1989

Report on the Establishment of an Automated Information System for the Indian Health Service

Department of Health and Human Services, Office of the Secretary

J. Markowitz

Follow this and additional works at: https://digitalrepository.unm.edu/nhd

Recommended Citation

Markowitz J. The establishment of an automated management information system for the Indian Health Service. Indian Health Service, Staff Office of Planning, Evaluation and Research, Rockville, MD 20857 (E-91). 1989
Report on
The Establishment of an
Automated Management Information System
for the
Indian Health Service

The Indian Health Care Improvement Act Amendments
of 1988
Public Law 100-713

Presented to the
President of the United States
and to the
Congress of the United States of America

Prepared by the
Secretary of Health and Human Services
with the assistance of the
Indian Health Service

September 1989
TABLE OF CONTENTS

EXECUTIVE SUMMARY ................................................................. 1

I. Introduction .................................................................................. 1

II. Activities Undertaken to Establish an Automated
Management Information System ..................................................... 1
   A. Methodology ............................................................................ 1
   B. Information Systems Overview .................................................. 2
   C. Information Management Activities .......................................... 3
      1. Evaluation and Improvement .................................................... 3
      2. Standardization of Data and Records ...................................... 4
      3. Information System Coordination .......................................... 4
      4. Systems Implementation Plan ................................................ 5
      5. Identification of Requirements to Implement
         the RPMS IHS-wide ............................................................... 5
   D. Resource and Patient Management System Status ...................... 6
      1. Financial Management System .............................................. 6
      2. Patient Care Information System ........................................... 7
      3. Privacy of Patient Information .............................................. 8
      4. Services-Based Cost Accounting .......................................... 8
      5. Tribal and IHS RPMS Requirements .................................... 11
      6. California Systems Provision .............................................. 12

III. Activities to Complete Implementation ....................................... 13
   A. Deployment of Technical Support and
      Computer Systems .................................................................... 13
   B. Integration of Patient, Administrative,
      and Financial Records ........................................................... 13
   C. Conversion to a National Database .......................................... 14
   D. Telecommunications Network ................................................ 14

IV. Funding Requirements for Succeeding Fiscal Years ...................... 15
   A. IHS Direct Care Facilities ...................................................... 15
   B. Tribal Facilities ....................................................................... 15

APPENDIX
   A - RESOURCE AND PATIENT MANAGEMENT SYSTEM MODULE ...... 16
   B - REQUIREMENTS TO IMPLEMENT RPMS IHS-WIDE ................... 17
   C - FINANCE AND ADMINISTRATIVE MODULES ............................ 19
   D - PATIENT CARE INFORMATION MODULES ............................... 20
   E - THE AHA MONITRENDE PROGRAM OF THE
      INDIAN HEALTH SERVICE ....................................................... 21
   F - SERVICES-BASED COST ACCOUNTING MODULES .................. 23
   G - FUNDS NEEDED TO COMPLETE IMPLEMENTATION OF AN
      AUTOMATED MANAGEMENT INFORMATION SYSTEM ................ 24
   H - FUNDS NEEDED TO COMPLETE IMPLEMENTATION OF A
      TRIBAL AUTOMATED MANAGEMENT INFORMATION SYSTEM ...... 25
This report presents the activities conducted, activities to be completed, and funds needed to complete the implementation of an automated management information system (AMIS) as required by Public Law 100-713 Section 602. The AMIS is incorporated within the Resource and Patient Management System (RPMS) and includes a financial management system, a patient care information system, a privacy component, and a services-based cost accounting component.

The report specifies the extent of management involvement to improve financial management, including the ability to generate data on cost, and the degree to which service unit directors and tribal health personnel have been involved in the planning and design of the management information system, and its planned implementation.

The standard cost accounting system approach has been assessed for applicability to IHS facilities and found to have a questionable cost/benefit. Alternative methods of meeting cost objectives are being pursued.

Computer systems with security software have been deployed in the hospitals and health centers for the installation of core clinical software. Eighty-nine percent (89%) of the hospitals and health centers have installed computer systems and a majority of these are implementing the RPMS core clinical software package.

The IHS activities which have been undertaken to establish the AMIS are inseparable and indistinguishable from the activities undertaken to establish the RPMS and in the context and purpose of this report are the same. The activities are:
1) the establishment of RPMS planning and management, and coordination of information systems development;
2) the establishment of a patient care information system core package of software;
3) the process of the installation of the initial hardware systems and core clinical software at the point of patient care; and
4) the initiation of consultation with tribes and key management for planning and design of information systems.
The activities which remain to be undertaken to complete the implementation of the RPMS are:
1) the deployment of technical support to field facilities and application development, and the acquisition of adequate computer storage and processing resources;
2) the integration of patient, administrative and financial records;
3) the conversion to a national database environment at the national data center; and
4) the installation of a telecommunications network at the range of IHS facilities.

Over the next five years, $71,000,000 is estimated to be needed to complete implementation by the IHS and $18,000,000 will be needed on a recurring basis to maintain, keep current, and meet the changing information needs of the implemented system. Tribal facilities outside the scope of IHS will require an estimated $8,600,000 in funding over five years and $3,400,000 on a recurring basis to support the projected implemented systems.
Ms. Corrine KillsPrettyEnemy
OPEL - Indian Health Service
Parklawn Building Room 6-40
5600 Fishers Lane
Rockville, MD 20857

RE: Studies-Assess IHS FY 1992
Budget Initiatives

Dear Ms. KillsPrettyEnemy:

The "Report on The Establishment of an Automated Management Information System for the Indian Health Service" is being forwarded for inclusion in a volume of studies which can be made to assess IHS's FY 1992 budget initiatives.

If you have any questions regarding this study, please feel free to contact Ed Mouss at 443-0750.

Jack N. Markowitz

cc: E. Mouss
I. INTRODUCTION

Public Law 100-713 Section 602 (a)(3) requires that by September 30, 1989 the Secretary shall submit a report to Congress setting forth the activities undertaken to establish an automated management information system (AMIS), and the activities and funding needed in the succeeding fiscal years. Specifically, (Sec. 602.(a)(2)) "The information system established ... shall include- (A) a financial management system, (B) a patient care information system for each area served by the Service, (C) a privacy component that protects the privacy of patient information held by, or on behalf of, the Service, and (D) a services-based cost accounting component that provides estimates of cost associated with the provision of specific medical treatments or services in each area office of the Service." The components of the AMIS as described by legislation are incorporated within the IHS Resource and Patient Management System (RPMS) and consist of an array of modules within the RPMS.

