Final report of a study of an integrated cost accounting and medical management information system for the Indian Health Service

Department of Health and Human Services, Office of the Secretary for Planning and Evaluation.

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FINAL REPORT OF A STUDY OF AN INTEGRATED COST ACCOUNTING AND MEDICAL MANAGEMENT INFORMATION SYSTEM FOR THE INDIAN HEALTH SERVICE

Submitted to:
Office of the Assistant Secretary for Planning and Evaluation
Department of Health and Human Services

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Macro Systems, Inc. October 1984
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EXECUTIVE SUMMARY

PURPOSE

The adoption by Medicare of a prospective payment system for reimbursement of inpatient hospital care, using Diagnosis Related Groups (DRGs) as the unit of reimbursement, has created a fundamental change in the way hospitals now view their costs of operations. It is now incumbent on hospital administrators to know their cost of operations in far more detail, particularly at the patient level, and in fundamentally different ways than under previous payment methods. Sophisticated cost accounting systems linking medical and financial data have proliferated rapidly in hospitals because these systems produce knowledge about costs necessary to assess hospital performance relative to DRG reimbursement. Such knowledge would have been helpful in the past from a management perspective. However, the great bulk of hospitals chose to stay with cruder accounting systems, until forced to change by virtue of the dramatic shift in the basic method of payment for inpatient care.

The Indian Health Service (IHS), which operates 47 hospitals and some 200 ambulatory health clinics throughout its network of reservation-based health services, presently bills and is reimbursed by DRG under Medicare, and it is now struggling with transforming its medical information systems to provide a basis for managing its financial resources, as well as its main patient care information system. IHS has had a patient care system, Patient Care Information System (PCIS), under development for many years. That system is primarily an outpatient medical management system with limited financial and inpatient capability. It is highly regarded by its users, mainly the medical staff in those IHS facilities where it is now operational. The IHS plans to use the PCIS as a core system in its effort to develop an information system that integrates patient and financial data.

This study, carried out over a four-month period, was conducted to assess IHS’s readiness to move toward cost accounting that integrates medical and financial information—a stated desire of IHS senior management. The study was carried out by staff of Macro Systems, Inc., under the auspices of the HHS Office of the Assistant Secretary for Planning and Evaluation and the Indian Health Service.

MAJOR FINDINGS

The IHS, independent of this study, had embarked on a major effort to enhance its automated management information capability. Having examined that effort in light of IHS’s desired system objectives, the following findings have emerged relative to IHS’s readiness to adopt a cost-based management approach.

- The current IHS approach incorporates the following major operational elements:
- Adoption of the IHS PCIS as the core system, upon which other system components would be built
- Adoption or adaptation of several systems components currently in use or under development by the Veterans Administration (VA), e.g., an inpatient pharmacy system and an outpatient scheduling system
- Conversion of the current IHS PCIS from COBOL to the MUMPS language, so as to make IHS compatible with the VA
- Development of the necessary communications and other integrative software to allow full communication among IHS Area and Service Units, and to and from IHS Headquarters
- Procurement of the necessary computer hardware and other supporting software for each Service Unit and Area office, based on the general approach of a minicomputer at each Area office and microcomputers at each (or most) Service Units

(More detail concerning the IHS approach is contained in the initial section of the main body of this report.)

• Although IHS tentatively has decided to adopt available portions of the VA system, that approach is itself under development and does not include cost accounting.
• Since the introduction of the Federal DRG approach and the decision by many hospitals to shift to a cost accounting management approach, the availability of low-cost, effective commercial software for hospital management has increased dramatically.
• Although IHS has carried out substantial developmental work on a systems approach, they have yet to complete a full systems requirements study, required by GSA for a delegation of procurement authority and for decisionmaking generally regarding hardware and software procurement.

MAJOR CONCLUSIONS

IHS senior management is making a serious commitment to modernize the agency's management systems, especially in the field where most of the staff and operations are located. The agency is now poised to capitalize on emerging technology to improve dramatically its management capabilities. A number of technical issues remain to be resolved, however, underscored by the following conclusions:

• It is by no means clear that IHS is compelled to move to a fully integrated medical and financial management system. Presently, the agency is significantly more interested in fully supporting its medical management than its cost management. The concept introduced by cost accounting is that decisions affecting the type and duration of care may be made considering the cost implications of such decisions. The current IHS approach is based heavily on patient care considerations that
transcend financial considerations. This point is not a clear-cut issue at all, since many decisions made within IHS affecting patient care are made based on financial considerations, e.g., decisions to contract for needed health care for the Indian population.

