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Report to Sen. John C. Stennis, Chairman, Senate Committee on Appropriations: Defense Subcommittee; by Elmer B. Staats, Comptroller General.

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Congressional Relevance: House Committee on Armed Services; Senate Committee on Armed Services. Sen. John C. Stennis.

The Department of Defense's (DOD's) Tri-Service Medical Information System (TRIMIS) should provide automated data processing support for patient care in military hospitals. Its potential benefits involve minimizing duplication in systems development by the services, money savings, and improved hospital patient care. However, little progress has been made toward achieving these objectives despite expenditures of about $50 million. Problems identified were: lack of unified support from services in the design and development effort, little management continuity, lack of definition of organizational responsibilities, inadequate planning, and lack of emphasis on system standardization. The Congress should advise the Secretary of Defense that further funding of the TRIMIS Program should be restricted to DOD's: preparation and presentation of a long-range plan for the development, implementation, and operation of TRIMIS within budgetary and time limitations; preparation of a series of short-range plans that provide DOD a firm commitment for implementing the long-range plan; identification of the uniform data elements, codes, and communication protocols that are to be used by the services throughout TRIMIS' life cycle; and designation of the patient administration module as the top priority module for development and implementation. (HTW)

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-182656 JULY 19, 1978

The Honorable John C. Stennis
Chairman, Subcommittee on Defense
Committee on Appropriations
United States Senate

Dear Mr. Chairman:

As requested in your March 23, 1978, letter, this summarizes the conclusions and recommendations of our followup review of the Department of Defense Tri-Service Medical Information System (TRIMIS) Program. Enclosure I presents additional details on our findings, and Enclosure II provides a DOD implementation schedule by system and site.

The TRIMIS Program, established in July 1974, has been the subject of numerous reviews. When completed, the system should provide automated data processing support for patient care in military hospitals. By providing for system development in a tri-service environment, several potential benefits could be achieved. For example, duplicate system development efforts by the services could be minimized because the potential exists for implementing a uniform interservice medical information system.

We believe the concept of providing a uniform interservice system is sound and could result in saving money and in improving hospital patient care if automated support is properly developed and implemented. Achieving this goal requires effective management, thorough planning, and cooperation among the services. For example, management continuity and the communication of clearly documented planning to all service organizations involved are necessary for a successful system. Further, the development effort must include a high priority for standardizing basic data elements early in the program to minimize overall costs and provide a greater assurance that TRIMIS objectives can be achieved.

Little progress has been made toward achieving TRIMIS objectives despite expenditures of about $50 million. Our previous report ("Better Communication, Cooperation and Coordination Needed in Department of Defense Development of its Tri-Service Medical Information System Program," LCD-76-117, Oct. 6, 1976) pointed out serious problems in

developing the system. We reported that the design and development effort for the Program had been started without the unified support from the three services needed to assure its successful development. As a result, specific information requirements necessary to support and satisfy user needs had yet to be established, even though development had been underway for more than 2 years and over $14 million had been spent. We made specific recommendations to the Secretary of Defense that would, if implemented, alleviate most of the major problems cited in that report.

The Department of Defense has been only partially responsive to our previous recommendations. Certain corrective actions have improved program credibility. For example, the transfer of program management to the Office of the Secretary of Defense in 1976 was an attempt to strengthen the overall management structure and provide a sound basis for system development. A similar transfer of funding responsibility from the services to the Office of the Secretary of Defense was also an improvement, allowing for better centralized control over program funding.

Nonetheless, more needs to be done to assure the Department of Defense that TRIMIS has a high probability for success. Many of the problems previously cited have not been resolved. As a result, the Program continues to proceed slowly at great expense, and, if improvements are not made, it may never achieve its objectives. Our review showed numerous deficiencies which are adversely affecting the Program's chances for success.

Since it began in 1974, the Program has had little management continuity due to frequent reorganization, staff reductions, and changes in management. The Air Force, for example, had primary system development responsibility when TRIMIS was first established. That responsibility was transferred in 1976 to the TRIMIS Program Office, a newly created field activity of the Office of the Secretary of Defense. During our followup review, an October 1978 date was being considered for another program management transfer to the Defense Logistics Agency. The lack of managerial continuity has wasted valuable time and resources and has jeopardized the future of TRIMIS. Unless the Program is stabilized, the Department of Defense will continue to spend much of its time and effort reorganizing rather than developing and implementing TRIMIS.

The roles and responsibilities of the various organizations involved with TRIMIS are not well defined. Since this is a major tri-service effort where responsibilities cross service lines, it is especially important that all organizations concerned be aware of and quickly and efficiently execute their responsibilities. Although the Program is nearly 4 years old, the Department of Defense has not issued necessary instructions or manuals detailing responsibilities in such critical areas of the TRIMIS life cycle as funding, training, and systems maintenance after the system becomes operational. When completed and approved, the TRIMIS Master Plan and related annexes should help clarify many of these areas. Until such time, however, it will be difficult to clearly define the roles of the various organizations involved with TRIMIS.

Presently, long- and short-range planning for TRIMIS is inadequate. Our review showed that plans change frequently, revisions are not timely, and current plans are neither complete nor documented adequately. Detailed long- and short-range planning would help to provide a sound basis for the development, implementation, and operation of TRIMIS, and thus increase the probability for the Program's overall success. In this regard, the TRIMIS Program Office and the services must work cooperatively to: (1) develop a long-range plan for the development, implementation, and operation of TRIMIS and (2) prepare and implement short-range plans that will provide the Department of Defense reasonable assurance that TRIMIS will achieve its intended objectives throughout the Program's life cycle.

The current system development approach has a low probability for success in terms of implementing a uniform interservice medical system. This current approach calls for such functional areas as pharmacies, laboratories, and radiology departments to be separately and independently automated and installed at numerous service hospitals. These initial capabilities are to use commercially available systems when possible and be modified only as necessary to operate in a particular service environment. They would be nonstandard in terms of a particular service's medical data elements and codes and in the ability to be electronically linked together to form a single automated patient care information processing system at a military hospital.

We believe that greater emphasis has to be placed on standardization efforts early in the development process.

Service medical data elements and codes vary, and little progress has been made to create uniform servicewide elements and codes even though they are essential to the development of TRIMIS. Further, even though various automated functional subsystems are identified for development, necessary standards, such as communication protocols needed to efficiently interconnect them within a hospital, have yet to be defined in sufficient detail to serve as a basis for further system development. Although these initial efforts may partially satisfy interim service, they delay the effective identification of uniform data elements and codes and the communication protocols necessary to develop and implement TRIMIS within cost and time limitations. Thus, TRIMIS standardization may never be achieved.