The IHS is working to improve its data systems for management purposes and has taken action to better manage its information systems. The Resource and Patient Management System (RPMS), initiated in 1984 utilizing standardized software modules, is capable of data integration throughout IHS and will provide the framework for a uniform national data system and automated management information system. Information systems coordination is provided through the Information Systems Advisory Council (ISAC), Professional Specialty Groups (PSG), Data Management Taskforce (DMT), and Area Information Systems Coordinators (ISC) to address the diverse information systems issues. The tribal consultation process on information systems is carried out through full tribal participation in the ISAC, PSG's, DMT and interaction with the Area ISC's. A goal adopted by the IHS is to integrate existing and new systems into a single database structure for the immediate future.

II. ACTIVITIES UNDERTAKEN TO ESTABLISH AN AUTOMATED MANAGEMENT INFORMATION SYSTEM

II. A. METHODOLOGY

The methodology to establish an automated management information system for the IHS followed this basic premise: the integration of existing and new systems would be a realistic approach for the immediate future and would result in cost savings, better management data, and program efficiency and effectiveness. The IHS
faced the problem of how to identify significant data, eliminate redundancy, improve the structure and framework of data collection, produce quality management information, and distribute the data for local, tribal, and national policy and program management.

The Information Systems Plan (ISP) proposed by the Information Systems Strategic Planning Taskforce [1984] provided the guidelines for the activities surrounding the Resource and Patient Management System (RPMS):

-- Data systems should be able to evolve to meet changing needs;
-- Information activities should relate clearly to IHS objectives;
-- The plan should promote coordination and control of existing and new systems;
-- The system should be a distributed data processing framework to promote local control; and
-- Implementation of such a system would require strong top management support and clarification of relations and responsibilities between Area Offices and Headquarters.

The IHS followed three basic principles in undertaking the activities to implement the RPMS:

1) Establish an overall framework and purpose for guiding data collection. The systematic approach for program management purposes has been a response primarily to clinical information and secondarily to program management needs. This provides opportunity for local initiatives to define and evaluate the usefulness of information.

2) Utilize automation for program efficiency and effectiveness. Quality and timely data will increase program management efficiency and effectiveness.

3) Conduct a systematic approach for information integration. The cost structure of assessing, coordinating, and phasing existing data into an integrated data system closely matched the IHS resource structure, thus allowing for coordination of growth and internal capacity development.

II. B. INFORMATION SYSTEMS OVERVIEW

The IHS is progressing from a collection of system specific information systems concentrated at Area Offices and the national data center to an integrated information system based at the point of patient care. By the end of FY 89, computer systems with Patient Registration software will have been installed at 89 percent of the IHS and tribal hospitals and health centers which account for 90 percent of the patient workload. A majority of IHS health care facilities are implementing an IHS-core clinical package consisting
of an automated Patient Registration, Outpatient Pharmacy, Maternal & Child Health Immunization, Dental, Ambulatory Patient Care (APC), and Contract Health system which indicates our accomplishments and progress toward our five-year proposed plan.

The RPMS software development status is summarized by major category in Figure 1, "RESOURCE AND PATIENT MANAGEMENT SYSTEM, Development and Certification Status". Reference Appendix A, "RESOURCE AND PATIENT MANAGEMENT SYSTEM MODULES", for a detailed listing of software modules and status.

Figure 1.

RESOURCE AND PATIENT MANAGEMENT SYSTEM
Development and Certification Status

Software Packages by Major Category

<table>
<thead>
<tr>
<th>SOFTWARE STATUS</th>
<th>Patient Financial Cost</th>
<th>Privacy</th>
<th>Care</th>
<th>Adm Mgmt</th>
<th>Acctng</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified</td>
<td>2</td>
<td>4</td>
<td>7</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Development</td>
<td>2</td>
<td>7</td>
<td></td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planned</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planned Revision</td>
<td></td>
<td>2</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Test</td>
<td>3</td>
<td>3</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under Modification</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>2</td>
<td>14</td>
<td>21</td>
<td>1</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

II. C. INFORMATION MANAGEMENT ACTIVITIES

The IHS has undertaken significant activities for the establishment of the RPMS:

II. C. 1. EVALUATION AND IMPROVEMENT

A. Organizational Objectives

Established information system objectives for each fiscal year for Headquarters and each Area.

B. Assessment of Site Management Capabilities

Assessed the site management capabilities of each Area to determine the level of technical capability currently existing and required to maintain the information system. Technical capacity must be established and maintained to support a local distributed data processing framework. IHS has established site management staffing criteria for technical staff to support computer systems at the local level.
II. C. 2. STANDARDIZATION OF DATA AND RECORDS

A. Data Management

Established standard RPMS data dictionaries which govern the accuracy and comparability of software applications throughout IHS. Standard data dictionaries will be applied retroactively to existing systems eliminating design redundancy and data duplication. Completed an inventory of currently existing systems and initiated a review to identify redundancy and potential data integration.

Established a patient information system data requirements taskforce which has proposed a 37 percent data element reduction. Identified the data elements required to meet the information needs of the Areas and IHS Headquarters. This is a sub-set of data collected to meet the local specific management needs of a tribal, service unit, or clinic organization.

B. Standards

Established an approach to an integrated database to reduce the redundancy of data, improve the quality and accessibility to patient information, and integrate patient/related administrative records and financial management. Adopted the Massachusetts General Hospital Utility Multi-Programming System (MUMPS) as the standard language, the Veterans Administration Filemanager as the standard data base management system, and Unix as the standard host operating system.

II. C. 3. INFORMATION SYSTEM COORDINATION

Established a framework of information system coordination which consist of:

A) The Information Systems Advisory Council (ISAC) whose purpose is to provide information systems overview and recommendations for systems development and implementation. This group consist of IHS Area Directors, Associate Directors, Service Unit Directors, and Tribal Health Directors.