The IHS shift to billing by DRGs under Medicare is more suggestive than compelling as a rationale to shift to a fully integrated cost accounting system. The private sector hospital industry did not shift its systems to include full cost accounting until the Federal Government forced the shift through adoption of prospective payment. IHS receives part of its revenue through this same method; however, IHS receives the lion's share of its revenue through the conventional budgeting process, which does not compel a shift to cost accounting. On the other hand, some IHS hospitals exist as community hospitals, available to all, with the distinct possibility that more IHS hospitals may move in this direction. Such hospitals will demand a financial management capability as any other hospital.

A shift in the dominant funding method to a cost-based approach would create a more compelling rationale to implement a cost accounting system. Lacking this rationale, it is by no means clear that IHS will shift its entire system to a cost-based approach as is suggested by DRGs and their accompanying cost accounting systems.

- The current IHS development approach is not the most efficient or cost-effective approach to produce an integrated medical and financial management system that includes all of the desired capabilities and that will cover the entire IHS. The current IHS approach is problematic for the following reasons:

  - It relies on an outpatient system (PCIS) as its core, whereas inpatient systems are the more logical base. Although outpatient care is the more active area for IHS in terms of volumes of service, inpatient care produces more cost by far.

  - It relies on adopting systems from the Veterans Administration which are not fully developed and which do not include cost accounting.

  - The current IHS approach requires a substantial amount of new systems design and programming in areas that are now commercially available.

  - Current IHS planning is proceeding without benefit of a completed "blueprint," a systems requirements study. Expensive mistakes are much more likely given this situation.

- Any approach undertaken by IHS, either its current path or the one suggested by the consultants in this report, will take five years or more to complete.
MAJOR RECOMMENDATIONS

• IHS should first complete a systems requirements study.

This study is needed not only for the GSA delegation of authority but will also be extremely helpful in guiding subsequent decisions on systems design hardware and software. A proposed scope of work for a study of this nature is attached as Appendix C.

• IHS should carefully examine the commercially available hospital management information systems that integrate financial and medical data, and other systems capabilities desired by IHS.

For as little as $60,000 per hospital, IHS can procure hardware and commercially available software to meet most of its needs, and which would permit record transfer across sites and areas. The PCIS capability would need to be developed for these commercially available systems, because they do not incorporate features such as the health summaries now produced by PCIS.

• IHS should abandon its plan to obtain Veterans Administration systems unless those systems prove to be more cost-effective than systems commercially available.

The VA health care system is far larger than the IHS system, and it is unlikely that IHS needs several of the VA systems components such as the automated outpatient scheduling. Furthermore, the VA expressly excludes cost accounting.

• IHS should not pursue its plans to enhance PCIS throughout IHS and purchase additional hardware.

PCIS should continue in its present configuration and mode of operations until such time that its capabilities are replaced by an adapted, commercially available system.
I. INTRODUCTION
L INTRODUCTION

1. PURPOSE

This study was designed to establish, for the Indian Health Service (IHS), the functional and operational capabilities of an integrated medical management and cost accounting system using diagnosis-related groups (DRGs). The objectives of this integrated information system are to:

- Improve medical and program management
- Improve third-party billing capability
- Facilitate comparisons with other private and governmental health care programs
- Facilitate potential to serve non-Indians

The decision for IHS to proceed with the development of a DRG capability is consistent with the objectives of the Department. On the assumption that the DRG approach is an effective way to contain health care costs, the Office of the Secretary has determined that those hospitals controlled directly by the Department should employ DRGs as a reimbursement mechanism. The development of an integrated system will be a necessary and advantageous attribute for the anticipated use of IHS facilities as community resources, and for billing charges for non-Indians who may be provided with health care.

IHS has already adopted a DRG methodology for reimbursement under the Medicare program. The decision by IHS to employ DRGs for all services and patient care was made with the knowledge that IHS would need to upgrade and integrate its patient care and financial information systems. This study assesses the changes required in current IHS systems to support efficiently a DRG billing and reimbursement approach.
2. IMPORTANCE OF COST ACCOUNTING

Cost accounting is a required component of any financial information system supporting management and cost control objectives under DRG reimbursement. A cost accounting system is important for IHS not only for good management, but also to compete effectively for Federal resources and to respond effectively to pressure from OMB and the Department.

Cost accounting systems are being adopted by almost all community hospitals in response to DRG reimbursement under Medicare, and in growing numbers by Medicaid and Blue Cross plans. These systems are complicated and difficult to design from scratch, but not very difficult to obtain from a variety of established vendors.

Cost accounting capabilities cannot readily be added to other financial or clinical information systems after their development. Necessarily based on patient transactions, cost accounting capabilities must be designed into the very heart of a system. Within integrated* systems, patient transactions initiate multiple system responses, including posting of results of a health intervention to a health summary, posting of charges to a patient's bill, posting of costs to a general ledger, maintenance of inventory, and workload reporting. The effective accomplishment of these multiple tasks in a timely, efficient, and reliable manner is the result of designing cost accounting capabilities into the most basic structure of the system from the outset.