Without emphasis on early standardization, the Department of Defense may be faced with costly subsystem replacement or conversion to uniform systems if and when they become available. One alternative available to reduce risk of excessive Program retrofit cost or subsequent Program termination is to develop a uniform patient administration system. We believe that a uniform patient administration system should have been specified, approved, and developed first--before the hospital functional areas. Our reason is that all hospital functional modules, such as laboratory and pharmacy, must interface with a patient administration system. It is substantially less costly to interface the functional modules with a uniform patient administration system that exists, operates efficiently, and whose communication protocols are known. In essence, the patient administration system serves as the central nervous system or basic information system for patient care in each TRIMIS hospital installation. For this reason, the patient administration system is also the functional area with the greatest need for standardization. Previous work by the Veterans Administration and the Air Force shows that the patient administration system must serve as the foundation for medical information system development efforts.

If current estimates are accurate, the Department of Defense may spend more than $305 million on the TRIMIS Program through fiscal year 1983. We believe a program of the size, cost, and complexity of TRIMIS needs serious attention if it is to succeed.

Therefore, we recommend that the Congress advise the Secretary of Defense that further funding of the TRIMIS Program be restricted to the Department's

--preparation and presentation of a long-range plan for the development, implementation, and operation of TRIMIS within budgetary and time limitations;

--preparation of a series of short-range plans that provide the Department a firm commitment for implementing the long-range plan;

--identification of the uniform data elements, codes, and communication protocols that are to be used by the services throughout the Program's life cycle; and

--designation of the patient administration module as the top priority module for development and implementation.

The completion of these tasks should demonstrate to the Congress and the Department of Defense that the TRIMIS Program has a strong probability for successful development, implementation, and operation.

As requested by your office, we did not obtain written agency comments. The issues covered in this report, however, were discussed with agency officials and their comments were considered in the preparation of this report.

As arranged with your office, we are sending copies of this report to the Secretary of Defense; the Director, Office of Management and Budget; and other interested parties.

Sincerely yours,

Comptroller General
of the United States

Enclosures - 2

ENCLOSURE I

REDIRECTION IS NEEDED FOR SUCCESSFUL DEVELOPMENT OF DEFENSE'S TRI-SERVICE MEDICAL INFORMATION SYSTEM

INTRODUCTION

The Tri-Service Medical Information System (TRIMIS) Program was established by the Department of Defense (DOD) to bring automated data processing (ADP) technology into military hospitals. The objectives of TRIMIS are to:

--Improve the effectiveness and economy of health care delivery by applying standardized ADP techniques.

--Centralize and coordinate the application of existing technology and the development of standardized automated systems which meet tri-service functional requirements.

--Adapt advanced data automation technology to health care delivery, and streamline, modernize, and standardize DOD medical information systems.

Origin of the TRIMIS Program

During recent years, DOD has annually spent about $3 billion to support Air Force, Army, and Navy medical activities. As medical care has become more complex, these military medical departments have faced an ever increasing workload and a shortage of medical personnel.

The Secretary recognized these problems and, as early as 1968, made a study of the military health system. The study resulted in the Assistant Secretary of Defense (Health Affairs) 1/ making the Air Force, in 1971, responsible for developing an automated medical information system to support the proposed New Generation of Military Hospital project at Travis Air Force Base, California. This facility was to be the prototype for testing the most recent ADP advancements and concepts in delivering health care. The thrust of this proposal was to reduce escalating hospital costs and enhance the quality of health care provided to eligible beneficiaries.

1/Effective March 1976, the Assistant Secretary of Defense (Health Affairs) was designated to replace the Assistant Secretary of Defense (Health and Environment).

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Duplication of effort, however, became apparent in 1973. At the same time the Air Force was studying and planning automated systems for the New Generation Hospital, the Army was initiating a comparable project at Walter Reed Army Medical Center, and the Navy was pursuing the idea of developing automated systems for its naval hospitals. This situation came to the attention of the Defense Systems Acquisition Review Council, who in November 1973 concurred with the Surgeons General of the three services and recommended that efforts to develop automated medical information systems be merged into one tri-service effort. The Review Council also recommended that the Air Force be responsible for developing TRIMIS and that priority be given to Walter Reed as the site for evaluating the new system. The tri-service program's purpose was to develop a servicewide standardized system which would avoid unnecessary duplication of effort and be adaptable to the various sizes and types of medical activities and facilities within Defense.

When the TRIMIS Program was established, it was to be the sole program to develop applications to satisfy the major automated health requirements of the military medical departments. No medical ADP applications/acquisitions were to be excluded from TRIMIS without prior approval from the Office of the Secretary.

The Air Force Director of Data Automation was assigned the actual responsibility for designing, developing, and testing TRIMIS. Within the Data Automation Directorate, the Air Force Data System Design Center was designated as the primary system development activity for the Program. The Assistant Secretaries of Defense (Health Affairs) and (Comptroller) were assigned joint responsibilities for establishing overall policies and procedures for program management. This responsibility was to be fulfilled through a TRIMIS Steering Group, consisting of the three Surgeons General and the President of the Uniformed Services University of the Health Sciences. Among other things, the TRIMIS Steering Group's responsibilities included determining user requirements; insuring a complete interchange of and access to pertinent DOD-owned medical hardware and software in support of TRIMIS; approving detailed functional specifications of subsystems; setting priorities for performing the work; and approving development schedules.

The Air Force effort was directed toward in-house development of an integrated automated system for the Walter Reed Army Medical Center. As a basis for forming the new

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concept and adopting innovative techniques in health care delivery, the Design Center initiated a three-step program which included an in-depth study of selected military hospital installations; a detailed examination of the state-of-the-art in both health care delivery and computer applications in medicine; and a comprehensive review of operational or projected systems for implementation in Government and civilian medical communities.

Following an onsite review of TRIMIS activities at the Design Center in November 1974 and a subsequent technical assessment of Walter Reed requirements, it became apparent to the Air Force that the state-of-the-art in medical ADP had overtaken most, if not all, of any in-house development. Recognizing a need for redirecting the Walter Reed project, the Air Force accepted an unsolicited proposal in March 1975 to analyze Walter Reed's functional requirements, develop detailed functional specifications for Walter Reed's automated systems, develop an implementation plan, provide technical assistance, and research and conduct a study of commercially available systems that would satisfy Walter Reed's requirements. However, service disagreements in almost every aspect of the Program and lack of a responsive mechanism for resolving those disagreements made progress difficult.

In September 1975, the Assistant Secretary of Defense (Health Affairs) initiated a study of the reorganization of the TRIMIS management structure in an effort to strengthen the Program through direct management at the Office of the Secretary level. The Secretary of Defense, in November 1975, issued a modified TRIMIS authorization placing policy and operational responsibility for TRIMIS with the Assistant Secretaries of Defense (Health Affairs) and (Comptroller). This responsibility included designing; developing; and/or procuring, installing, testing, and evaluating automated and medical systems. The TRIMIS Steering Group was directed to advise the Assistant Secretaries that the Air Force Director of Data Automation was no longer responsible for developing TRIMIS. In June 1976, the Deputy Secretary of Defense issued DOD Directive 6000.5, 1/ which established the TRIMIS Program Office as a separate field activity of the Office of the Secretary and provided for the continuance of the TRIMIS Steering Group. The TRIMIS Program Office was to support the Assistant Secretaries in their roles and responsibilities.