B) The Professional Specialty Groups (PSG) whose purpose is to provide user input into the planning and design process of the applications software development effort. A PSG has been created for each major user group and consists of IHS and tribal professionals. The management information system planning and design process involves Service Unit Directors and Tribal Health Directors.
C) The Information Systems Coordinator (ISC) whose function is to coordinate day-to-day Area Office and health facilities information system activities. The ISC is the focal point for tribal/IHS information system interface.

II. C. 4. SYSTEMS IMPLEMENTATION PLAN

A. Systems Deployment Strategy

Established a hardware deployment strategy in conformance with the Information Systems Plan which would support distributed data processing and promote local control and management information at the point of patient care. Redeploy computer hardware systems which were replaced by improved systems to smaller facilities in order to extend the life cycle and utilization.

B. Software Implementation

Established a core package strategy to implement software. A core software package is a basic set of common software modules which provide fundamental information and is capable of being installed at any health center in the IHS and tribal system. The core clinical package consists of Patient Registration, Outpatient Pharmacy, Dental, or Ambulatory Patient Care (APC), Maternal and Child Health Immunization, and the Contract Health system. Established a priority system to convert the array of service-specific data systems from a single-purpose to an integrated data environment.

II. C. 5. IDENTIFICATION OF REQUIREMENTS TO IMPLEMENT THE RPMS IHS-WIDE

The IHS has identified requirements necessary to implement the RPMS IHS-wide within a proposed five-year plan. The cost associated with these requirements has been identified as recurring cost and the initial five-year cost is an investment cost of automating the IHS-wide management information system. The requirements are:

1) To provide technical personnel to support the IHS and tribal hospitals and health centers;
2) To provide technical personnel to conduct software development and technical support of the IHS information system;
3) To provide appropriate computer systems to support the information system from Headquarters through the health center level;
4) To establish a national database to provide information for national and local policy and program management;
5) To complete the IHS telecommunications network.

Reference Appendix B, "REQUIREMENTS TO IMPLEMENT RPMS IHS-WIDE", for a detailed description.
II. D. RESOURCE AND PATIENT MANAGEMENT SYSTEM STATUS

II. D. 1. FINANCIAL MANAGEMENT SYSTEM

The IHS has initiated financial management system activities (Sec. 602 (a)(2)(A)) which include finance and patient-related administrative activities consisting of twenty-one software modules in the Financial Management and Administrative categories.

A) Financial Management Activities

Three significant examples are:

1) Acquisition Resource Management System (ARMS)
   The ARMS project is a major automation activity consisting of supply, procurement, and financial functional interfaces at the service unit, Area, and Headquarters offices. A PSG has been established to guide the development and is in the process of defining the functional requirements and identifying the software development specifications. The IHS has identified resources for specification analysis/design and technical support.

2) NCR Rehost
   The Area Offices have a series of IHS-service specific systems currently operating. These systems are primarily finance systems and are to be converted to standard RPMS sub-systems and become part of the integrated database environment. The IHS has identified the resources for the technical support to convert these systems. This activity is to be completed in FY 90.

3) Private Third-Party Billing
   The IHS is in the process of implementing private third-party insurance billing manually. The automated private insurance planning and functional specifications have been completed. The IHS has identified the resources to develop the software to automate this system. This activity has been undertaken with the participation of tribal "638" contractors who utilize RPMS systems and is scheduled to be completed in FY 90.

B) Administrative Activities

There are a number of patient-related administrative management activities undertaken at the service unit level which can be identified; e.g., Patient Registration, Contract Health, Scheduling, etc. In addition, a framework for generic activities workload processing and analysis has been identified and is under development.

The finance and related systems status are summarized in Figure 2., "FINANCIAL MANAGEMENT SYSTEM, SOFTWARE STATUS". Reference Appendix C, "FINANCE AND ADMINISTRATIVE MODULES", for a detailed listing of software modules and status.
II. D. 2. PATIENT CARE INFORMATION SYSTEM

The IHS has initiated a standardized patient care information system (Sec. 602 (a)(2)(B)) for each Area of the IHS. By the end of FY 89, 189 computer systems will have been installed at hospital and health centers including a core clinical software package which will provide comparable and standard data IHS-wide. Examples of significant accomplishments include:

-- A demonstration site in each Area available for tribal contractors to review software applications of interest;
-- A software testing facility in each Area;
-- An automated process of reviewing a patient's health status in a comprehensive manner through the integration of patient data files (Patient Care Component). This automation is presently being beta tested in the IHS Areas.

The status of patient care systems are illustrated in Figure 3, "PATIENT CARE INFORMATION SYSTEM, SOFTWARE STATUS". Reference Appendix D, "PATIENT CARE INFORMATION MODULES", for a detail listing of software modules and status.

Figure 3.

==== Patient Care Information System ====
SOFTWARE STATUS

<table>
<thead>
<tr>
<th>STATUS</th>
<th>NO. OF SOFTWARE MODULES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified</td>
<td>4</td>
</tr>
<tr>
<td>In Development</td>
<td>2</td>
</tr>
<tr>
<td>Planned</td>
<td>4</td>
</tr>
<tr>
<td>Planned Revision</td>
<td>3</td>
</tr>
<tr>
<td>In Test</td>
<td>1</td>
</tr>
<tr>
<td>Under Modification</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>14</td>
</tr>
</tbody>
</table>
II. D. 3. PRIVACY OF PATIENT INFORMATION

The IHS has established security measures which protect the privacy of patient information held by or on behalf of the Service (Sec. 602 (a)(2)(C)). These measures are in conformance with the Privacy Act of 1974, the Computer Security Act of 1987 and appropriate regulations.

The RPMS software environment includes multiple mechanisms to ensure only authorized entry to patient information through the following features:

-- A system security sign-on module that requires each user to enter a log-on and password code to gain access to the system;
-- A database security sign-on module that requires each user to enter an "access" and a "verify" code to gain access to the database system;
-- Each user is given a selective menu of functions and files that further restricts which data is available and whether it can be added to or changed.
-- Each user must have proper file security codes to interact with the database manager files.
-- Each user must be given the authorized security (an electronic password) in order to complete designated activities.