* As used in the context of this study, integration refers to the combination of data from separate data processing systems to produce new data. In the case of IHS, the two separate groups of systems, each of which could and currently do function independently of the other, are patient care/medical information systems and operations accounting/financial information systems. The combination and processing of data from each of these systems, i.e., integration, produces data that could not be produced from data maintained by each system group alone.
3. OVERVIEW OF STUDY METHODOLOGY

This study was originally conceived under a very tight time schedule (15 weeks) so that IHS might have the option to proceed with procurement in FY84. As it became apparent that IHS was not ready to proceed with a procurement, this time constraint was relaxed.

This study relied heavily upon existing information provided by IHS and other Federal agencies, information obtained through interviews with knowledgeable government officials and individuals within the private health information system vendor sector, and our own knowledge and experience.

The major tasks of this study were to:

- Catalog and analyze existing IHS systems and development efforts
- Establish general functional and operational capabilities for the desired new system
- Develop alternative approaches to securing the desired capabilities
- Develop an implementation plan for the desired approach

A detailed description of the methodology employed in this study is presented in Appendix A.
II. BACKGROUND
II. BACKGROUND

This chapter provides background information on the IHS delivery system, a description of the functional and operational capabilities of IHS's desired system, a description and analysis of IHS's system development efforts, and a summary of systems development by other health care providers.

1. DESCRIPTION OF IHS DELIVERY SYSTEM

The Indian Health Service provides, either directly or through its contract health service vehicle, the health care needed by all Indians and Native Alaskans, estimated to number 909,000 in 1984. To accomplish this service delivery mission, IHS is organized into 12 Area Offices, which are further divided into 98 Service Units. Ten of the twelve Area Offices and approximately 80 percent of the Service Units are located west of the Mississippi River.

IHS directly operates 47 hospitals, 72 health centers, 12 school health centers, and 71 health stations. A number of tribes, under contract with IHS, operate an additional 4 hospitals, 50 health centers, and 204 health stations.

In FY83, IHS directly provided over 3,250,000 ambulatory visits. Almost two-thirds of these were provided in hospital outpatient facilities. Another 230,000 outpatient visits were provided by contract health service physicians. In addition, IHS directly provided 77,000 hospital discharges, with an average length of stay of 5.2 days. Another 25,000 discharges, with an average length of stay of 4.8 days, were provided by contract health service hospitals.

In FY84, out of a total IHS budget of $770 million, $278 million was spent directly on hospitals and clinics, another $158 million was allocated to contract health care, and an additional $150 million was directed to the tribes.
2. FUNCTIONAL AND OPERATIONAL CAPABILITIES OF DESIRED SYSTEM

IHS's desired information system is built on the principles of integration and distributed processing. Integration refers to the synthesis of patient care and financial or accounting information. This integration is essential to support medical management and cost control objectives under DRG reimbursement.

Distributed processing refers to the hierarchical networking of the information system. Under this data processing concept, data processing functions are assigned, i.e., distributed, to those organizational units where the responsibility for performance of the operational function resides. For example, data processing functions related to patient admission/discharge would be performed at the organizational unit directly responsible for these operational functions. In distributed processing, information generally flows upward, while reports flow downward within the system. All operational components of the service delivery system are connected from a data processing perspective. Distributed processing is central to the new system's ability to provide timely reports, to be maximally useful to IHS personnel, and to support IHS Headquarters' information requirements.

IHS's desired functional capabilities for the new system are presented in Exhibit 11-1 under the following categories: patient administration, medical/health information, clinical services support, management support, operations accounting, and central accounting. The 24 functional capabilities listed are minimal requirements, subject to augmentation by additional modules desired by individual Area Offices or Service Units.

Exhibit II-2 lists IHS's desired operational capabilities for the integrated system under the following categories: distributed processing, organizational concept, hardware/communications, and system operations. This system is designed to work 24 hours a day, 365 days a year, using microcomputers, minicomputers, and a central computer integrated through a hierarchical network.

A number of special capabilities must be built into the system to assure reliable cost accounting data. These include the standardization of common data elements across Service Units, such as uniform cost centers, uniform coding structures, and a unique
EXHIBIT II-1

HHS, Office of the Assistant Secretary for Planning and Evaluation

IHS DESIRED FUNCTIONAL CAPABILITIES

1. **PATIENT ADMINISTRATION**
   - Registration/Identification
   - Third Party Eligibility
   - Inpatient Admission/Discharge/Transfer
   - Patient Scheduling

2. **MEDICAL/HEALTH INFORMATION**
   - Health Summary Maintenance
   - Discharge Abstracts
   - Health Action Management
   - Epidemiologic Analyses
   - Results Reporting

3. **CLINICAL SERVICES SUPPORT**
   - Order Entry
   - Utilization Review
   - Transaction/Procedure Reporting
   - DRG Grouper
   - Modules for Pharmacy, Laboratory, etc.

