modify the database, etc.. This sub-sub-section must include any user requirements for parallel operation of the new and existing system during implementation along with the potential impact of any additional activities to be provided by the user to aid in development.

e. Assumptions and Constraints

This sub-section shall describe any user assumptions and constraints that will affect development and operation of the system. Any limitations affecting the desired capability (including the predication of expected types of errors) and explicit identification of any desired capabilities that will not be provided by the proposed system shall be discussed. Examples of assumptions include organizational actions, budget decisions or operational environment and deployment requirements. Examples of constraints include operation environment, budget limitations, system implementation deadlines or regulatory policy.

3. Detailed Characteristics

This section shall provide a detailed description of the performance requirements of the proposed system written in noncomputer terminology.

a. Specific Performance Requirements

This sub-section shall describe the specific performance requirements to be satisfied by the system. This presentation shall be a delineation of requirements on which the

system design is to be based (anticipated deviations from any of the standards specified by the documents listed the "Project References" section must be specifically indicated). The requirements shall be stated in such a manner that system functions discussed in the "Functional Area System Functions" sub-section can be related to them as well as system testing requirements. A quantitative presentation of these requirements will be included, such as the number of records that must be handled, maximum allowed time from query to receipt of requested information and flexibility required to accommodate changing user requirements.

(1) Accuracy and Validity. This sub-section shall provide a description of the accuracy requirements placed upon the system. The following items must be considered:

- accuracy requirements of mathematical calculations
- accuracy requirements of the data
- accuracy of transmitted data

(2) Timing. This sub-section shall provide a description of the timing requirements to be placed on the system. The following timing requirements must be considered:

- response time from receipt of input data to availability of the system output
- response time to queries and to updates of data files
- sequential relationship of functions
- priorities imposed by types of inputs and changes in modes of operations, and
- any deviations from specified response times for peak load periods, as applicable

b. Functional Area System Functions

This sub-section shall amplify and describe each individual function of the major functional processing steps contained in the "Proposed Methods and Procedures" sub-

section. This description should relate the functions of the performance requirements in the "Specific Performance Requirements" sub-section.

c. Inputs-Outputs

This sub-section shall describe each data element in the data inputs and outputs from the system. The following requirements for each data element may be listed information such as the following:

- data element name
- synonymous name
- definition
- format
- range or enumeration of values
- unit of measure
- data item name, abbreviations and codes
- characteristics such as precision, accuracy, timing and capacity

When the information is published in a data element dictionary, reference to an entry in the dictionary will be made rather than including an extract from that dictionary. Any variations in either the inputs or outputs from the formats or data item names that will be used on the database of the system as discussed in the "Database Characteristics" sub-section must be specifically identified.

When available, the various input data formats shall be shown and input medium (disk, cards, magnetic tape, analog-originated signals from revolving radar, etc.) shall

be specified. When available, the various output data formats including any quality control outputs shall be specified. When possible these outputs should be related to the system functions described in the "Functional Area System Functions" sub-section above.

d. Database Characteristics

This sub-section provided a discussion concerning the data elements to be used in the database. Each data element listed may contain the following information:

- data element name
- synonymous name
- definition
- format
- range or enumeration of values
- unit of measure
- data item name, abbreviations and codes
- characteristics such as precision, accuracy, timing and capacity

When the information is published in a data element dictionary, reference to an entry in the dictionary will be made rather than including an extract from that dictionary. An estimate of the data storage requirements in terms of size and number of records will be provided. A description of the expected growth of the data and related components should also be provided.

e. Failure Contingencies

This sub-section shall provide a discussion of alternative courses of action that may be taken to satisfy the information requirements if the proposed system fails. This should be included as appropriate:

(1) Back-up. A discussion shall be provided of the back-up requirements necessary to ensure the continued achievement of the system functions given in the "Functional Area System Function" sub-section above. "Back-up" as used here means the redundancy available in the event of the primary system element fails.

(2) Fallback. An explanation of fallback techniques required for ensuring the continued satisfaction of the specific requirements of the system shall be provided. "Fallback" as used here indicates the use of another system or other means to accomplish the system requirements. For example, the fallback technique for an automated system might be manual manipulation and recording of data.

4. Design Considerations

This section shall briefly describe how the proposed system shall satisfy the functional requirements delineated in Section 2 and 3. This section shall restate the user's requirements, previously presented in nontechnical terms, using any formalism needed for the design methods to be used for development. This section may also be used to document additional technical requirements when these do not relate directly to the functions and performance seen by the user and have not therefore been described in Section 3.

a. System Description

This sub-section shall provide a general description of the proposed system. Related and interfacing systems and their documentation will be referenced as required to enhance this general description. Included within this description shall be a chart showing the relationship of the user organizations to the major components of the system. This chart shall be based on the information included in the "Proposed Methods and Procedures" sub-section above.

b. System Function

This sub-section shall describe the functions of the proposed system. This will be both a quantitative and qualitative descriptions of how these functions will satisfy the requirements of the "Specific Performance Requirements" sub-section above. The functions must be described in such a manner that the system environment in Section 5 can be related to them.