The patient privacy system has been certified and is operational on all installed systems as summarized in Figure 4., "PATIENT PRIVACY SYSTEM, SOFTWARE STATUS".

Figure 4.

===== PATIENT PRIVACY SYSTEM =====
SOFTWARE STATUS
--------------------------------------------------------------------------------
STATUS NO. OF SOFTWARE MODULES
Certified 2
In Development
Planned
Planned Revision
In Test
Under Modification
TOTAL 2
================================================================================

II. D. 4. SERVICES-BASED COST ACCOUNTING

The IHS initiated two major activities to establish a services-based cost accounting component (Sec. 602 (a)(2)(D)). The first activity was to assess the methodology of developing specific cost information in an IHS hospital setting. The second, was to engage in a cost finding and comparison pilot program as a
follow-up to the findings and recommendations in the first activity. The pilot program is still underway.

The methodology assessment of developing specific cost information was conducted by Ernst & Whinney at the Alaska Native Medical Center (ANMC), and is contained in the report "Cost Management Project" [1987], and had the following objectives:

"1. Assess the applicability of designing a cost management methodology for an IHS hospital facility including the development and installation of a standard cost accounting system with related software and hardware.

"2. Assess the applicability of a DRG produced definition as part of the standard cost system" (pg. 8).

The assessment found that

"Typically (with the exception of the three medical centers) IHS hospital facilities can be categorized as rural, under 100 beds and operating in a noncompetitive environment. The size of the management team and medical staff does not require sophistication to pinpoint areas of functional responsibility. Their primary concerns will be maintaining volumes and controlling costs through gross measures such as overall budget to actual expenditures deviations and productivity analysis as documented in the Level II management accounting section." (pg. 32).

The implementation of sophisticated cost management systems in small hospitals like those found in the IHS commonly encountered the following problems, the assessment reported:

"The hospital may not have the computer hardware capabilities or capacity to process all cost management systems applications.

The hospital's transactions systems (e.g. payroll, patient billing) may not capture the data elements required to fully support the cost management system.

Implementing all functions simultaneously may overwhelm end users.

Adequate staff may not be available to carry out the data gathering and implementation tasks." (pg. 33).
In summary, the study recommended:

"Without the appropriate computerized transaction systems to compile and maintain the required data bases for a standard cost accounting system, such an implementation is not feasible."

"Based on the facility sizes within IHS and their operating environment, there exists a questionable cost/benefit relationship in implementing a standard cost accounting system. The objectives and related benefits of implementing a DRG based system should be reconsidered given the actual experience and implementation practices in the private sector of the health care industry."

"Appropriate attention should be focused on developing the basic Administrative Component of the RPMS system before proceeding with more sophisticated cost management applications and the required decision support software."

As a follow-up to the "Cost Management Project", the IHS is conducting a pilot program to evaluate the American Hospital Association's Monitrend program, a cost finding and comparison approach, to demonstrate the utility of such a program within IHS. This program is being reviewed at Parker, Clinton, and Albuquerque Hospitals for the feasibility of installing the program IHS-wide. This program is an extensive source of comparative financial and statistical information for short-term general acute care hospitals and provides the analytical capacity to measure given data values against a median for a given hospital, group of hospitals, or departmental operations. The pilot study will be completed in FY 90. Reference Appendix E, "THE AHA MONITREND PROGRAM OF THE INDIAN HEALTH SERVICE", for a detailed description.

A cost accounting professional specialty group (PSG) has been constituted to guide the future evaluation and development of the software for the system. The PSG is to actively consult with Area, service unit, and tribal management to determine local management needs, and alternative methods of meeting cost objectives.

There is no certified software for the cost accounting component. The status is summarized in Figure 5, SERVICES-BASED COST ACCOUNTING SYSTEM, SOFTWARE STATUS". Reference Appendix F, "SERVICES-BASED COST ACCOUNTING MODULES", for the detailed software listing and status.
Figure 5.

==== SERVICES-BASED COST ACCOUNTING SYSTEM====

SOFTWARE STATUS

<table>
<thead>
<tr>
<th>STATUS</th>
<th>NO. OF SOFTWARE MODULES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified</td>
<td></td>
</tr>
<tr>
<td>In Development</td>
<td></td>
</tr>
<tr>
<td>Planned</td>
<td>1</td>
</tr>
<tr>
<td>Planned Revision</td>
<td></td>
</tr>
<tr>
<td>In Test</td>
<td></td>
</tr>
<tr>
<td>Under Modification</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>1</td>
</tr>
</tbody>
</table>

II. D. 5. TRIBAL AND IHS RPMS REQUIREMENTS

The IHS has initiated several activities to provide automated information systems (Sec. 602 (b)(1)) to Indian tribes or organizations providing health services under a "638" contract.

The IHS has established the framework to provide technical assistance to assure that tribal management information systems would meet compatibility requirements with IHS systems and comply with any applicable reporting requirements established by the IHS for the facilities IHS operates directly. The technical assistance is provided through the Area Information System Coordinator (ISC).

The established and current IHS policy for automated systems is:
1) IHS furnish a comparable system as provided for IHS direct care facilities;
2) IHS furnish the RPMS software for existing compatible tribal systems; or
3) IHS make available technical assistance to tribes operating their own automated systems to assure that the data format compatibility for reporting requirements is met.

The IHS has provided automated systems and technical support to tribes or organizations who wished to utilize IHS systems. There are 46 IHS furnished RPMS tribal systems in operation and 16 others utilizing or accessing IHS systems via telecommunications.

The IHS management information systems planning and design activities have involved both tribal and IHS efforts. Examples of tribal involvement include the participation in:
1) the Information Systems Advisory Council (ISAC) software development priority process for IHS direct care;
2) the Professional Specialty Group (PSG) process for defining the functional requirements and specifications for IHS direct care facilities and applicable Tribal facilities for Private Third-Party Billing program design; and

3) the Data Management Taskforce (DMT) process to define the proposed core data set which will be utilized for national and local program management.

The IHS has developed software applicable to tribal needs such as diabetic registers, immunization registers, pap smear registers, and clinical scheduling and will continue to focus on specific tribal needs to enhance patient care at the tribal level.