4. **MANAGEMENT SUPPORT**
   - Cost Analysis Reporting (by department, DRG, M.D., etc.)
   - Budgeting
   - Word Processing

5. **OPERATIONS ACCOUNTING**
   - Billing
   - Accounts Receivable
   - General Ledger/Subsidiary Ledgers
   - Accounts Payable
   - Management of Contract Care

6. **CENTRAL ACCOUNTING**
   - Linkage with Payroll/Personnel
   - Linkage with Health Accounting System
HHS, Office of the Assistant Secretary for Planning and Evaluation

IHS DESIRED OPERATIONAL CAPABILITIES FOR THE INTEGRATED SYSTEM

1. DISTRIBUTED PROCESSING
   - Processing to occur where functional responsibility resides

2. ORGANIZATIONAL CONCEPT
   - Any entity within IHS to have access to any non-confidential database, through on-demand inquiries
   - Automatic data transmission to higher levels
   - Automatic reports to lower levels

3. HARDWARE/COMMUNICATIONS
   - Micros, minis, and a central computer integrated through a hierarchical network
   - Various communication linkages to be employed

4. SYSTEM OPERATIONS
   - 24 hour, 365 day operations
   - Health summaries available from any part of system
     - Within Areas on-demand
     - Across Areas within 24 hours
   - Data transmission and processing at night
patient identifier. Transactions must be captured on both a cost center and patient-specific basis. The databases must be integrated through communication linkages between medical management and accounting systems.

3. DESCRIPTION OF IHS SYSTEMS DEVELOPMENT

Over 50 different information systems are used within the IHS network of providers. Most of these systems stand alone, with no ability to integrate with other systems. Some are specially designed to meet the needs of a particular facility or tribe. Many of the systems are Departmental requirements, such as the Health Accounting System (HAS), Contracts Data System, Grants Data System, Personnel System, Payroll System, and Supply System. Others have been developed internally within IHS over time, including the Patient Care Information System (PCIS), Ambulatory Patient Care (APC) System, Contract Health Services System, Dental System, and Equipment Inventory System. Various equipment is used at several operational levels, including microcomputers, minicomputers, word processing systems, key tape machines, and telecommunications circuits.

**PATIENT CARE INFORMATION SYSTEM (PCIS)**

The purpose of the Patient Care Information System is to integrate outpatient, community health, and prevention functions of IHS and to issue consolidated health summaries. PCIS is currently operational in the Alaska Area, Billings Area, and the Tucson Area (Sells Service Unit); however, only Tucson operates in an on-line mode (Alaska and Billings use microfiche for health summaries). The remainder of IHS uses the Ambulatory Patient Care (APC) system for similar functions.

PCIS is designed to emphasize outpatient care, collecting only limited information from inpatient episodes. Written in COBOL, as currently configured, the system uses batch input with data collection at the Service Unit level, data entry at the Area level, data processing at the IHS Data Processing Services Center (DPSC) in Albuquerque, and data output on-line to Tucson and on microfiche to Billings and Alaska. PCIS has a very limited capacity for billing; it can be used to bill some Medicaid programs and private insurers, but cannot be used to bill under Medicare Part A.
A variety of enhancements are planned for PCIS by IHS systems staff. These include data entry at the Service Unit level on personal computers, database management and processing at the Area level on minis, and a translation of PCIS into MUMPS.

HEALTH ACCOUNTING SYSTEM (HAS)

The purpose of the Health Accounting System is to monitor Health Resources and Services Administration (HRSA) obligations and funds flow. HAS allocates funds to accounting points (Area Offices) on the basis of approximately 20 "sub/sub activities," such as hospitals and clinics, dental, sanitation, and mental health. Area Offices transmit their HAS data directly to the Parklawn computer, bypassing IHS Headquarters. Parklawn manages the overall database, and sends a copy of certain data elements to DPSC, which generates reports desired by IHS.

HAS employs common accounting numbers (CANs) as cost center identifiers through the "CAN explosion." The system also incorporates a Document History Record (DHR), which obligates funds for contractual services or products. The "piggyback" system provides expenditures by vendors by object class for contract care.

HAS does not include personnel or payroll functions, which are actually separate systems. It should be noted, however, that personnel and payroll information are integrated with HAS data to generate necessary financial reports.