c. Flexibility

This sub-section shall provide a description of the capability to be incorporated for adapting the system to changing requirements, such as, anticipated operational changes, interaction with new and proposed systems and planned periodic changes. Components and procedures designed to be subject to change will be identified.

d. System Data

Included in this sub-section shall be a description of the inputs, outputs and data used presented in Section 3. It shall describe details of data structures or the encoding of data that arise from technical requirements if the have not previously been addressed

5. Environment

This section shall describe the current AIS environment and attempt to project the environment needs to satisfy those requirements delineated in Sections 2 and 3.

a. Equipment Environment

This section shall provide a description of the equipment capabilities required for the operation of the proposed system. This section will present broad descriptions of the equipment presently available and the characteristics of any new equipment necessary based on the information in Section 3 above. A guideline for equipment to be described follows:

- Processor(s), including the number of each online/offline, and size of internal storage
- Storage media, including the number of disk units, tape units, etc.
- Output devices, including the number of each online/offline
- Input devices, including the number of each online/offline
- Communications network, including line speed

b. Support Software Environment

This sub-section shall provide a description of the support software with which the computer programs to be developed must interact. Included will be both support software, input and equipment simulators and test software, if needed. The correct nomenclature, level (version) documentation references of each such software system, subsystem and program shall be provided. In addition, the language (compiler, assembler, program, query, etc.), the operating system and any Data Management System to be used must be identified.

c. Communications Requirements

This sub-section shall describe the support software with which the applications software to be developed must interact. Included will be support software, input and equipment simulators and test software, if needed. The correct nomenclature, level (version) and documentation references of each software system, subsystem and software unit shall be provided. In addition, the language, the operating system and an Data Base Management System to be used will be identified.

(1) Graphic Overview. This sub-section shall contain or refer to a chart or diagram showing the known communications requirements of the AIS. Notations on type and peak volume of data will be included on the chart.

(2) Hardware. This sub-section shall list the know communications hardware required to support the AIS being developed.

(3) Software. This sub-section shall list the known communications software required to support the AIS being developed.

d. Interfaces

This sub-section shall provide a description of the interface requirements. For each interface, the following should be specified:

- Description of operational considerations of data transfer, such as security considerations
- General description of data transfer requirements to and from the subject system and characteristics of communications media/systems used for transfer
- Format, unit of measurement, range of values, data codes

- Type of anticipated interface, such as manual or automatic
- Anticipated interface procedures, including telecommunications considerations

e. Summary of Impacts

This sub-section shall describe the anticipated organizational, and developmental impacts of the proposed system on the AIS organizations.

(1) AIS Organization Impacts. Organizational impacts may include the modifications of positional responsibilities that will be required by the proposed system. Any personnel interactions eliminated will be identified and a discussion provided of the possibilities for retraining. AIS personnel responsibilities will be discussed. Requirements for the number and skills of additional personnel will be identified. Included will be changes in authorized strength, location and position identifier, if known.

(2) AIS Operational Impacts. This sub-section shall discuss impacts on the operational procedures of the data processing center(s) to implement the proposed system. Included will be operational impacts caused by a change in equipment configurations, if known.

(3) AIS Development Impacts. This sub-section shall assess the personnel and AIS processing commitment necessary for the development and testing of the automated system. Additional requirements for program and data conversion will be addressed, if known, along with any additional developmental impacts resulting from the requirements in the "User Development Impacts" sub-section above.

f. Failure Contingencies

This sub-section shall provide a discussion of possible failures of the hardware or software system, the consequences (in terms of system performance) of such failures and alternative courses of action that may be taken to satisfy the information requirements.

(1) Restart. Include a discussion of the restart capabilities for ensuring effective and efficient recovery from a temporary problem within the hardware or software systems. The "restart" capability, as used, is a capability to resume operation from a point in the automated process prior to where the problem occurred, with appropriate restoration of data.

(2) Other. The fallback and back-up contingencies described in the "Failure Contingencies" sub-section above will be considered, as appropriate.

g. Assumptions ad Constraints

This sub-section shall address any data automation assumptions and constraints that relate to development and operation of the automated system, as applicable.

6. Security

To control the dissemination of sensitive information, all or portions of this section may be maintained and distributed separately from the remainder of the document.

a. Background Information

This sub-section shall provide background information on sensitivity or classification of the application.

b. Control Points, Vulnerabilities and Safeguards

This sub-section shall describe each control point, the vulnerabilities at the control point and safeguard requirements to reduce the risk at the point to an acceptable level. This description shall include consideration of alternate modes of operation based on emergency, disaster or accident, if appropriate.

(1) Control Points. This sub-section shall describe the points in the system where there is known vulnerability which requires specific safeguards. A control point can be located at any interface where there is movement of data with in or between sites. The following control points should be considered:

- Input Control Points
  - origin
  - data entry
  - disposition
  - error correction
- Process Control Points
  - accuracy and completeness
  - system interfaces
- Output Control Points
  - production
  - distribution

(2) Vulnerabilities. This sub-section shall describe the vulnerabilities at each control point identified above. A vulnerability is a design, implementation, or operational condition inherent in the application or system which lends itself to error, loss or compromise of information or denial of service.