The IHS established a patient information system data requirements taskforce consisting of tribal and IHS membership to review and recommend changes. The results of this review was a proposed 37 percent data element reduction and the identification of data required to meet the information needs of the Areas, IHS Headquarters, local specific management needs of tribal/service units, or clinic organizations. This proposal is being prepared for publication as a general notice in the Federal Register.

The IHS is also evaluating alternative cost effective automation strategies for assisting tribes to meet objectives of self-determination. The primary goals are to encourage data standardization and integration, to lower technical support cost, and to maximize access to computing resources. To achieve the latter, the emphasis will be on small tribes which have limited automation resources. Alternative strategies include:
1) supporting small tribes and/or sites from a single large computer located off-site and linked to each user; or
2) linking a small tribe and/or site into an existing off-site IHS computer system to administer a program or series of programs.

II. D. 6. CALIFORNIA SYSTEMS PROVISION

The IHS is providing systems to California in the same manner provided other Areas (Sec. 602 (b)(3)). Due to the lack of IHS direct care facilities in California, the IHS is conducting a small systems study to determine the configuration(s) necessary to meet automated management information system needs, consistent with Departmental regulations, and for tribal contractors to identify special considerations and alternative configurations supportable within the technical support resource structure of IHS. This will provide the maximum system configuration alternatives to tribes. This study will be complete in FY 90. Systems will be provided to California as resources permit under the Departmental priorities and within the President's Budget.
III. ACTIVITIES TO COMPLETE IMPLEMENTATION

The major activities to be completed to implement the Resource and Patient Management System (RPMS) (Sec. 602 (a)(3)(B)) are divided into four major categories. The most critical activity is to complete the deployment of technical support and computer systems. The end of FY 1994 is the estimated completion date of these activities providing resources permit under the Departmental priorities and within the President's Budget.

III. A. DEPLOYMENT OF TECHNICAL SUPPORT AND COMPUTER SYSTEMS

The technical support for field facilities and application development must be implemented to complete the remaining development, testing, installation, and maintenance support required by the RPMS. This support is the key which will produce and maintain the software required for the information systems. This is predicated on the proper resources being available in a timely manner.

The appropriate sized computer systems must be installed at larger and mid-range facilities to support the scope of information systems and requirements imposed. Otherwise, IHS would be forced to revert to a patchwork of applications based on computer size.

III. B. INTEGRATION OF PATIENT, ADMINISTRATIVE AND FINANCIAL RECORDS

The activities which need to be completed fall into two major sub-categories:

1. PROGRAM AND ADMINISTRATIVE MANAGEMENT

The national program management core data has been defined and proposed for review and comment. This proposal will serve as the basis for the national and local management information systems. Activities will include the adoption by the IHS and tribes, the coordination with the core clinical software design strategy, the analysis, planning, design, programming, and implementation of system changes, and the system coordination with tribal contractors. The core data will serve as the basis for the patient related component and identifies the data elements required to meet the information needs of the Areas, IHS Headquarters, tribal/service unit, or clinic organization management and serves these purposes: quality management, epidemiology, identification of population in need, resource management/allocation, budget support/justification, facilities and program planning, and
national billing. Major remaining activities include the evaluation and completion of the Patient Care Component which integrates patient related data in a comprehensive manner. Major administrative and financial activities remaining would include the conversion of existing systems and integration of administrative and finance records on which efforts are planned for FY 90. These activities will include activities similar to those undertaken by the program management core data taskforce, and in addition, system interfacing activities with other agencies; i.e. Health Accounting System, etc.

2. EVALUATION OF COST ACCOUNTING METHODS

The evaluation of cost accounting methods for practical implementation and contribution to service unit/tribal management is to undergo additional assessment to meet IHS and tribal needs. This process will include consultation with tribes, and other agencies; a determination of specific needs and feasible alternatives; and a testing of agency-wide options. Major considerations are: data collection; tribal interface; and the costs and methods of implementation.

III. C. CONVERSION TO A NATIONAL DATABASE ENVIRONMENT

The primary activity in converting to a national database environment is centered on the national data center. The data center is presently operating in a batch processing environment with inadequate on-line processing and data storage technology to support a database environment. Two activities must be accomplished:
1) the installation of the computer technology to support a homogeneous database environment; and
2) the conversion of the historical data to the database environment.

It is imperative that the computer system have adequate memory, processing capacity, and on-line disk storage to function in a database environment.

III. D. TELECOMMUNICATIONS NETWORK

A telecommunications network is required to provide timely and quality information. By the end of FY 90, all Area Offices will be on the IHS dedicated network. The IHS is planning in FY 91, assuming additional resources, to conduct a traffic and volume data study to determine appropriate networks to the health center level. This work is being planned in consideration of and in conjunction with the Federal Government's conversion to FTS 2000 which will aid in data and voice quality.
IV. FUNDING REQUIREMENTS FOR SUCCEEDING FISCAL YEARS

IV. A. IHS DIRECT CARE FACILITIES

The funding requirements (Sec. 602 (a)(3)(C)) are directed toward the implementation of the Resource and Patient Management System (RPMS). These funding requirements address the following:

- Technical staff to provide direct support for health facilities, and technical staff to develop and maintain software for national information systems;
- Computer systems and upgraded systems technology for large hospitals, mid-range facilities, and the national data center.

The funding needed over the next five years to complete the implementation of the RPMS is an estimated $71,000,000. An annual recurring amount of $18,000,000 is required to maintain the implemented system, keep abreast of technology, and support management and changing information needs. These funds are an investment in an information system which spans the entire agency from Headquarters through the facility level, and interfaces with tribal management information systems related to patient care.

The significant costs over the next five years are for hardware and personnel. The system life of the computer equipment being placed in the facilities is five years and at the end of that period, the equipment will require upgrades and/or replacements. Computer systems hardware being replaced/upgraded is from 4 through 10 years old and the technology is older than 15 years of age.

Reference Appendix G, "FUNDS NEEDED TO COMPLETE IMPLEMENTATION OF AN AUTOMATED MANAGEMENT INFORMATION SYSTEM", for requirements.