A new accounting system is being developed by HRSA, to be implemented October 1, 1984.

CENTRAL ROLE OF PCIS IN CURRENT SYSTEMS DEVELOPMENT

PCIS currently plays a central role in current IHS development efforts. PCIS is being revised and expanded to operate on minicomputers at the Area level and to be used with Service Units of "sufficient size." Under current plans, PCIS would be augmented with system modules from the Veterans Administration (VA), including inpatient admissions, discharge, and transfer; outpatient scheduling; outpatient pharmacy; and others, as developed.
The present IHS approach, which is decentralized rather than distributed in nature, is illustrated in Exhibit II-3. An expanded PCIS is the core of the envisioned system, with the requirement to develop custom linkages to VA modules and the Health Accounting System, plus the in-house custom development of a cost accounting system and missing inpatient components. To implement this approach, IHS plans to procure hardware, using local purchase authority, for pilot testing of VA modules at local sites. After testing, modules would be brought to Tucson for integration with existing (and enhanced) hardware and software. Modules would then be transported to other Areas, subsequent to testing and system integration. Custom development of an inpatient billing system is also planned.

4. ANALYSIS OF CURRENT IHS SYSTEMS AND DEVELOPMENT

IHS's in-house information systems development has evolved over a period of 15 or more years, and reflects the political realities and restraints perceived by systems development staff. These include difficulties in implementing a centralized system, in training staff, in securing clinician compliance with data processing procedures, in accurately defining needs, in maintaining flexibility to meet local conditions, and in dealing successfully with outside contractors. Another major factor is the determination that the system should be driven by medical rather than financial requirements. Current system development efforts attempt to avoid what staff see as the pitfalls of designing a system from "the top down" and to rely on and foster the natural creativity and energy of the IHS system development staff.

* Under this decentralized data processing concept, all data processing functions are duplicated, usually by comparable organizational units; e.g., Tucson Area. Each data processing system (e.g., personnel or pharmacy) stands alone and relies on no other data processing system to perform any function, provide any data, or produce any information. Because decentralized data processing functions are duplicative, the opportunity to achieve economies of scale are generally lost. Because of local level autonomy in design and implementation, any system (e.g., PCIS) may not collect comparable data or operate in a consistent manner. PCIS, for example, is on-line in Tucson, employs a batch processing in Billings and Alaska, and collects different data elements.
EXHIBIT II-3
HHS, Office of the Assistant Secretary
for Planning and Evaluation
PRESENT IHS APPROACH

Custom Develop Missing in Patients Components

Custom Linkage

Expand PCIS

Custom Linkage

Test VA Components

Custom Linkage

Custom Develop Cost Accounting System

H.A.S.
The characterization of IHS systems operations and systems development as decentralized is manifested in a number of ways. First, there has been a historical trend toward allowing each Area great flexibility in choosing to participate fully in IHS information systems. Second, many systems, including PCIS, have important data elements and functions such as procedure coding that are optional, employed only at the user’s discretion. Third, although a systems needs assessment recently was conducted of all IHS Areas and most large Service Units, the information obtained never has been integrated into a set of system-wide specifications under a distributed processing concept. The result is that existing systems are not uniformly implemented throughout IHS, and systems development efforts currently underway are not based on an established set of systems requirements for the whole of IHS.

IHS itself, in its Five Year Strategic Information Systems Plan, provides the following characterizations of its own information systems and development efforts:

- "A collection of largely incompatible data systems of limited utility at most levels of IHS" (p. 11)
- "A distrustful and adversarial relationship (exists) between Headquarters and field components dealing with ADP" (p. 11)
- "The ability of field components to define (MIS) objectives independently of each other is of special significance" (p. 19)
- "Existing automated systems were in general of limited use to Service Units and areas" (p. 41)
- "There was little enthusiasm for continued support of centralized information systems since feedback is untimely, voluminous, and of little local use" (p. 41)
- "If sufficient support and commitment cannot be reached, then management should abandon the effort to institute an organization-wide information systems program and recognize that no further activities in this area will be fruitful" (p. 26)

### PROBLEMS INHERENT IN CURRENT IHS DEVELOPMENT APPROACH

A number of significant problems are inherent in IHS's current development approach. First and most important, IHS is planning to procure hardware and develop or obtain software without complete definition of system requirements. Adequate
specifications and documentation for an integrated, distributed IHS-wide management information system do not exist. Lacking a completed requirements study, IHS is attempting to build a system without a blueprint.

Second, acquisition of the VA modules, when combined with PCIS, may not get IHS any nearer to the desired integrated medical management and cost accounting system. The current development approach makes no provision for what a cost accounting capability will demand of other system components. The VA inpatient system under development does not include a cost accounting capability.