1/DOD Directive 6000.5, issued in June 1976, is the charter for the TRIMIS Program.

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This latter reorganization resulted in the organizational structure which existed during our review.

Following these developments several other changes occurred. A new Assistant Secretary of Defense for Health Affairs was appointed. The contractor, after publishing a voluminous, detailed document that was considered unique to Walter Reed and cost more than $4 million, ceased to be a support contractor and turned over its work to the Government rather than a new contractor. This occurred because the competitive acquisition of a new contractor had not yet been completed. A former Air Force Deputy Surgeon General was appointed TRIMIS Program Manager, and a few months later a new contractor was obtained. In July 1977, the Office of the Secretary decided to reduce the TRIMIS Program Office Staff by 40 percent and suggested transferring TRIMIS to an executive agency. In a December 16, 1977, memorandum, from the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics) to the Deputy Secretary of Defense, June 1, 1978, was the date established for transferring the TRIMIS Program to the Defense Logistics Agency. During our review this date was changed to October 1, 1978. The apparent rationale for the transfer was part of a Defense effort to remove operating functions from the Office of the Secretary. Defense officials have said the Defense Logistics Agency was deemed appropriate since the Agency has had other system development activities.

All of these reorganizations and changes have impeded program progress because valuable time has been invested in contending with startup problems and turmoil caused by the unclear status of TRIMIS-related personnel and contractors. To successfully develop such a complex system as TRIMIS requires continued strong managerial direction and sound planning throughout the system's life cycle. In a tri-service environment, the task becomes even more difficult since close coordination and cooperation are essential among all DOD components involved.

The TRIMIS Program continues to proceed slowly because basic principles of prudent management have been violated. Unless these deficiencies can be corrected, TRIMIS Program success will continue to be jeopardized.

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THE TRIMIS PLAN

In its attempts to provide automation in a health care environment, the TRIMIS Program Office has concentrated on three main areas:

--An integrated system within a medical treatment facility which would link specified functional areas within the facility. As a whole this is termed a Composite Hospital System.

--A group of separate systems which facilitate direct patient care and are not required to be integrated with the above functions in the Composite Hospital System. These are grouped under the heading Health Care Support Systems.

--A resource management and patient care data system which would supply data to all levels of management within DOD. This effort is the Medical Management Information System (MMIS).

Composite Hospital System

A major effort planned by the Program Office is the development of a Composite Hospital System (CHS) for a medical treatment facility. As envisioned by Program Office officials, a CHS will use common data base management and communications support to provide for on-line real time processing for patient data within a medical treatment facility. The objectives are to collect data at its source location, store it as needed in a central data base and transmit that data needed to functional areas. Further, all functional applications within the system would be available at any user terminal with access constraints based on security and privacy features. Included in the system are eight functional areas which are common to most military hospitals. Their subsystem summaries follow.

Patient administration will provide the capabilities to establish a patient date base record as the patient visits the health care facility, and provide for the preadmission, admission, patient paper record location and control, disposition, medical service accounting, and other related administrative support activities.

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Patient appointments scheduling will match patients' needs and demands to available health care providers and services.

Wards and clinics will provide the health care ordering, reporting, inquiring, and review support; nursing care plan support; problems lists; and other patient record update capabilities.

Pharmacy will accept medical orders from health care providers, prepare medication labels and unit-dose cart fill lists, permit drug interaction screening, assist in preventing drug administration to patients with known drug allergies, record medications in a patient's medication profile data base, and provide inventory control.

Food service will accept diet orders from health care providers, accept specific daily patient menu selections within prescribed diet limits, provide inventory and production control, maintain recipe and menu files, facilitate nutritional analysis of diets, and permit screening of food allergies.

Clinical laboratory will accept requests for laboratory tests; prepare worksheets for obtaining specimens; provide positive identification of samples; include production control, results analysis, reporting, audit, inquiry, and interfaces with automated hematology, chemistry, and urinalysis equipment; and report test results to the patient data base.

Radiology will accept requests for radiological procedures from health care providers, schedule diagnostic radiology procedures, assist in film library and patient processing management, and report X-ray interpretations to the patient data base.

Logistics will insure that health care supply points will be restocked; accept requests and schedule issues of routine hospital supplies; determine the presence, location, and availability of necessary health care equipment; and provide support for maintenance and repair of medical equipment, transportation, communications, and custodial and building maintenance.

Currently, none of these are available as standardized tri-service subsystems. Subsystems which were either developed in-house by the Air Force or obtained from commercial vendors are being tested at several medical facilities. Although none of these subsystems meet tri-service requirements, they are being used to gain experience in the

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medical ADP field, assist the TRIMIS Program Office and the military medical departments to better define user requirements, and meet interim needs at certain locations. Subsystems which were being tested during our review include:

Subsystem	Location	Comments
Air Force Clinical Laboratory System (AFCLAS)	Wright-Patterson Air Force Base (AFB), Ohio Andrews AFB, Maryland	AFCLAS is a clinical laboratory system developed by Honeywell, Inc., and modified to meet Air Force requirements.
Medical Administrative Management System - Revised (MAMS-R)	Wright-Patterson AFB, Ohio McDill AFB, Florida	MAMS-R performs many of the functions proposed for the Patient Administration subsystem. MAMS-R was developed by the Air Force but cannot be used by the other services without major modifications.
Pharmacy	Charleston Naval Regional Medical Center, South Carolina	This system was commercially available from the National Data Corporation.

A February 1978 schedule for proliferating all subsystems is found on pages 26 to 29. TRIMIS Program Office officials said the proposed service sites, as shown in the schedule, may change due to changing service requirements and funding.

The CHS will differ in composition and size, depending on the particular military hospital where it is to be installed. Some hospitals, for example, have no need for all the automated functions listed earlier; and some, because of their size, need differently scaled versions of a particular functional area.

The Program Office realizes these distinctions and is planning scaled systems for both large and small hospitals. In its plan, the Program Office envisions two approaches for arriving at a standardized CHS; each demands an incremental approach, building from initial nonstandardized systems and

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proceeding to standardized systems. One approach dictates, in the first phase, that separate stand-alone ADP systems for the functional areas be installed in various hospitals. Time and money would be wasted in the interim period since patients needing multiple services would be required to register separately in various functional areas. However, the desired CHS would be achieved through linking the various functional areas and creating a centralized patient data bank and registration capability. This concept is being pursued under the Network Interface System. It is conceivable that many different types of ADP hardware and software within a hospital would require integration.