IV. B. TRIBAL FACILITIES

The impact of funding tribally contracted programs has been included with funding requirements for IHS direct care facilities. The funds required (Sec. 602 (a)(3)(C)) to implement the management information system at tribal facilities which are not within the scope of IHS direct care facilities is estimated to be $8,600,000 over the 5 year period with recurring cost of $3,400,000 to support the projected implemented systems. Tribal systems are also facing technological changes and will face increased personnel and technical support cost.

Reference Appendix H, "FUNDS NEEDED TO COMPLETE IMPLEMENTATION OF A TRIBAL AUTOMATED MANAGEMENT INFORMATION SYSTEM", for requirements.
APPENDIX A
RESOURCE AND PATIENT MANAGEMENT SYSTEM MODULES

<table>
<thead>
<tr>
<th>MODULES</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition &amp; Resource Management</td>
<td>FIN</td>
</tr>
<tr>
<td>Admission, Discharge, and Transfer</td>
<td>FIN</td>
</tr>
<tr>
<td>APC Date Entry</td>
<td>FIN</td>
</tr>
<tr>
<td>Automated Office Systems</td>
<td>FIN</td>
</tr>
<tr>
<td>Billing- Private Insurance</td>
<td>FIN</td>
</tr>
<tr>
<td>Central Warehouse (Stores) System</td>
<td>FIN</td>
</tr>
<tr>
<td>Chemical Dependancy Management</td>
<td>PAT</td>
</tr>
<tr>
<td>Children's Special Needs Register</td>
<td>PAT</td>
</tr>
<tr>
<td>Clinical Scheduling</td>
<td>FIN</td>
</tr>
<tr>
<td>Community Injury Control</td>
<td>FIN</td>
</tr>
<tr>
<td>Contract Health Services (SU/AREA)</td>
<td>FIN</td>
</tr>
<tr>
<td>Cost Accounting Tribal Sub-System</td>
<td>FIN</td>
</tr>
<tr>
<td>Dental Facility Reporting System</td>
<td>FIN</td>
</tr>
<tr>
<td>Diabetes Health Care</td>
<td>PAT</td>
</tr>
<tr>
<td>Eye Care</td>
<td>PAT</td>
</tr>
<tr>
<td>Financial Management- Cost Accounting</td>
<td>CST</td>
</tr>
<tr>
<td>Generic Activity Reporting</td>
<td>FIN</td>
</tr>
<tr>
<td>TV Pharmacy</td>
<td>PAT</td>
</tr>
<tr>
<td>Laboratory</td>
<td>PAT</td>
</tr>
<tr>
<td>Maternal/Child Health Immunization</td>
<td>PAT</td>
</tr>
<tr>
<td>Mini PCC Data Entry</td>
<td>PAT</td>
</tr>
<tr>
<td>NCR Application Conversion</td>
<td>FIN</td>
</tr>
<tr>
<td>Nursing Care Plan</td>
<td>PAT</td>
</tr>
<tr>
<td>Nursing Patient Acuity Classification</td>
<td>PAT</td>
</tr>
<tr>
<td>Outpatient Pharmacy</td>
<td>PAT</td>
</tr>
<tr>
<td>Pap Smear Tracking</td>
<td>PAT</td>
</tr>
<tr>
<td>Patient Care Component (PCC)</td>
<td>PAT</td>
</tr>
<tr>
<td>Patient Registration (SU/Area)</td>
<td>FIN</td>
</tr>
<tr>
<td>PCC - Multi Facility Integration</td>
<td>FIN</td>
</tr>
<tr>
<td>PCC Query Language</td>
<td>FIN</td>
</tr>
<tr>
<td>Personnel Management (Impact)</td>
<td>FIN</td>
</tr>
<tr>
<td>QA Staff Credentials Tracking</td>
<td>FIN</td>
</tr>
<tr>
<td>QA/UR CHS Inpatient Register</td>
<td>FIN</td>
</tr>
<tr>
<td>QA/UR Inpatient Register</td>
<td>FIN</td>
</tr>
<tr>
<td>Time &amp; Attendance</td>
<td>FIN</td>
</tr>
<tr>
<td>VA Food Service</td>
<td>PAT</td>
</tr>
<tr>
<td>Security*</td>
<td>PRV</td>
</tr>
</tbody>
</table>

Total: 13 9 7 2 6 1 38

STATUS CODES: C = Certified; D = In Development; P = Planned; R = Planned Revision; T = Test Basis; M = Under Modification.
TYPE by Major Category: FIN = Financial/Administrative; PAT = Patient Care; CST = Cost Accounting; PRV = Privacy.
* Security modules (2) in operating system and kernel software.
APPENDIX B
REQUIREMENTS TO IMPLEMENT RPMS IHS-WIDE

1. Hospitals and Clinics Technical Support

The IHS plan is to promote coordination and control of existing and new systems in a distributed data processing framework under local management and control which requires technical personnel to provide computer technical support, training, and user-support to the facility level.

2. Information System Development and Technical Support

The IHS has adopted the Department of Veterans Affairs software development center model to meet software automation requirements. A center's primary responsibility is to develop software and to convert the array of service-specific data systems from a single-purpose to an integrated data environment. A center will specialize in IHS-wide application development and programming requirements which are necessary to support a uniform IHS national database and information system.

3. Appropriate Computer Systems

The immediate requirement is for appropriately sized computer hardware to implement the levels of RPMS software from the point of care to management information requirements of Headquarters which are reflected in the following plans:

A. A three-year plan to procure large computer systems to run the RPMS at the largest hospitals, Area Offices, and support systems.

B. A two-year plan to upgrade/replace existing mid-level RPMS systems to support existing and conversion software modules, computing capacity, and data storage.

C. A three-year plan to upgrade the data processing services center mainframe computer to current technology in order to support on-line management information systems.