Third, the currently employed decentralized approach makes no provision for distributed processing; all activities appear to stand alone, without hierarchical integration within the system. Two types of limitations inherent in decentralized development threaten IHS's ability to further its integrated systems priorities:

- Communication between decentralized systems is difficult; requesting health summaries in a timely fashion across Areas will be cumbersome or impossible.
- Decentralized systems will not offer standard data sets across all Areas and Service Units; the ability of IHS to make comparisons across Areas will be impaired by the inconsistent nature of available data.

Finally, the current approach assumes that IHS has the requisite technical resources in-house necessary for systems design, installation and testing, and that technical staff have sufficient time for developmental efforts in addition to other ongoing responsibilities.

**LIMITATIONS OF PCIS AND HAS**

There are specific problems with both PCIS and HAS that impede IHS's progress toward its desired system. First, PCIS is principally an outpatient system used to summarize information regarding health encounters. Furthermore, the inpatient portion of PCIS is sketchy. Such information is incorporated only subsequent to a patient's discharge. Enough information is received to assign a DRG, but the system has no ability to generate itemized bills for inpatient services. No cost data are contained within the system.
Second, PCIS procedure and service codes are not uniform throughout the system. Procedure and service codes are the critical linkage to a cost accounting system, for they represent patient transactions. ICD 9-CM coding of procedures is done manually on an optional basis and is time consuming. Third, there are no unique patient identifiers in PCIS. Unique patient identifiers are another critical element for an integrated system, for they are the basis for accumulating patient-specific transactions.

Fourth, PCIS is on-line in the Sells Service Unit only, the desired operational environment. Although it is planned that this system will have wider implementation and other substantive enhancements, these efforts are not expected to affect the limitations listed above.

The Health Accounting System was not designed to be and is not useful for cost management in the field, partially because of its design and partially from its lack of timeliness. There is a three to four month lag, for example, in generating reports with workload data. Perhaps more importantly, program control within HAS is by budget line, rather than cost center. HAS has the capability to calculate costs per unit of service, but there are obstacles to accomplishing this:

- The system cannot distinguish between inpatient and outpatient costs
- Supplies are not allocated to cost centers
- Indirect costs are not allocated to cost centers

HAS has a number of other significant limitations and is not a substitute for a cost accounting system. Workload units exist for only a limited number of cost centers. The system has no inpatient billing capability, nor can it assign services to individual patients, nor prices to services. Furthermore, HAS lacks standardization of operational units.

Nondirect IHS employees are not included in HAS. Payroll costs are assigned to CANs for direct IHS employees only. Outside employees appear only under "reimbursements," and are not reflected in cost center calculations. Finally, on occasion, costs are arbitrarily assigned to cost centers on the basis of funds availability, as occurred recently with hepatitis B vaccine.
In summary, both PCIS and HAS have significant limitations that must be corrected, eliminated, or bypassed as the desired system is designed and implemented.

5. SUMMARY OF SYSTEMS DEVELOPMENT BY OTHER HEALTH CARE PROVIDERS

The Veterans Administration (VA), the Department of Defense (DoD), and the private sector are all actively undertaking management information systems development, relevant to IHS's initiative. We examined VA systems efforts because of IHS stated intentions to adopt or adapt parts or all of the systems. DoD efforts were examined because their development approaches are somewhat different from the VA and yet remain in the public domain. Private sector efforts were examined because of the proliferation of integrated systems over the past few years. Analyses of their systems development efforts are discussed below, to provide insight into ongoing efforts outside of IHS that are of direct relevance to IHS systems objectives.

THE VETERANS ADMINISTRATION

The VA information system under development is known as the Decentralized Hospital Computer Program (DHCP). Written in MUMPS, DHCP currently has three operational modules: (1) inpatient admission, discharge, and transfer; (2) outpatient scheduling; and (3) outpatient pharmacy. Most of the VA's system is still under development, with three additional modules scheduled for implementation in 1985: (1) ward reporting, (2) laboratory, and (3) inpatient pharmacy.

Because it is written in MUMPS, DHCP also offers file management and report writing capabilities. The system is written in ANSI-standard MUMPS and can work with any hardware with a MUMPS interpreter or compiler, including IBM personal computers. The software is considered to be easily transportable and is "user friendly." The system's design is based on a decentralized, rather than distributed, processing approach.