(3) Safeguards. This sub-section shall describe the safeguard requirements at each control point to reduce vulnerabilities. At least the following areas should be considered:

- administrative safeguards - any procedure that requires management supervision
  - personnel
  - collection and preparation
  - environment constraints
  - distribution
  - access/permission
- physical safeguards - any physical means that limits access to data, e.g., locked doors
  - dedicated equipment
  - storage and protection
- technical safeguards - any automated process that assures appropriate processing, e.g., passwords
  - process safeguards
  - security identification requirements

c. System Monitoring and Auditing

This sub-section shall describe all user requirements for the production of an audit trail including automated reports or journals necessary to monitor the system. This monitoring may be provided by this AIS or by other existing systems.

(1) Journalizing. This sub-section shall describe all journalizing requirements for the system. Journalizing is the recording of selected events as they occur within the system and provides the basis for monitoring the processing and use of data and the use of computer resources.

(2) Audit Trail. This sub-section shall describe all user requirements for an audit trail, such as total transaction counts processed by location, time and type.

7. System Development Plan

This section shall discuss the overall management approach to the development and implementation of the proposed computer system. Included shall be a discussion of and schedule for the documentation to be produced, time frames for the development of the system or the modules of the system, necessary liaison and participation by other organizations to ensure successful development and any other factors that must be known prior to initiating development. Reference may be made to such information contained in other documents.

8. Cost Factors

This section shall provide a summary of cost factors for the proposed system in accordance with DOD Instruction 7041.3, when applicable. While the proposed system responds directly to the project request, other factors may determine the need for this system, such as requirements, telecommunications considerations and the need to interface with other automated systems. General alternative that may be discussed include those for system development and system design with consideration being given to equipment, software, supporting telecommunications requirements, organization, operation, etc. Reference may be made to such information contained in other documents.

The above documentation standard [Ref. 8] was written six (6) years ago, therefore, it does not consider the new development techniques or new technologies. Yet, it is still used as the standard for documenting AIS in DOD.

B. NHCSPP DRAFT FUNCTIONAL DESCRIPTION

The Navy Medicine EIS NHCSPP module is to be developed in a rapid prototyping mode, which is iterative in nature. Therefore, many of the functional requirements will be identified after a number of iterations. As such, information for the following areas is not yet available in its complete form.

- Database Characteristics
- Inputs
- Outputs
- Security
- Costs

The following sub-sections contain the draft functional description for the NHCSPP.

1. General

a. Purpose of the Functional Description

This Functional Description for the Navy Health Care Strategic Planning Process Module of the Executive Information System provides:

- The System requirements which must be satisfied and which will serve as a basis for mutual understanding between the user and the developer
- Information on performance requirements, preliminary design considerations, and user impacts including fixed and continuing costs
- A basis for development of system tests

b. Project References

The documentation applicable to the history and development of the EIS Health Care Strategic Planning Process Module is listed in the List of References and Bibliography of this document.

c. Terms and Abbreviations

A list of terms, abbreviations and acronyms unique to this project and document can be found in Appendix B.

2. System Summary

a. EIS Navy Health Care Strategic Planning Process Module Background

The EIS is based on a centralized database system that utilizes the capabilities of the mainframe computer at NMIMC for database maintenance. Also the Navy Medical EIS has the same capability as any commercially available EIS software to answer queries. A corporate database is created from data extracted monthly from external operational systems located in medical treatment facilities (MTFs), dental treatment facilities (DTFs) and outside organizations. Chapter V discusses the Navy Medical EIS in more detail.

The EIS project sponsor is NMIMC-09EIS. Once EIS is fully operational, it will be available at thirty seven (37) MTF and thirty two (32) DTF sites to over two hundred fifty (250) users. These users can be divided into three (3) categories: top-level executive, who will receive performance indicators and success factors, health care analysts and planners, who require more detailed data for problem analysis and modeling and health care facility managers, who use facility-level data to support operations, management and planning activities.

The Navy Health Care Strategic Planning Process module, as with other EIS modules, will be designed to provide information to the three (3) levels of users: executive managers, staff analysts and MTF level managers. Executive managers require summary information rolled up from the MTFs throughout the claimancy. Staff analysts require access to facility level summary data by unit identification code which can be compared and contrasted with MTFs of like size and mission. While MTF planners need information on their MTF and its catchment area. A detail discussion of the NHCSPP is found in Chapter IV.

b. Objectives

The objective of the EIS Navy Health Care Strategic Planning Process module is to provide integrated and flexible health care planning information and tools to users at all levels. The module must provide:

- Population based planning
- Need and Demand variance analysis
- Graphical and tabular display, comparison and analysis of multiple year (minimum of three) information
- Support other functions and information needs of the health care planners in areas such as:
    - Budget formulation / justification
    - Cost Benefit analysis
    - Staffing requirements
    - Problem identification and resolution

c. Existing Methods and Procedures

Currently the NHCSPP is being used manually with health care planners extracting data from the source systems individually then using COTS spreadsheets and databases management systems to analyze and store the data.