4. National Database

The integration of the information system and creation of a point of care database is changing the role of the national data center from a batch processing - service specific to a national database environment. This change requires a technological upgrade, the conversion of off-line (tape) historical data to an on-line (disk) database environment, and creation of a on-line user environment.
APPENDIX B
REQUIREMENTS TO IMPLEMENT RPMS IHS-WIDE
(Cont'd)

5. Telecommunications Network

The benefit of automated information systems is to provide timely and quality information. This can be accomplished through a telecommunications network which supports the local integrated database environment. The 189 hospitals and health centers where computer systems are being installed are tape dependant for data transfer due to the lack of data quality telecommunications. A quality telecommunications network is necessary to support a timely management information system.
## APPENDIX C

### FINANCE AND ADMINISTRATIVE MODULES

<table>
<thead>
<tr>
<th>MODULES</th>
<th>STATUS CODES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition &amp; Resource Management</td>
<td>X FIN</td>
</tr>
<tr>
<td>Admission, Discharge, and Transfer</td>
<td>X ADM</td>
</tr>
<tr>
<td>APC Date Entry</td>
<td>X ADM</td>
</tr>
<tr>
<td>Automated Office Systems</td>
<td>X ADM</td>
</tr>
<tr>
<td>Billing- Private Insurance</td>
<td>X ADM</td>
</tr>
<tr>
<td>Central Warehouse (Stores) System</td>
<td>X ADM</td>
</tr>
<tr>
<td>Clinical Scheduling</td>
<td>X ADM</td>
</tr>
<tr>
<td>Community Injury Control</td>
<td>X ADM</td>
</tr>
<tr>
<td>Contract Health Services (SU/AREA)</td>
<td>X (X) ADM</td>
</tr>
<tr>
<td>Cost Accounting Tribal Sub-System</td>
<td>X FIN</td>
</tr>
<tr>
<td>Dental Facility Reporting System</td>
<td>X ADM</td>
</tr>
<tr>
<td>Generic Activity Reporting</td>
<td>X ADM</td>
</tr>
<tr>
<td>NCR Application Conversion</td>
<td>X FIN</td>
</tr>
<tr>
<td>Patient Registration (SU/Area)</td>
<td>X (X) ADM</td>
</tr>
<tr>
<td>FCC - Multi Facility Integration</td>
<td>X ADM</td>
</tr>
<tr>
<td>FCC Query Language</td>
<td>X ADM</td>
</tr>
<tr>
<td>Personnel Management (Impact)</td>
<td>X ADM</td>
</tr>
<tr>
<td>QA Staff Credentials Tracking</td>
<td>X ADM</td>
</tr>
<tr>
<td>QA/UR CHS Inpatient Register</td>
<td>X ADM</td>
</tr>
<tr>
<td>QA/UR Inpatient Register</td>
<td>X ADM</td>
</tr>
<tr>
<td>Time &amp; Attendance</td>
<td>X ADM</td>
</tr>
</tbody>
</table>

**Total**                  | 7 7 2 2 3 0 21

STATUS CODES: C = Certified; D = In Development; P = Planned;
R = Planned Revision; T = Test Basis; M = Under Modification.

TYPE by Major Category: FIN = Financial/Administrative;
PAT = Patient Care; CST = Cost Accounting; PRV = Privacy.
## APPENDIX D

### PATIENT CARE INFORMATION MODULES

<table>
<thead>
<tr>
<th>Modules</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Dependancy Management</td>
<td>X PAT</td>
</tr>
<tr>
<td>Children's Special Needs Register</td>
<td>X PAT</td>
</tr>
<tr>
<td>Diabetes Health Care</td>
<td>X PAT</td>
</tr>
<tr>
<td>Eye Care</td>
<td>X PAT</td>
</tr>
<tr>
<td>IV Pharmacy</td>
<td>X PAT</td>
</tr>
<tr>
<td>Laboratory</td>
<td>X PAT</td>
</tr>
<tr>
<td>Maternal/Child Health Immunization</td>
<td>X PAT</td>
</tr>
<tr>
<td>Mini PCC Data Entry</td>
<td>X PAT</td>
</tr>
<tr>
<td>Nursing Care Plan</td>
<td>X PAT</td>
</tr>
<tr>
<td>Nursing Patient Acuity Classfication</td>
<td>X PAT</td>
</tr>
<tr>
<td>Outpatient Pharmacy</td>
<td>X (X) PAT</td>
</tr>
<tr>
<td>Pap Smear Tracking</td>
<td>X PAT</td>
</tr>
<tr>
<td>Patient Care Component (PCC)</td>
<td>X (X) PAT</td>
</tr>
<tr>
<td>VA Food Service</td>
<td>X PAT</td>
</tr>
</tbody>
</table>

**Total** 4 2 4 0 3 1 14

**STATUS CODES:**
- **C** = Certified
- **D** = In Development
- **P** = Planned
- **R** = Planned Revision
- **T** = Test Basis
- **M** = Under Modification

**TYPE by Major Category:**
- **FIN** = Financial/Administrative
- **PAT** = Patient Care
- **CST** = Cost Accounting
- **PRV** = Privacy
Background and History of Program Development

In early 1986 the Health Care Administration Branch initiated discussions with the American Hospital Association regarding its Monitrend Program and the possible use of this program by the Indian Health Service.

This program, a cost finding and comparison program, traditionally had special relevance and significance for private sector hospitals, since it was originally designed to meet their special cost finding and comparison needs.

It did not have the flexibility and capability to meet the special needs of public sector or Federal hospitals, primarily because public hospitals do not generate revenue like private hospitals.

There was, therefore a need for the Indian Health Service to simulate generation of revenue in its hospitals in order to participate in the program. This was subsequently accomplished by the creation of a chargemaster system by the AHA that would generate equivalent private sector charges for equivalent hospital procedures performed by the Indian Health Service.

The Role of the Monitrend Program

Monitrend is the most extensive source of comparative financial and statistical information available for short-term general acute hospitals in the United States. Comparative data highlight operational differences among similar hospitals enabling hospital management to analyze the source of differences and determine whether corrective actions are warranted.