The alternate approach begins with an orders and reporting system, termed a Hospital Information System, which would provide communication links among various services within a particular hospital. It would gradually be supplemented with detailed automated functional area subsystems which would be linked to the system.

Health Care Support Systems

A second area of TRIMIS concern is the application of specific health care support systems. The thrust of this development, although within the TRIMIS scope, may be done independently of other TRIMIS applications. These applications are noted by their specialized use and more direct contact with patients. They include, but are not limited to: automated cardiology assistance, pulmonary monitoring, and multiphasic health testing. These systems fulfill immediate patient needs and operate with little interaction with other TRIMIS applications. Further, many of these applications are available in the commercial market. Thus, the TRIMIS Program Office believes that using these commercial systems in a DOD environment will not only provide needed services in a particular area, but will give them added experience in acquiring, modifying, and prototyping automated systems which are applicable to other TRIMIS efforts.

Medical Management Information System

Currently, there is no uniform DOD-wide information system in the medical area capable of supplying both individual and aggregate data to all management levels. Each service varies regarding administrative medical reporting requirements and definitions of data elements and codes used, which makes valid medical comparisons among the services extremely difficult.

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We noted this in a recent report 1/ to the Congress. The primary aim of the proposed Medical Management Information System is to provide improvement in patient care; secondary benefits accrue through collecting and utilizing comparable financial, workload, and staffing data. The system itself would not need additional data generated but could derive its data from the operating functional subsystems within a particular medical treatment facility. It is envisioned that through a linking of each facility's system, a DOD-wide capability would be created, thus providing necessary data for all management levels within the DOD structure.

COST OF THE TRIMIS PROGRAM

Due to a lack of centralized funding and inconsistent recordkeeping procedures in the early years of the TRIMIS Program, actual costs expended by each service for system development are not available. Estimates provided by the services and the TRIMIS Program Office show that during fiscal years 1974-78, more than $50 million will have been spent on the TRIMIS Program.

The chart below shows the source and year these funds were expended.

TRIMIS
Expenditures by Source

	1974	1975	1976	197T	1977	1978 (estimate)	Total
	(000 omitted)						
Air Force	$1,138	$2,451	$5,509	$ 505	$ 4,361	$ 322	$14,286
Army	-	2,510	1,457	372	4,533	845	9,717
Navy	380	966	715	181	2,252	451	4,945
TRIMIS Program Office	-	-	-	-	939	20,408	21,347
	1,518	5,927	7,681	1,058	12,085	22,026	50,295

1/"Uniform Accounting and Workload Measurement Systems Needed for Department of Defense Medical Facilities," (FGMSD-77-8, Jan. 17, 1978).

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The TRIMIS Program Office estimates that during the next 5 years (fiscal years 1979-83) about $255 million will be spent on the Program. Although the Program is scheduled for many years beyond 1983, DOD has not developed life cycle cost estimates.

PREVIOUS TRIMIS REVIEWS

The TRIMIS Program has been under continued review since its beginning in 1974. The General Accounting Office (GAO), Office of Management and Budget (OMB), various congressional committees, and DOD-contracted groups have all questioned specific aspects of the Program. Although the scope of each group's involvement has varied, all have been concerned with a sound basis for and progress of the TRIMIS Program.

--As early as January 1975, a private consulting firm uncovered weaknesses in the system development effort, including inexperienced project managers, impractical development plans, and unrealistic time schedules. The firm had been requested by the Directorate of Data Automation within the Air Force to conduct a brief review of the current plans and activities of the Air Force Data System Design Center relating to TRIMIS.

--In October 1976, a GAO report 1/ indicated serious system development problems, service parochialism, and inadequate managerial direction which threatened the Program's existence.

--In December 1976, a DOD-contracted review group also noted management weaknesses and recommended, among other things, that a plan be created to guide the newly formed TRIMIS Program Office to a specific course of action with minimal changes in personnel and direction. DOD formed the TRIMIS Program Office in an attempt to strengthen the Program's overall direction and control.

--In January 1977, a report (Oszustowicz report) issued by a committee for the Assistant Secretary of Defense (Health Affairs) concluded that the TRIMIS Program

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1/"Better Communication, Cooperation and Coordination Needed in Department of Defense Development of its Tri-Service Medical Information System Program," (LCD-76-117, Oct. 6, 1976).

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Office was not properly managing the Program, as specified by DOD Directive 6000.5; that a lack of coordination existed between the TRIMIS Program Office and the Veterans Administration, who had an automated medical information system; and that because TRIMIS had had a variety of management environments, successful development of the system had been adversely affected. The review committee consisted of a mix of ten people from the Government and the private sector whose background and experience were highly oriented to the medical area.

--In 1977, both the Senate and House Appropriations Committees inquired into the TRIMIS Program. The House reduced TRIMIS funds for fiscal year 1978 by $7 million. The Senate restored the funds but indicated a strong concern over program management and system development. The conferees agreed to the House reduction and asked DOD to submit additional data about the program.

--OMB has asked Defense on several occasions to submit cost-benefit analyses for TRIMIS. In November 1977, OMB claimed that not one valid cost benefit study had been completed for any TRIMIS project. As a result, some budgetary reductions were imposed by DOD pending the completion of necessary economic studies. The TRIMIS Program Office has since forwarded individual cost-benefit analyses for seven TRIMIS subsystems to OMB.

These inquiries indicate that the TRIMIS Program has suffered from a lack of strong management and a sound development plan. Although strong management in itself cannot assure a successful development effort, its absence weakens that effort. TRIMIS is no easy task; improvements are needed to increase the probability for success.

Recommendations from the October 1976 GAO report

In 1975, a member of the Senate Committee on Banking, Housing, and Urban Affairs, requested that we review the TRIMIS Program. The review was directed toward obtaining and evaluating information on the management and progress of the TRIMIS Program, and on the types of automated medical information systems in existence and available at Government and non-Government facilities.

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Among other things, our report 1/ concluded that

--the design and development effort for this Program was started without the unified support of the three services,

--specific information requirements needed to support and satisfy user requirements had not been established, and

--development had been underway for more than 2 years and over $14 million had been spent.

As a result, we recommended that the Secretary of Defense initiate actions to:

--Complete the reorganization of TRIMIS and designate a full-time project manager with the authority to manage the Program, control its funding (including the centralization of financial management controls and records), and be responsible for its progress.

--Establish program evaluation criteria in sufficient detail to provide an effective means of measuring program progress.

--Formulate uniform definitions of data elements for TRIMIS and information reporting procedures for its health care providers.

--Conduct an economic analysis of the alternatives that meet identified user needs and support program development actions.

The report also stated that when a sound basis had been established for developing TRIMIS, the Secretary of Defense should require the Assistant Secretaries to

--review and control the Program through frequent contact with the project manager;

1/"Better Communication, Cooperation and Coordination Needed in Department of Defense Development of its Tri-Service Medical Information System Program," (LCD-76-117, Oct. 6, 1976).