d. Proposed Methods and Procedures

The EIS Navy Health Care Strategic Planning Process module will consist of a core hierarchical Comshare Commander EIS models that will reside on the NMIMC mainframe host computer, augmented by user adaptable Comshare One-Up+ models on selected workstations. Maintaining the core system on the central host will provide data integrity and control, facilitate communication and provide the capacity required to handle the large amounts of data. Use of Comshare One-Up+ at selected workstations will allow the analysts to extend and adapt the Health Care planner's capabilities to new and unique requirements. The combined capabilities of the EIS/Comshare System will provide the health care planner with the information required and a standard set of tools which will obviate the need for unique applications and diverse islands of automation.

e. Assumptions and Constraints

The following assumptions and constraints will apply to the development of the EIS NHCSPP Module

- data used by the NHCSPP module must be accurate
- source data collection systems must be responsible for the accuracy of the data

3. Detailed Characteristics

The following paragraphs discuss the detailed characteristics, but in no way limit the system to the characteristics listed.

a. Specific Performance Requirements

Considering that this draft functional description is being written in the earliest stage of the rapid prototyping process, determining the quantitative performance requirements of the NHCSPP is beyond the scope of this thesis. Additionally, the iterative nature of rapid prototype development will allow for the development of these requirements as the NHCSPP module is developed. The following specific user performance requirements must be satisfied. The NHCSPP module must provide:

- the ability to view the population by catchment area or claimancy level
- the capability to accept and display data from two years prior as well as the current year
- the capability for side by side comparison of years, actual and projected, in both graphical and tabular format
- the capability to build standard reports and to export data to local (One-Up+) models
- a user-friendly, menu driven application to input and/or move data into models from other files and applications and to move data between models)both mainframe System W models and workstation One-Up+ models)
- population trend analysis
- service and care location trend analysis
- periodic updates (monthly for most data) must be incorporated into all models
- indicate date of last periodic update and/or special update. An update log will be maintained and accessible to users to determine the currency of data.

(1) Accuracy and Validity. Each facility will be responsible for the accuracy, validity, and timely update of the data contained on their facility's NHCSPP module.

(2) Timing. Timing of periodic updates of accounting data will be monthly. Timing of other periodic updates will be determined by the nature of the data and will be available through system inquiry.

(3) Capacity Limits. The capacity limits of Comshare One-Up+ workstation software five dimensions and approximately three hundred million cells require that the core models reside on the mainframe System W (nine viewpoints and over three hundred million cells).

b. Functional Area System Functions

The system functions contained in the Comshare, Commander EIS, Executive View, One-Up+ and the System W development tools are the inherent capabilities as well as the limitations of the system.

c. Inputs and Outputs

Inputs will be primarily extracted from population, patient, provider, man-power, accounting and financial data. Outputs will be provided to the users in accordance with the overall system architecture discussed in Section D, Design Considerations.

d. Database Characteristics

Due to the complexity of the NHCSPP, the database characteristics could not be established within the scope of this thesis. Each step in the NHCSPP will require access to different data. As a result, the database characteristics need to be developed in

collaboration with the functional users. It will be critical when developing the data that users from all levels of the planning process are represented.

e. Failure Contingencies

Mainframe failure contingencies will be in accordance with NMIMC contingency plans.

Backup capability in case of communication failure or overload (LAN or DDN) exists through the use of dial-up communications directly with the host.

Workstation failure will require the operator to use a different DSS configured workstation until the affected workstation has been repaired. The EIS system administrator will provide assistance in configuring the workstations and in using the system.

4. Design Detail

The prototype discussed in the following sections provides guidelines required for the development of functional capabilities that fulfill the requirements given in Section C. These guidelines in no way limit or constrain the final NHCSPP module design. The "Prototype Architecture" section provides a template that could be used in the development of the NHCSPP module.

Several additional capabilities are required by the nature of this planning system and must be addressed in the design phase of the system. These include:

- Security. Access to the mainframe model and the corresponding reports ("Briefing Books") generated from the model as well as the charting capability ("Execu-view") provided by the Comshare software must be firmly limited to authorized users of the system. These authorized users are further broken into three categories:

  Category 1 - Executive Level Managers
  Category 2 - Staff Analysts
  Category 3 - Facility Planners and Managers

- Data Feeds - Input. Data will be provided to the module from the following sources:

  Population Data
  Projected Health Care Needs Data
  Historical Health Care Demand Data
  Unit Cost data

- Data Feeds - Outputs. The NHCSPP module outputs will be recommendations, charts and printed reports in support of alternative delivery strategy selection.

a. System Description

The EIS Strategic Health Care Planning Module is being developed in a rapid prototyping environment. Prototype applications are reviewed by the users for usability and applicability and are incorporated into the system architecture and design on an incremental basis. Therefore the overall system description presented in the following paragraphs in no way limits of constraints the final NHCSPP module design. The NHCSPP module is defined as a mainframe Comshare EIS model with the following characteristics:

(1) Identify the Issues/Problem. The HCSPP module of the EIS would not support the step of identifying an issue. This step would be done through the analysis of data within the other steps of the module. The user would identify the issue based on Diagnostic Related Group (DRG) codes or some other standard reporting method.