Monitrend addresses and assists hospital management in identifying and resolving management problems in areas such as staff productivity, cost control and utilization patterns. It also can be used to educate employees, medical staff, governing boards and others, about a hospital's operating performance. The Monitrend Hospital Report provides the foundation and is the key to receiving the most significant data generated by this system. This data includes percent of occupancy, length of stay, average daily census, revenue, patient days, direct expense/patient day, salary expense/patient day, ratio of total direct expense/revenue, percentage of direct expenses, RN's average hourly salaries, LPN's average hourly salaries, other personnel's average hourly salaries, paid hours/patient day, the percent of registered nurses, and the percent of licensed practical nurses.
The above data is provided for both departmental and hospital-wide operations, and a given hospital's performance is measured against the median value for a given data value. The median is the comparative measure used because it is least affected by extreme data values. It also represents the midpoint in the data since half the values fall above and half the values fall below this midpoint. To facilitate comparisons, variance and extension values are also provided. The variance is the difference between the designated median and a hospital's actual data item value.

The ultimate power of Monitrend lies in its ability to synthesize a large volume of comparison data and project potential cost savings for a hospital or group of hospitals such as the Indian Health Service's 43 general acute short-term hospitals.

Other services available from this program include the provision of material to ensure uniform reporting and assistance in the analysis and interpretation of Monitrend reports. This means a trained AHA field representative is assigned to work closely with a hospital and its staff to install the Monitrend system and to provide ongoing consultation to analyze the hospital's Monitrend reports.

Other services available to Monitrend participants include:

1. Workshops for departmental heads.
2. Review of data with individual department heads.
3. Special presentations to the hospital's board and/or medical staff.

Current Status of IHS Participation in the Monitrend Program

On February 1, the Indian Health Service initiated a pilot program to test the feasibility of expanding the Monitrend Program to all IHS hospitals. The sites selected for pilot testing were Clinton, Albuquerque, and Parker hospitals.

The study has been initiated and will be completed within 9 months for a total of $2754. The test sites have begun to collect data. This data will be submitted to Chicago for processing and the first reports are expected in mid-summer.
APPENDIX F
SERVICES-BASED COST ACCOUNTING MODULES

<table>
<thead>
<tr>
<th>MODULES</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Management - Cost Accounting</td>
<td>X</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
</tr>
</tbody>
</table>

STATUS CODES: C = Certified; D = In Development; P = Planned; R = Planned Revision; T = Test Basis; M = Under Modification.

TYPE by Major Category: FIN = Financial/Administrative; PAT = Patient Care; CST = Cost Accounting; PRV = Privacy.
APPENDIX G
Funds Needed to Complete Implementation of an Automated Management Information System

**IMPLEMENTATION COST ($000)**

<table>
<thead>
<tr>
<th>FY 90</th>
<th>FY 91</th>
<th>FY 92</th>
<th>FY 93</th>
<th>FY 94</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>COST ELEMENTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PERSONNEL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area Support/ Development Staff</td>
<td>3,100</td>
<td>3,100</td>
<td>3,100</td>
<td>3,100</td>
<td>3,100</td>
</tr>
<tr>
<td>EQUIPMENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systems</td>
<td>2,500</td>
<td>2,500</td>
<td>2,500</td>
<td>2,500</td>
<td>2,500</td>
</tr>
<tr>
<td>Large Systems</td>
<td>-----</td>
<td>3,500</td>
<td>5,100</td>
<td>4,700</td>
<td>-----</td>
</tr>
<tr>
<td>Upgrades/Replace</td>
<td>-----</td>
<td>1,300</td>
<td>1,300</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Data Center</td>
<td>-----</td>
<td>1,000</td>
<td>1,200</td>
<td>1,200</td>
<td>-----</td>
</tr>
<tr>
<td>Maintenance-In House</td>
<td>-----</td>
<td>700</td>
<td>2,500</td>
<td>3,600</td>
<td>6,800</td>
</tr>
<tr>
<td>Data Communications</td>
<td>-----</td>
<td>600</td>
<td>600</td>
<td>800</td>
<td>2,000</td>
</tr>
<tr>
<td>SOFTWARE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition</td>
<td>-----</td>
<td>300</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Conversion</td>
<td>-----</td>
<td>300</td>
<td>400</td>
<td>300</td>
<td>1,100</td>
</tr>
<tr>
<td>Purchase</td>
<td>-----</td>
<td>200</td>
<td>---</td>
<td>---</td>
<td>200</td>
</tr>
<tr>
<td>SUPPLIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONTRACTED COMMERCIAL SERVICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Consulting</td>
<td>-----</td>
<td>-----</td>
<td>300</td>
<td>300</td>
<td>200</td>
</tr>
<tr>
<td>Eqqipt Maintenance</td>
<td>-----</td>
<td>-----</td>
<td>2,600</td>
<td>3,800</td>
<td>4,800</td>
</tr>
<tr>
<td>Maintenance-Software</td>
<td>-----</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>600</td>
</tr>
<tr>
<td>Anlysis, Desgn &amp; Pyrrg</td>
<td>-----</td>
<td>300</td>
<td>300</td>
<td>200</td>
<td>800</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5,600</td>
<td>11,400</td>
<td>18,700</td>
<td>19,600</td>
<td>15,700</td>
</tr>
</tbody>
</table>

NOTE: Cost reflected in current dollars.
APPENDIX H
FUNDS NEEDED TO COMPLETE IMPLEMENTATION
OF A
TRIBAL AUTOMATED MANAGEMENT INFORMATION SYSTEM

<table>
<thead>
<tr>
<th>IMPLEMENTATION COST ($)000</th>
<th>FY 90</th>
<th>FY 91</th>
<th>FY 92</th>
<th>FY 93</th>
<th>FY 94</th>
<th>TOTAL</th>
</tr>
</thead>
</table>

**COST ELEMENTS**

**PERSONNEL**
- Support Staff 230 310 690 1,150 1,600 3,980
- Training --- 30 70 150 100 350

**EQUIPMENT**
- Systems --- --- 500 600 600 1,700
- Upgrades/Replace 50 60 140 230 320 800
- Maintenance 70 90 190 300 450 1,100

Data Communications (Included with system cost)

**SOFTWARE**
- Acquisition --- --- 10 20 20 50

**SITE SUPPORT**
- Facility Preparation 10 10 100 130 100 350
- Facility Maintenance --- --- 30 50 70 150
- Supplies --- --- 50 70 100 120

**TOTAL** 360 500 1,780 2,700 3,360 8,600

Note: Cost is reflected in current dollars and based on current and projected systems.