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--reevaluate information concerning available systems, and select those systems that closely meet established user requirements for additional study before deciding how development will be pursued;

--base the Program on machine transferable software to encourage future competition and reduce conversion costs; and

--apply uniform reporting procedures and data element definitions developed in TRIMIS to the military health services system and to the maximum extent possible.

DOD's actions taken in response to GAO's recommendations

The Secretary of Defense has taken actions to correct some of the problems cited in our October 1976 report. For example:

--The TRIMIS Program was reorganized and a former Deputy Surgeon General of the Air Force was appointed Program Manager. He has been unable to serve as a full-time manager because he is also Deputy Assistant Secretary (Health Resources and Programs). In addition, the recent decision to transfer the TRIMIS Program to the Defense Logistics Agency may further detract from the Program Manager's ability to manage TRIMIS. At this time there are only limited details available on the future roles and responsibilities of various organizations involved in the transfer. Establishing the TRIMIS Program Office has allowed for centralized funding and control, a significant improvement over the previous decentralized service funding.

--A contract was awarded to Analytic Services, Inc., to establish program evaluation criteria for TRIMIS. Its report was issued to the Program Office in June 1977. The report contained an overview of measures and indicators which may be used to evaluate the Program's impact when systems are operational. The report did not contain quantifiable criteria which could measure progress during the Program's developmental stages.

--The TRIMIS Program Office, using the measures and indicators developed by its contractor, has established more detailed performance evaluation criteria for the 10 basic TRIMIS projects now under consideration.

This action will certainly be beneficial in future evaluations of the Program; however, more work needs to be done to measure progress during each project's planning and developmental stages. At the time of our review, the TRIMIS Program Office had just created a project control group to monitor progress. As detailed project milestones are developed by project managers, this group should be able to greatly assist TRIMIS management by monitoring each project's progress against key milestones to help assure that each stage is "on course."

--A working group composed of representatives of the three services has been assigned the responsibility of forming uniform definitions of data elements for DOD. The group's first meeting, however, was not held until October 1977, a year after our report was issued. Recent contacts with the standardization group indicate that there are still no standardized medical data elements approved by the services. Progress is slow, and if history is any indicator, Defense will place little emphasis on the standardization effort.

--Since GAO's last report, Defense has made at least one important move toward standardization. A Uniform Chart of Accounts has been completed and is currently being tested at several military hospitals. This is an encouraging sign since it is designed to facilitate tri-service standardization of cost and workload information.

--Economic analyses of proposed automated systems for the Walter Reed Army Medical Center and several of the TRIMIS subsystems have been completed. Many of these economic analyses were developed as part of a procurement package for the systems or in response to OMB requirements. It is not possible at this time to determine whether the TRIMIS Program Office will effectively use the economic analyses as a management tool.

--Our report recommended that the Assistant Secretaries of Defense (Comptroller) and (Health Affairs) review and control TRIMIS through frequent contact with the Program Manager. This review and control was implemented by establishing the TRIMIS Program Office as a field activity of the Office of the Secretary. However, this review and control mechanism may be abandoned if DOD continues with plans to transfer the

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TRIMIS Program to the Defense Logistics Agency. Presently, only limited details are available concerning the roles and responsibilities of the Assistant Secretaries of Defense (Comptroller) and (Health Affairs) after the TRIMIS Program is transferred.

--According to information received from the Assistant Secretary of Defense (Health Affairs), TRIMIS systems will be based on machine transferable software to the maximum extent practical. The transferability of some initial systems will be limited; however, according to the Assistant Secretary, these constraints will not be carried forward into the TRIMIS standard systems.

CURRENT PROBLEMS

Although Defense has taken the corrective actions discussed, problems still exist. Only limited progress, in terms of operational systems, has been made because:

--The TRIMIS Program has encountered several reorganizations, management changes, and staff reductions since its inception.

--Roles and responsibilities of numerous groups associated with TRIMIS have not been well defined, causing indecisiveness, lack of coordination, and poor communication.

--Project documentation is poor. Detailed plans of overall TRIMIS philosophy, developmental approaches, and implementation procedures have not been completed or adequately communicated to all groups associated with TRIMIS.

--A lack of medical standard data elements and codes among the military medical departments, a situation which greatly complicates efforts to design and implement a standardized system, still exists.

--DOD officials have said there are no real incentives for each of the services to have a standardized tri-service medical information system. The services would rather develop their own automated medical systems based on their user needs, priorities, and funding schedules. There are signs of support; however, there is still some parochialism and an underlying

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resentment that the TRIMIS Program Office has control of medical data processing funds but has not produced an operational tri-service system. This lack of progress in getting systems available for use by the military medical departments has increased the services' dissatisfaction with TRIMIS.

Need to solidify program management and provide continuity

The TRIMIS Program has been adversely affected by frequent reorganizations and changes in managerial approaches in the system development effort. When the Program was first organized, the Air Force had primary responsibility for system development of TRIMIS. Priority was given to in-house development of an integrated TRIMIS system for the Walter Reed Army Medical Center. With the help of a system engineering and integration contractor, detailed user requirements were developed for the Walter Reed facility. Although over $4 million was expended for the contractor effort, only a limited portion of the product has been used as intended because of a subsequent change in managerial direction. That is, in 1976, DOD realized that the Walter Reed facility was atypical and that higher priority should be given to other Defense facilities. The TRIMIS Program Office, a DOD activity which replaced the Air Force as the TRIMIS developer, decided not to use the Walter Reed requirements and has been developing tri-service user requirements for DOD facilities.

The Program Office claimed that the requirements developed for the Walter Reed facility were much too extensive and sophisticated for other facilities. Because of this change in direction and the greater use of commercial applications, the work done by the Air Force has had limited value for the Program. Over 2 years had passed and over $14 million had been spent.

Other actions have impeded Program progress. In the fall of 1975, DOD placed a hold on all TRIMIS funds until management changes could be made regarding an upcoming reorganization of TRIMIS management. This action delayed giving the contractors work, and major Program actions were suspended until a new organization plan began to emerge.

At approximately the same time, the Office of the Air Force General Counsel began challenging continuance by the Air Force of the systems engineering and integration contractor's effort. Resolution took until late spring 1976

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and caused program turmoil due to the contractor's unclear status. Reviews by Defense in 1975 and our office in 1976 concluded that the Program should be managed at the DOD level, with centralized control and funding. Approval for a TRIMIS Program Office at the DOD level was obtained in January 1976. The next 5-1/2 months were spent writing a new charter and planning for the new organization.

In June 1976, the charter for establishing the TRIMIS Program Office was issued. However, at that time, TRIMIS Program officials said that the organization was split into three distinct geographical locations; personnel changes and assignments did not occur immediately; and effective leadership was difficult to establish. The new military personnel began arriving in late September and were not all on board until January 1977. Civilian personnel assignments and reassignments were much slower, and most newly recruited and key personnel were not on board until January to March 1977. Equipment and office furniture did not arrive until February 1977. Thus, organization occurred from June 1976 to March 1977.