However, DHCP does not offer a billing component, cost accounting capabilities, discharge abstracts, transaction or procedure data, nor medical management information.
Acquisition of the VA modules, when combined with a PCIS rewritten in MUMPS, is not a feasible solution to meeting IHS's integrated systems objectives. The VA's system is decentralized, with no ability to distribute information across the system through appropriate communication linkages. Furthermore, the system does not integrate cost data at a transaction level with medical management information, and cannot generate patient bills. Most of the system is still under development, and it is unclear as to whether further development will be custom designed in-house or purchased from established software vendors, or what actual directions a VA-wide system will take. A Request for Proposal (RFP) was issued in August 1984 to seek outside contractor assistance "in developing a plan, designing, and implementing a decentralized medical management system." The procurement underscores the uncertainty of the VA system as the following requirements in the RFP illustrate:

- During Task C, "the Contractor will investigate alternative technical configurations for a DM&S medical management system, evaluating differences between competing system designs, communication protocols, hardware, and software." (p. 12)
- During Task D, "the Contractor will then proceed to develop a database design which will incorporate the structures, processes and technologies required for the effective functioning of the DMMS configuration." (p. 13)

DoD and VA have followed significantly different paths in providing automatic data processing support for their respective medical systems. While the VA has done most of its development in-house, DoD has employed a variety of outside contractors. DoD's TRIMIS (Tri-Service Medical Information Systems) program is now in the process of defining and designing its desired system, of developing and validating functional requirements. Although still in the design phase, TRIMIS already has some 85 systems operating on a test basis in about 200 hospitals. Many of these systems were acquired from commercial vendors, including pharmacy, laboratory, radiology, patient appointment and scheduling, and patient administration modules. Programs have been written in both COBOL and MUMPS.
TRIMIS has adopted an approach of testing various software and hardware configurations, making extensive use of many commercial vendors, including Martin Marietta and Technicon. Vendors are responsible for software development and maintenance, installation and training, and hardware maintenance.

The patient administration (TRIPAD) system is the most developed of all TRIMIS systems. The functions supported by this system include patient registration, pre-admission and admission scheduling, patient and bed accountability, disposition planning, clinical record management, casualty reporting, patient accounts receivable and billing, and biostatistical and workload data capture and reporting.

Although the system architecture has not yet been finally decided, TRIMIS's approach is more decentralized than distributed in nature. Databases are likely to reside in individual hospitals, with limited capabilities to send information upward. Security is a major issue regarding the release of information to other bases or facilities. No cost accounting (other than linkages to DoD's Uniform Chart of Accounts) or billing (other than on a flat rate basis) capabilities are envisioned within the new systems. DoD has standardized automated systems that take care of finance, personnel, payroll, and inventory control; interfaces are to be built among these systems and the newly developing ones.

THE PRIVATE SECTOR

In deciding to examine the private sector, the principal question posed was: Are there available software packages largely meeting the functional capabilities shown in Exhibit II-1, including the integration of medical management and cost accounting information?

Significant advances have occurred in systems development in the private health care sector during the past few years. This is primarily the result of a shift to prospective reimbursement under DRGs. It should be noted that the private sector embraced cost accounting systems only after prospective payment became a reality. Now a variety of vendors offer integrated cost accounting/medical management
## Exhibit II-4(1)

**Survey of HIS Vendors**

**Survey Findings for Planning and Evaluation**

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Place of Business</th>
<th>No. of Installations</th>
<th>List Price 1, 2</th>
<th>Maintenance Contract 1, 4</th>
<th>Hardware Make 1, 5</th>
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<td>Dairyland Computer + Consulting</td>
<td>Sauk Centre, MN</td>
<td>20 2 0</td>
<td>59K(C) 74K(C) 80K(C)</td>
<td>$240(H) $400(H) $600(H)</td>
<td>CADO CADO CADO Integrated - ADT, A/R, A/P, BIL, BUD, DRG, FM, G/L, IC, P/P, RG, W/P Separate - BUD</td>
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<td>Health Micro Data Systems</td>
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</tr>
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<td>JS/Data</td>
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<td>24 57 21</td>
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<td>Melyx Corporation</td>
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<td>17 3 N/A</td>
<td>15K(H) 42K(H) N/A</td>
<td>$84(H) $137(H) N/A</td>
<td>IBM PC IBM PC IBM PC Integrated - ADT, A/R, A/P, BIL, BUD, DRG, FM, G/L, IC, MRA, P/P, RG Separate - BUD</td>
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<td>MicroHealth Systems Corp.</td>
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<td>$108(H) $270(H) N/A</td>
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</table>

1. 150 Beds or less.
2. Key: (C) denotes combined Hardware + Software; (H) denotes Hardware; (S) denotes Software
3. Hardware price assumes following configuration: 0-50B = 3 Term + 1 Prt; 50-100B = 5 Term + 2 Prt; 100-200B = 7 Term + 3 Prt
SYSTEM APPLICATIONS KEY

ADT    Admission, Discharge, Transfer
A/R    Accounts Receivable
A/P    Accounts Payable
BIL    Billing
BUD    Budgeting
DRG    DRG Grouper
FM     Financial Modeling
G/L    General Ledger
IC     Inventory Control
P/P    Personnel, Payroll
RG     Report Generator
W/P    Word Processing
FAM    Fixed Assets Management
MRA    Medical Records Abstracting
ranged from $244 to $966 per month. For the 50 to 100 and 100 to 200 bed categories, combined maintenance contracts ranged from $387 to $1,177 per month and $500 to $1,375 per month, respectively.