(2) Specify the Population. The population data for each area of responsibility would be pulled once each quarter and stored locally. The user could do ad hoc reporting, trend analysis and population forecasting.

(3) Assess the Need. The actuarial models would be stored on the mainframe at the NMIMC due to the size and complexity of these models. The expected need for a

particular catchement area could be extracted quarterly. The expected need data would be stored locally allowing the MTF planner to do trend analysis, ad hoc reporting, forecasting etc. The actuarial models must contain the flexibility to meet the need of both coordinated care sites and standard health care delivery sites.

(4) Access the Demand. This step in the process would allow the user to do ad hoc reporting and trend analysis both on patient and provider information as well as customer expectations. A mechanism for inputting the customer expectations should be available to the planner. The user could access patient level information on a particular episode of care. Data from both the Direct Care System and the CHAMPUS would be available to the health care planner.

(5) Determine the Requirements of Services. This step requires the ability to do a variance analysis of expected need, historical demand and customer expectations. The health care planner should then be able to choose on which variable the requirements for service will be based, expected need, historical demand or customer expectation.

(6) Forecast Resource Requirements. Here the requirements for service are converted to a forecast of the resources required to meet the health care services needs. The resources required will be forecasted without regard for the ability to deliver the care.

(7) Begin Plan Development. Contained in this step is a model of each MTF's current staffing and in place provider contracts. This staffing model provides the planner the ability to calculate the amount of the total resources required. The difference between the total resources required and the available resources at the MTF is the target for the

health care planner's alternative delivery strategies. The ability to do "what if" scenarios with hospital staffing and contracts will is of critical importance.

(8) Develop Alternative Delivery Strategies. In this step the health care planner should be able to choose from an existing list of alternative delivery methods supported by industry standard staffing and cost models. The planner can choose what type of contract and at what discount for a total cost for the services to be rendered. The planner should be able to select multiple alternatives and then compare them for cost effectiveness.

(9). Select Alternative. With the alternatives laid out, the planner would choose one of the alternatives and be able to do "what if" scenarios to see the effect of the selected alternative on the difference between total resources required and available resources. Once the alternative has been selected and implemented, the user should be able to add it to the list of available resources at this particular MTF.

The above characteristics only briefly describe the NHCSPP, a detailed description is present in Chapter IV.

b. System Functions

The system functions contained in the Comshare, Commander EIS, Executive View, and One-Up+ development tools will be the inherent capabilities, as well as the limitations, of the system.

c. Flexibility

The system functions and expansion capabilities contained in the Comshare, Commander EIS, Execu-view, and One-up development tools will be the determining factors affecting the flexibility of the NHCSPP module.

d. System Data

The following paragraphs briefly describe the inputs, outputs and database characteristics of the NHCSPP module. Considering that this draft functional description is being written in the earliest stage of the rapid prototyping process, the types of inputs, outputs, and database described here in no way limit these areas for the NHCSPP module.

(1) Inputs. The inputs to the NHCSPP module shall include issues facing the facilities, industry standard staffing models, population actuarial models, make-buy models and a facility unique capabilities and staffing models.

(2) Outputs. The outputs will include graphs and reports to support the selection of an alternative delivery strategy.

(3) Database. Due to the complexity of the NHCSPP, the database characteristics could not be established within the scope of this thesis. Each step in the NHCSPP will require access to different data. As a result, the database characteristics need to be developed in collaboration with the functional users. It will be critical when developing the data that users from all levels of the planning process be represented.

5. Environment

The Automated Information Systems (AIS) environment in which the EIS will operate is comprised of :

- NMIMC Amdahl 5890-190E Mainframe Computer System
- Networked LANs at hospital and headquarters facilities connected via a NMIMC MED-OA LAN to the NMIMC Amdahl and data PBX
- AT&T 3B2 LAN servers

- Personal computer workstations
- Data PBX for dial-in communications

The software components of the EIS will reside on the NMIMC Mainframe and on personal computer workstations. Data input used by EIS will reside on the Direct Access Storage Devices (DASD) connected to the NMIMC mainframe on the AT&T 3B2 Servers and on the personal computer workstations. Communications and interfaces among the software and data components will be provided by the network and by asynchronous modem dial-in capabilities using the Data PBX. The following paragraphs discuss the environment in detail.

a. AIS Equipment Environment

The EIS will require that software and data components reside on the NMIMC mainframes (Amdahl), AT&T 3B2 and PC AIS equipment. Comshare, Inc.'s, System W software, an integral part of the EIS, will run on the Amdahl 5890-190E dual processor mainframe system. The mainframe is constantly being upgraded and , at the time of this writing, consists of the following equipment suite:

- Dual 370 architecture compatible processors divisible into four (4) multiple domain processors
- MVS and VM operating system
- 64 megabyte main memory, with 28 megabyte of production-oriented domain
- 48 - 3380 Amdahl DASD spindles for a total of 7.5 gigabytes
- 16 - 3350 Memorex DASD spindles for a total of 317 megabytes
- 5 - 3420 and 8 - 3480 model tape units

- 96 dial in modems
- a total of 192 hardware ports.