In September 1976, just as the contract for a new systems engineering and integration contractor was to be awarded, DOD requested a further look at the necessity for that contract. A study group was appointed to review the Program's objectives. This study was completed in January 1977, and a decision to proceed was made in February 1977. The new contract was held in abeyance during the entire 5-1/2-month period.

By stopping the procurement process from selecting a new contractor in September 1976, the Program had been dealt another setback. The contract had provisions for the existing contractor to have a 2-month transition overlap with the new contractor. This was to occur during October and November 1976. When the procurement decision was held up until February 1977, the new contractor had to take additional time to obtain a working-level knowledge of the Program. Thus, the new contractor's initial efforts were not as immediately productive as anticipated.

Recent changes in the Program include a 40-percent reduction in the TRIMIS Program Office staff and a proposed plan to transfer the TRIMIS Program to the Defense Logistics Agency. The full effect of these changes has not yet been realized.

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TRIMIS Program Office, Assistant Secretary of Defense (Health Affairs), and Defense Logistics Agency officials could not provide valid rationale or substantial information regarding the transfer, which they were not in favor of. Health Affairs has said that the Office of the Secretary is reconsidering the transfer, but no decision had been made at the time of our review.

All of these reorganizations and changes have slowed TRIMIS progress because valuable time has been invested in contending with startup problems caused by the unclear status of TRIMIS Program Office personnel and contractors.

Need to further define roles and responsibilities of TRIMIS-related organizations

Although DOD Directive 6000.5 states that TRIMIS is the sole program within Defense responsible for fulfilling automated data processing requirements of the Air Force, Army, and Navy medical departments, there are several organizations involved in this tri-service project. The three services' medical departments (who are system users), the data automation agencies, the DOD managers, the procurement agencies, and the TRIMIS Program Office are just a few of the organizations playing major roles in the TRIMIS Program.

A review of program documentation, as well as discussions with personnel from several organizations involved with TRIMIS, show that these organizations' roles and responsibilities have not been well defined. As a result, there appears to be poor communication and coordination at many levels within the Defense chains of command. This could also involve intraservice communication problems; however, we did not perform a comprehensive review of this specific area.

Prior to TRIMIS, each service was responsible for meeting the data processing needs of its own medical departments. Each service used its own chain of command for defining user requirements, writing system specifications, developing or purchasing automated systems, selecting procurement agencies, and providing overall management of new systems.

Because of the drastic changes made, the TRIMIS Program Office now has overall responsibility for these tasks. Managing a tri-service project of this magnitude is no easy task, and the Program Office must rely on support from many organizations. Secretary of Defense memoranda, such as the one

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dated July 11, 1974, which established the TRIMIS Program, and DOD Directive 6000.5 dated June 11, 1976, provide general descriptions of organizational roles and responsibilities. However, they do not totally define duties assigned to the TRIMIS Program Office and other groups responsible for TRIMIS-related activities. For instance, the TRIMIS Program Office once selected an Army hospital to be the recipient of an automated system apparently without any Army knowledge or involvement. However, when the Army became aware of this the site was changed. Since that time, the services have made site selections.

To eliminate problems caused by overlapping or undefined roles and responsibilities, there is a need for detailed instructions and procedures which clarify issues relating to organizational relationships throughout the TRIMIS life cycle.

Program planning should be improved

The success of any ADP system development effort depends largely on establishing and properly executing formalized planning. Planning becomes especially critical when the effort involved is of the magnitude, complexity, and duration of the TRIMIS Program. Planning further provides a communications vehicle through which all concerned parties or organizations can be apprised of the activities scheduled for a particular program. The TRIMIS Program is a major tri-service effort where responsibilities cross service lines and involve coordinating personnel within and among each of the military services, DOD offices, Government contractors, and such other governmental agencies as OMB, the Veterans Administration, and the General Services Administration.

Because many groups are involved in planning and implementing the TRIMIS Program, continuous coordination is essential to Program progress. Personnel working as program managers, system developers, system users, or monitors of program progress must be well informed about the Program's current status and future ADP philosophy for system development, implementation, and testing. Not all TRIMIS-related groups have access to day-to-day information and decisions which affect the TRIMIS Program and, therefore, they must rely on written material describing TRIMIS plans.

A review of planning, system design, policy, and procedure documents showed that most of these documents could be greatly improved by providing more current and detailed information concerning TRIMIS plans and philosophy. Program

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documentation was found in numerous publications; however, it is extremely difficult to put together a total picture of the TRIMIS Program, its planned direction, and strategies that management will follow in meeting program objectives.

The TRIMIS Master Plan, for example, is difficult to understand because such important annexes as those pertaining to configuration management, technical standards, and architecture and integration are still not completed.

TRIMIS planning documents do not show firm plans for purchasing, developing, testing, proliferating, and maintaining medical information systems. Currently, detailed plans are uncertain or available only through discussions with project managers or consultants. Also, many available documents are inconsistent. For example, proliferation schedules shown in the March 1978 Cost/Benefit Analyses differ from proliferation schedules issued in February 1978.

This lack of detailed consistent planning has caused personnel within the military services to initiate actions on their own, which may ultimately conflict with TRIMIS Program Office plans. For example, at one time during our review, the Army Health Services Command, a major Army Command for health activities, was making plans and preparing required documentation to purchase the Air Force Clinical Laboratory System for Army hospitals. At a January 1978 meeting with TRIMIS Program Office officials, we learned that they did not plan to use the Air Force system as the tri-service laboratory system, and, in fact, a Defense consultant said they wanted to terminate the Air Force project as soon as possible. If they did not intend to allow the Army to use the Air Force system, the Health Services Command should have been informed. This problem has been solved now; however, the Army wasted valuable time and resources. Program Office officials believe a lack of communication between Army personnel at the Army Surgeon General's office and the Health Services Command caused this problem. TRIMIS plans need to be sufficiently detailed to allow personnel associated with the Program to fully understand current and long term strategies and not have to rely on informal information through multilevel communication channels.

Need to define detailed user needs and provide for standards earlier in the system development effort

Although the TRIMIS Program has expended about $50 million in 4 years, detailed user needs have not been totally defined.

Service officials said that health care providers have been unable to agree on automation needs, partially because each service uses nonstandard procedures to provide medical care and to collect patient care, workload, and cost information.

The original system engineering and integration contractor worked 20 months under a contract of over $4 million to help the Air Force and later the TRIMIS Program Office develop TRIMIS systems. Its efforts culminated in a TRIMIS Technical Workbook which contained detailed and elaborate user requirements. Although tri-service representatives contributed to the Technical Workbook, the contractor's efforts were directed specifically toward the Walter Reed Army Medical Center and did not adequately consider tri-service requirements.

The TRIMIS Program Office realized that there would not be enough time to develop a system as elaborate as that described in the Technical Workbook and still meet schedule commitments and satisfy other facility needs. Consequently, the Program Office undertook a new course of action to purchase existing commercial systems which could meet minimal user needs without extensive modification. TRIMIS officials and service representatives have jointly developed summary functional requirements to define general user needs to the extent where commercial systems which meet many of these requirements can be identified. At this stage, tri-service differences are minimal because these requirements define minimal user needs, while specific or detailed user requirements would identify service differences. Commercial systems to be installed at military hospitals could be modified to meet specific service or hospital needs. Therefore, tri-service standardization is years away. TRIMIS Program Office officials believe it is necessary to acquire several commercial systems to gain experience in using automated medical information systems in a Defense environment, help better define and validate user needs, and identify the types of data which should be output and shared among automated functional areas. This allows for numerous nonstandard subsystems early in the TRIMIS effort. The plan is to proliferate these initial capabilities for a 5-year life cycle if the cost-benefit analyses are favorable. After this period, the systems will be either converted to or replaced by standardized versions of the functional area.

Although TRIMIS is nearly 4 years old, DOD officials believe they need more experience in further defining and validating user needs. One of the most logical and basic steps early in developing automated systems is defining the

information which each should provide and which should be shared among various subsystems. This could have been done by thoroughly analyzing current manual operations, as well as available commercial and Government systems such as the Veterans Administration's automated hospital information system. Although the Veterans Administration system may be outdated in terms of hardware or software, DOD could have learned from its approach in designing the system.

If Defense uses the pilot, or prototype, testing approach, there must be strict limits placed on the number of initial systems which will be obtained in the interim timeframe before standard TRIMIS systems are approved. TRIMIS personnel have said that OMB has limited proliferation to three sites per subsystem, pending cost-benefit analyses showing proliferation as favorable. This allows for the proliferation of nonstandard subsystems if they are cost justified. A proliferation schedule published in February 1978 shows 28 nonstandard patient appointment scheduling subsystems to be implemented by fiscal year 1980. Similarly, the schedule also shows that by fiscal year 1981, there could be 33 nonstandard pharmacy subsystems with the first standardized version not available until fiscal year 1983. This schedule was being revised during our review.

By providing for standards earlier in the system development effort, the TRIMIS objective would be achieved earlier and at a savings because costly conversions of nonstandard systems to standard ones at a later date would be avoided.

Need to increase emphasis on developing standard data elements and codes

Because new data information systems are being developed DOD-wide, common data standards must be developed and implemented to facilitate an interchange from one ADP system to another and ensure compatibility among systems. DOD, however, has not sufficiently emphasized a formal standardization program, and only limited resources have been committed; a low priority has been placed on the program; and management environments have constantly changed. Thus, little progress has been made over the last decade.

Background

The issuance of DOD Directive 5000.11 formally established a program for standardizing data elements and codes in

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December 1964. This program directive was the result of a 1962 Deputy Secretary of Defense study, which surveyed DOD's ADP systems and made recommendations that would enhance their management. A primary ADP goal of the program was to promote data communication and consonance among ADP systems within DOD by using standardized data elements and codes. Subsequently, DOD issued two instructions and a manual which provided for standardization procedures, data standards implementation, and publishing.

As DOD was gearing up its standardization program, OMB issued Circular A-86 in June 1967. Using the Brooks Act (Public Law 89-306) as a primary authority, this document established a plan for officially announcing international, national, and Federal agencies' data standards. In addition, it established procedures for developing Federal data standards and assigning responsibilities for data standards development.

However, in May 1973, Executive Order 11717 transferred OMB's standardization responsibilities to the Secretary of Commerce. The order directed that the National Bureau of Standards be assigned the dual responsibility of providing policy on standards registration and technical advice to those groups established to develop general and program standards.

Although the standardization program has existed for approximately 13 years, no approved data elements and codes exist in DOD's health care arena. This is significant, considering DOD's current efforts to promote both economical and improved health care delivery by using standardized automated medical information systems.

Lack of emphasis on DOD's medical data elements and standardization program

Through the use of ADP technology, DOD envisions a standardized automated health care information system. Its standardization efforts, however, not only apply to hardware, software, and communications, but to medical data standards as well. However, little emphasis has been placed on standardizing interservice medical data elements. For example, in 1970, when DOD began to reduce its budget and manpower ceiling, the data standards program--including medical data standards--was among the first to feel the impact. Personnel assigned the data standardization responsibility were reduced from six full-time employees to one employee. This lack of emphasis may delay the development and existence of a standardized, tri-service automated medical information system.

While DOD's other standardization efforts, such as hardware and software interfaces, may be needed before a completely automated information exchange can take place, placing a high priority on the medical data standardization program would enhance the probability for TRIMIS success.

Difficulty in maintaining program continuity

Originally, DOD assigned the Air Force to be the responsible agent for developing DOD medical and dental data standards. During its tenure, the Air Force developed about 200 medical data elements and codes. However, instead of developing standards which could be used in all military medical treatment facilities, those data standards were unique to the Air Force.

In September 1975, a DOD Work Group on Data Elements and Codes was established to assess the usefulness of the standardization program and update policy guidance as appropriate. As a result of the Work Group's recommendations, the Assistant Secretary of Defense (Health Affairs) requested that his office be designated as the responsible agent for DOD's medical data standardization program.

In 1977, the Assistant Secretary of Defense (Comptroller) issued a memorandum designating Health Affairs to be responsible for developing, coordinating, and recommending data standards. Furthermore, Health Affairs, according to the memorandum, was responsible for implementing and maintaining data standards after they were approved.

Since that time, Health Affairs has established a working group to develop standard data elements and codes. Their work began in October 1977. There is no evidence to date that the working group has developed any approved medical data standards for use in DOD's automated medical information systems. Moreover, unless DOD provides adequate guidance and stability for its standardization program, it is questionable whether a significant amount of success can be achieved.

Need for strong coordination between the TRIMIS Program Office and the standardization working group

TRIMIS is foreseen as a standardized automated medical information system to be used by each of the military medical departments, but standardization of data codes and elements

is required before the implementation of a truly standardized system can be achieved.

The TRIMIS Program Office is responsible for designing, developing, and implementing the standardized medical information system; however, standardization of data codes and elements is the responsibility of a working group under the Assistant Secretary of Defense (Health Affairs). Currently, there is little formal coordination between the TRIMIS Program Office and the standardization working group.