PC equipment running the Commander-EIS based component of the EIS will reside on UNISYS, Everex and possibly other vendors' Intel 80386-based personal computer systems. These will contain a minimum of 4 megabytes internal memory and 40 megabytes of disk storage. EIS will require the use of EGA/VGA displays. The approximate number of PC systems to be fielded is 250.

Network servers (AT&T 3B2s) will in some cases be used as large data repositories (virtual disks) for PC-based EIS software. All 3B2 servers now in place and those being delivered have 16 megabytes of main memory and 300 megabytes of disk storage, 150 megabytes of which is required by the UNIX OS, leaving 150 megabytes free for network users.

b. Communication Environment

The EIS will use asynchronous, 9600 and 2400 baud dial-in capabilities and , where possible, the TCP/IP network to connect to the NMIMC Mainframe. The connectivity is required for access to detailed data which can only reside in large System W model files on the mainframe. The network, through Remote File Sharing (RFS) capabilities of TCP/IP and AT&T UNIX, also provides a virtual disk space for personal computers connected to LANs.

(1) Network Description. The overall communications environment will consist of TCP/IP over Ethernet LANs which are internetted using MILNET (DDN). These

networks provide office automation capabilities where currently installed. EIS will require connectivity through MILNET to all but a few small, remote systems. The network will provide connection points for AT&T 3B2s, personal computers and other EIS-related systems. Connections to the MILNET (DDN) are anticipated to be at 19.2 KBPS. Actual data transfer rates over this network will be slower due to the store and forward nature of an internet. Users with local servers or users accessing local machines on their network will be operating at 10 MBPS. Actual data rates again will be slower depending upon network usage. The communication network will also be the primary means of software and data upgrades for remote sites. Eventually all users with access to the MED-OA LAN will be able to access the Corporate Data Base at NMIMC Bethesda.

(2) Physical Interface. Physical interface will be provided for each workstation by either one of three (3) versions of Ethernet cards used on MED-OA LANs or by dial-up modems. The Ethernet interfaces are compliant with the IEEE 802.3 Ethernet standard. The network will provide 10 MBPS local connectivity through either fiber optics or twisted pair media. Dial up capabilities will be provided via 2400 or 9600 Baud modems.

(3) Protocol Interface. The network will use TCP/IP protocols. The communications performed by EIS applications will not directly interface with the transport layer mechanisms of TCP/IP, and therefore no constraints on data or record formats are placed on EIS communications by the network. Protocol interface, where necessary, will be provided by separate, stand-alone software components. Dial-up interface protocols will be standard asynchronous ASCII with capabilities up to MNP 7 error correction provided by the NMIMC PBX.

(4) Applications User Interface. Comshare, Inc.'s, Commander-EIS will provide user interface for all required workstations-to-host and workstation-to-server communications. The application user interface will be icon, panel, and/or menu driven. The user interface will eliminate the need for a user knowledgeable in communications.

(5) Diagnostics. Simple user diagnostic procedures will be an important attribute of the EIS. The user will be informed by the EIS when connections cannot be accomplished. Diagnostic procedures will consist of the following types of procedures:

- For Application End Users
  - Noting the error messages displayed by the system
  - Performing simple checks to determine if the network is active
- For Computer Operations and Field Assistance Personnel
  - Performing simple diagnostics on the network
  - Obtaining support from the local MED-OA LAN administrator

c. Support Software Environment

The support software environment for the mainframe includes:

- IBM MVS Operating System
- IBM VM Operating System
- IBM Professional Office System Program Product (PROFS)
- ADABAS/NATURAL DBMS/Query Language
- IBM MVS Time Sharing Option (TSO) with Interactive Software Productivity Facility (ISPF)

- Comshare, Inc., System W Data Modeling Facility
- Top Secret Mainframe Security Package

System W, ADABAS/NATURAL, and TSO/ISPF all run under the MVS operating system. System W is used to develop data models for view by PC-based Commander-EIS systems. ADABAS/NATURAL queries are made on the NMIMC Corporate Database to produce flat files for importing into System W. MVS/TSO is the development operating system and the utilities set used to develop mainframe models. The software support environment for the PC workstation consists of :

- Microsoft MS-DOS 3.3 or higher
- Comshare, Inc., Commander-EIS
- Comshare, Inc., One-Up+

Comshare, Inc.'s Commander-EIS is an EIS development shell which will run under MS-DOS as an applications development and run time EIS tool. Comshare, Inc.'s One-Up+ is a PC-based modeling tool which mirrors the capabilities of System W on the mainframe. This tool will be used to develop small PC or LAN based Models.

d. Software Interfaces

EIS interface with other software components/operational systems will be via import of flat files produced by ADABAS/NATURAL queries of those systems. The details of this interface are provided in Section D, Design Considerations. EIS software

components on the mainframe (System W) and PC (Commander-EIS) will interface to provide the user views of detailed data residing on the mainframe. This interface is already integrated into Comshare off-the-shelf software.

6. Security

No classified data will be processed by the EIS. Sensitive data will consist of primarily financial data on Navy Medical programs and facilities as well as privacy act information from direct care and CHAMPUS patient and provider data. Access to this data will be controlled by System W and Commander-EIS software components using encrypted user identification passed between System W and Commander-EIS software components. This user identification data is managed by the local EIS administrators as delegated by the EIS information provider. The EIS information provider will control which users have access to which models using information security features in System W. System W models on the mainframe and 3B2 servers will be read-only and constitute the "models of record" from a data integrity standpoint.

7. System Development Plan

Determining the System Development Plan for the NHCSPP module of the Navy Medical EIS is beyond the scope of this thesis. This will be done by NMIMC.

8. Costs

Determining the cost to develop the NHCSPP module of the Navy Medicine EIS is beyond the scope of this thesis. This will be done by NMIMC.

The next chapter will discuss the recommendations and conclusions drawn from the research.

VII. CONCLUSIONS AND RECOMMENDATIONS

This chapter provides recommendations and conclusions drawn from the research conducted.

A. PROBLEMS WITH THE PROCESS

The following paragraphs discuss problems identified during this research.

1. Data Comparison

The primary problem identified with the current NHCSPP becomes readily apparent when comparing Direct Care system data and the CHAMPUS data. The CHAMPUS systems use Diagnostic Related Group (DRG), International Classification of Disease version nine (IDC9) and Clinical Procedure Terminology version four (CPT4) codes. While, on the other hand, the Direct Care System costs (material, manpower, facility overhear, etc.) using work center costing and performance reporting. Therefore, when the two areas are compared, the direct care data must be manipulated in order to devolop an estimate of the per patient cost which then can be compared to the CHAMPUS per patient cost. This manipulation and massaging of the data introduces errors, making the resultant data questionable. This in turn makes make or buy decisions questionable.

2. Standardization of the HCSPP

During an interview with the Tri-Service Project Office [Ref. 10], regarding the NHCSPP, concern was expressed over the fact that each service is developing a service unique HCSPP. Captain (CAPT) Hood, USN and his directors, expressed the concern

that all services are planning health care delivery systems with a different process. This separate development hinders CCP efforts and makes more difficult the Tri-service efforts to get the most out of shrinking resources. [Ref. 10]

3. Unit Costing

The movement is under way, within DOD, to progress from the present method of budgeting for health care to a capitation method [Ref. 10]. Capitation budgeting is budgeting on a per beneficiary basis. The problem, however, is that the Navy Medical Department can not isolate the cost of each procedure performed, therefore estimating the monthly or yearly cost of each beneficiary is almost impossible. Without this estimate, it is difficult to know what resource requirements will be.

B. PROBLEMS WITH THE NAVY MEDICAL EIS

1. *EIS or* DSS

What the users of the Navy Medical EIS need is a system that provides both summary and detailed information that may be combined with analytical tools. As such, users need a system that assists their decision making capabilities in resource allocation. The question then becomes which is needed, an Executive Information System (EIS) or a Decision Support System (DSS)? Below are the definitions of each system:

EIS - a computer-based system that serves the information needs of top executives. It provides rapid access to timely information and direct access to management reports. It is very user-friendly, supported by graphics, and provides exceptions' reporting and "drill-down" capabilities. Is also easily connected with on-line information services and electronic mail. [Ref. 11]

DSS - an interactive, flexible, and adaptable computer-based information system that utilizes decision rules, models, and model base coupled with comprehensive database and the decision maker's own insight. leading to specific, implementable decisions in solving problems that would not be amenable to management science optimization models per se. A DSS supports complex decision making and increases effectiveness. [Ref. 11]

After interviewing many of the potential users, the follow description for a Executive Support System (ESS) describes the users needs.

ESS - The ESS is a comprehensive support system that goes beyond EIS to include communication, office automation, analysis support and intelligence. [Ref. 11]

C. RESPONSE FROM THE WORKING HEALTH CARE PLANNERS

The NHCSPP is currently being employed at staff commands and at the MTFs in manual mode. Several interviews where conducted with prospective end-users of the NHCSPP module of the Navy Medical EIS. Following are concerns expressed by personnelinterviewed in regard to the NHCSPP itself and any future NHCSPP module.

1. Executive Managers

The executive managers from BUMED [Ref. 12 & 13] and the Tricare Project Office [Ref. 10], offered the following recommendations regarding the automation of the NHCSPP:

- data be tri-service. This includes population, historical workload, financial, staffing and patient (direct care and CHAMPUS) data.