TRIMIS officials agree that they are proceeding with TRIMIS plans even though medical data codes and elements are not standardized. For example, while the Army and Air Force use a prefix to the social security number to identify a patient, the Navy uses a suffix. Furthermore, the numerical codes for this entry vary as to service. By purchasing commercially available systems that meet part of the medical department's needs, TRIMIS officials can avoid standardization at the data element level at the present time. This approach can be used for only a limited time and they must soon begin to tackle such other important systems as Patient Administration, which will become the foundation for the overall TRIMIS Program. In such areas as Patient Administration, standardization is a requirement that must be met before the system can be implemented efficiently in a triservice environment.

It is essential that the TRIMIS Program Office and the standardization working group coordinate their efforts to develop systems and standards for the TRIMIS Program. Providing for standard servicewide data elements and codes and technical standards early in the design process is a prerequisite for increasing the chances for overall TRIMIS success. A failure to do so means a high probability for nonstandard ADP systems, which is contrary to the TRIMIS mission. Unless there is close coordination, the standardization problems confronting TRIMIS may go unresolved and seriously impair the Program's success.

FY 1979 BUDGET IMPLEMENTATION SCHEDULE

BY SYSTEM AND SITE

System/Subsystem	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983
Composite Hospital System (CHS):						
Interim Food Service	Walter Reed Army Medical Center (AMC)					
Tri-Food			Army Site Camp Pendleton Andrews Air Force Base (AFB)	Army Site Army Site Naval Regional Medical Center (NRMC) Long Beach Scott AFB	Army Site Army Site NRMC Oakland Wilford Hall Air Force Medical Center (AFMC)	Army Site Army Site Army Site NRMC San Diego
Interim Logistics	Walter Reed AMC					
Tri-Log				Army Site NRMC Bethesda AF Site		
Laboratory:						
TRILAB I	Walter Reed AMC NRMC Oakland		Fort Bragg Brooke AMC Army Site Army Site NRMC Charleston NRMC Jacksonville			
TRILAB II				Army Site NRMC San Diego Sheppard AFB	Army Site Army Site Army Site NRMC Portsmouth NRMC Bethesda NRMC Great Lakes Scott AFB Wilford Hall AFMC Keesler AFB	Army Site Army Site Army Site Army Site NRMC Oakland Maxwell AFB Carswell AFB MacDill AFB Eglin AFB
Patient Administration	Wilford Hall AFMC		NRMC Philadephia (note a) Ft. Belvoir (note a) Carswell AFB (note a)			Walter Reed AMC Brooks AMC Fitzsimmons AMC NRMC Portsmouth NRMC San Diego NRMC Oakland Camp Pendleton Wilford Hall AFMC Scott AFB
Medical Administration Management System - Revised		MacDill AFB (upgrade) Wright-Pat. AFB (upgrade) Scott AFB Keesler AFB	Carswell AFB Travis AFB Eglin AFB Shaw AFB Andrews AFB Offutt AFB Sheppard AFB Minot AFB	March AFB Maxwell AFB		

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System/Subsystem	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983
Patient Appointment Scheduling (PAS) (Initial)		Walter Reed AMC NRMC Long Beach Sheppard AFB	Brooks AMC Fitzsimmons AMC NRMC Portsmouth NRMC San Diego Wilford Hall AFMC Scott AFB NRMC Philadephia Maxwell AFB March AFB Army Site Camp Pendleton Carswell AFB Keesler AFB MacDill AFB Undes. Army Site NRMC Oakland Kirtland AFB Dover AFB Undes. Army Site NRMC Bethesda Andrews AFB Army Site Wright-Pat. AFB NRMC Jacksonville Eglin AFB			
PAS (Standard)						NRMC Portsmouth Wilford Hall AFMC NRMC San Diego NRMC Oakland Scott AFB Camp Pendleton Wright-Pat. AFB
Pharmacy (Initial)	Walter Reed AMC (note b) NRMC Bethesda (note b) Andrews AFB (note b)	Wright-Pat. AFB NRMC Jacksonville Undes. Army Site	Camp Pendleton NRMC Long Beach Keesler AFB Undes. Army Site NRMC San Diego NRMC Oakland NRMC Pensacola Camp Lejune Undes. Army Site NRMC Bremarton NRMC Great Lakes Wilford Hall AFMC San Diego Trng Crt NRMC Philadephia Army Site NRMC Orlando NRMC Memphis Army Site NRMC New London NRMC Newport Undes. Army Site NRMC Beaufort	Walter Reed AMC Army Site NRMC Bethesda NRMC Charleston Andrews AFB		
Pharmacy (Standard)						NRMC Portsmouth Wilford Hall AFMC NRMC San Diego NRMC Oakland Scott AFB Camp Pendleton Wright-Pat. AFB

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System/Subsystem	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983
Radiology (Initial)		NRMC Portsmouth Walter Reed AMC Andrews AFB	NRMC San Diego Army Site NRMC Oakland Scott AFB Army Site NRMC Charleston NRMC Bethesda March AFB Army Site NRMC Philadelphia NRMC Great Lakes Wright-Pat. AFB Undes. Army Site Camp Pendleton Camp Lejune Sheppard AFB Army Site NRMC Long Beach NRMC Pensacola Keesler AFB NRMC Jacksonville			
Radiology (Standard)						NRMC Portsmouth Wilford Hall AFMC NRMC San Diego NRMC Oakland Scott AFB Camp Pendleton Wright-Pat. AFB
Hospital Information System (HIS)	Walter Reed AMC	NRMC Jacksonville Eglin AFB (note c)	Eisenhower AMC (note c) Wilford Hall AFMC			
Network Interface Subsystem (NIS)		Prototype Site Wilford Hall AFMC	NRMC Oakland NRMC San Diego Scott AFB Camp Pendleton Wright-Pat. AFB NRMC Long Beach Sheppard AFB Andrews AFB March AFB NRMC Philadelphia	NRMC Bethesda Army Site Keesler AFB NRMC Great Lakes Army Site Army Site Camp Lejune NRMC Pensacola Undes. Army Site		

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System/Subsystem	FY 1978	FY 1969	FY 1980	FY 1981	FY 1982	FY 1983
Health Care Support System:						
Automated Cardiac Catheterization Laboratory System		NRMC San Diego	Army Site			
Automated Multiphasic Health Testing (AMHT)		NRMC San Diego	NRMC Portsmouth	Army Site Andrews AFB	Scott AFB Wright-Pat. AFB	Army Site Army Site Army Site NRMC Jacksonville Eglin AFB
Automated Quality Assurance Program (AQUAP)			NRMC San Diego	Army Site Wright-Pat. AFB		
Computer Assisted Practice of Cardiology (CAPOC)	NRMC San Diego	Brooks AMC Walter Reed AMC	NRMC Portsmouth	Keesler AFB Wright-Pat. AFB 4 Army Sites	NRMC Philadelphia NRMC Jacksonville Wilford Hall AFMC 2 Army Sites	
Computer Assisted Instruction (CAI)	Forrestal Bldg.					

a/Tri-Service Test.

b/Regionalized Total Pharmacy Test.

c/Regional Test.

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