- the same planning tool be used throughout the entire planning and budgeting chain of command starting at the DOD level and flowing downward through the three (3) services
- as much interaction as possible
- a crosswalk be established between the direct care patient data and the CHAMPUS data
- the software has "what if" capabilities
- the services begin to do patient level accounting
- military staffing of the MTFs be done across the services, shifting assets between services as the population demands
- the software allow for future year projection in all steps

2. Staff Analysts

The staff analysts at BUMED [Ref. 14 & 15] proposed the following recommendations regarding the automation of the NHCSPP:

- the system be flexible enough to allow them to continue to do a detailed level of program costing
- the system be responsive to the move to capitation budgeting
- the system must be able to do planning and budgeting by Unit Identification Code (UIC)
- the source data be provided in a timely manner to the analysts
- there be standardization of data across the services
- there be on-line access to the source data
- there be ad hoc capabilities with each step of the NHCSPP
- the software allow for future year projection in all steps

3. Facility Planner/Manager

The facility planner at Naval Hospital Portsmouth, Virginia, Lieutenant Commander (LCDR) John Tempesco, Medical Service Corps, United States Navy [Ref. 6], considered by many in DOD to be an expert in health care planning, offered the following recommendations:

- the same planning tool be used throughout the entire planning and budgeting chain of command starting at the DOD level and flowing downward through the three (3) services
- as much interaction as possible
- the system provide decision and analytical support
- a crosswalk be established between the direct care patient data and the CHAMPUS data
- the software contain the ability to have "what if" capabilities in regard to each step in the NHCSPP
- the services begin to do patient level accounting
- military staffing of the MTFs be done across the services, shifting assets between services as the population demands
- the software allow for future year projection in all steps

D. RECOMMENDATIONS

The following recommendations are made regarding the development and deployment of the Navy Medical EIS NHCSPP module.

1. Standardization of the Health Care Planning Process

The current health care planning process differs within each service and at the DOD level [Ref. 10]. In order to effectively manage the military health care system in this time of budget cuts and force right-sizing, all services need to do health care planning in

the same manner. At the DOD level, a health care strategic planning process should be developed and used by the service components. This would enable budgeting to be based on common planning processes for all DOD components.

2. **The Navy Medical EIS NHCSPP module**

Upon completion of the research, it is evident that further research in required. This additional research is beyond the scope of this thesis. Yet, if the NHCSPP module of the Navy Medical EIS is to be completely and successfully implemented, the MTF level health care planners, staff analysts and executive manages need to collaborate on the development of a detailed functional description. This document contains a rough draft of the functional description and should act as a springboard for further discussion.

3. **Department of Defense Automation Information Systems Documentation Standard**

The research indicates that Navy Health Care Strategic Planning is an extremely complex and intricate process and as such, traditional methodologies that emphasize capturing and representing users' requirements upfront, i.e. DOD-STD-7935A, are not appropriate for automating the planning process. The development of strategic planning tools is an extremely complex process that requires the use of new development methologies, i.e., rapid prototyping, incremental development, etc.. In many cases, for example the NHCSPP, all of the users' requirements can not be identified until the tool has been tested in a operational environment. Therefore, expecting to capture all user requirements upfront is not feasible yet, this is a requirement of the current standards.

The Department of Defense Automation Information Systems Documentation Standard, DOD-STD-7935A, October 1988 [Ref. 8] was written six years ago and as such, does not consider new AIS developmental techniques or new technologies. Yet, this standard is still used for documenting AIS in DOD. This standard should be update to reflect changes in technology.

4. Executive Support System

Upon completing the research, it is clear that what the users at all level require is an Executive Support System (ESS). The ESS incorporates the decision support requirements of the headquarters and facility level planner with the executive information requirements of the executive managers. This would allow the development and use of one system across the echelons of command and decision making.

APPENDIX TERMS AND ABBREVIATIONS

AG	Activity Group
AIS	Automated Information System
BUMED	Bureau of Medicine and Surgery
DASD	Direct Access Storage Device
DBMS	Data Base Management Systems
DDN	Defense Data Network
DTF	Dental Treatment Facility
DSS	Decision Support System
EE	Expense Element
EIS	Executive Information System
EOB	Expense Operation Budget
HSO	Health Care Support Organization
ISPF	interactive Software Productivity Facility
JCL	Job Control Language
LAN	Local Area Network
MBPS	Mega Bits Per Second
MED-OA	Medical Office Automation Department
MEPRS	Medical Expense and Performance Reporting System
MILNET	Military Network
MTF	Medical Treatment Facility
MVS	Multiple Virtual System
NH	Naval Hospital
NMIMC	Naval Medical Information Management Center
OPTAR	Operation Target
PBX	Public Branch Exchange
PCDM	Personal Computer Data Management File
PM	Performance Measure
PROFS	Professional Office System Program Product
RFS	Remote File Sharing
SAG	Sub-Activity Group
TCP/IP	Transmission Control Protocol/Internet Protocol
TSO	Time Sharing Option
UIC	Unit Identification Code
VM	Virtual Machine
WIRS	Worldwide Inpatient Reporting System
WORS	Worldwide Outpatient Reporting System

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