Four of the six survey participants use IBM hardware with their systems. For the systems using microcomputers, a variety of hard disk storage devices were recommended.

Fourteen system applications were identified on which survey participants were requested to respond whether the feature was available, and if so, whether it was integrated with at least one other system application. Only one of the survey participants offered a system with all of the identified system applications, but every vendor offered at least 12 of the applications. Of the system applications offered, the majority were integrated with at least one other function.

This brief survey suggests that there are a variety of commercially available software packages that could meet many of IHS's systems objectives. There is not any single available package that would meet every IHS objective. Perhaps the biggest gap is that no package produces a health summary, deemed to be the most salient and useful attribute of PCIS by IHS clinical personnel. It does appear, however, that available software packages would meet 70-80 percent of the functional capabilities explicated by IHS during the course of this study. Meeting the remainder of the needs would involve custom programming by IHS staff or an outside vendor. It is far easier to modify existing software packages to meet 20-30 percent of the need than to develop, from scratch, software to meet 70-80 percent of the need. More importantly, available software packages already have thought through and solved the complex problems of integrating medical management and cost accounting systems, problems untouched and not even posed in IHS's current development efforts.
III. FINDINGS AND RECOMMENDATIONS
III. FINDINGS AND RECOMMENDATIONS

This chapter presents the findings of this study, the options available to IHS for further systems development, our recommendations, and a discussion of the required next steps.

1. FINDINGS

(1) Current IHS in-house systems development is decentralized and does not embrace distributed processing.

(2) Current in-house development efforts include:

- Revision and expansion of the Patient Care Information System (PCIS) to operate on minis at the Area level
- Testing of system modules obtained from the Veterans Administration to augment PCIS, including:
  - Inpatient admissions, discharge, and transfer
  - Outpatient scheduling
  - Outpatient pharmacy
  - Others, as they are developed
- Adoption of certain standards for development by the IHS Information Coordinators Group, e.g., MUMPS

(3) An integrated patient care and cost accounting system requires a common set of data elements (a minimum data set) across service delivery sites, even in a decentralized system, if comparisons are to be meaningful among sites.

(4) For cost accounting purposes, the minimum data set must include a uniform set of cost centers, a uniform set of diagnostic, procedure, and service codes, and a unique patient identifier.
(5) The current development approach for IHS does not have all of these elements nor are they conceptually designed, precluding acquisition of a cost accounting system at this time.

(6) IHS has not made many of the tactical decisions necessary to proceed with large-scale systems development or acquisition. IHS has not articulated, in a formal sense, its systems requirements such as what functions are to be performed, where they are to be performed, how information will flow, and how various functional components would be interrelated. In effect, there is no "blueprint" for a system. IHS has not cast its information needs into a form immediately amenable to systems development or acquisition.

(7) IHS is not a unique service delivery system in terms of its information needs. DoD, VA, and private providers have the same need for integrated patient care and cost information.

(8) A number of reasonably priced, commercially available software products could provide IHS with the majority of the operational and functional capabilities desired—products developed for those with similar information needs. Vendors of these products have already thought through most systems design and development issues.

(9) In prior centralized systems design efforts such as RADEN, IHS experienced substantial difficulties including a lack of timely decisions, problems with changes, and turf problems. The decentralized approach to systems design developed as a result, capitalizing on the creative drive within IHS.

(10) Given the historical difficulties with centralized systems design, an optimal approach—centralized design for distributive processing with a fully integrated medical management and cost accounting system meeting all stated capabilities—may not be possible. Without the adoption of the optimal approach, the development of a transaction-based cost accounting system within IHS will be extremely difficult.
Decentralized systems development means that one does not necessarily care what the end products of the development efforts are. It is likely that the result will be a plethora of systems in the field with equivalent names that vaguely resemble one another—the precise situation described in IHS's Five Year Strategic Information Systems Plan. Decentralized systems development could work within IHS provided that a minimum data set is developed and installed uniformly, meaning centralized design. The data set will have to be extensive to guarantee uniform cost accounting.

2. OPTIONS

A number of developmental options are available to IHS. Before any option is adopted, a comprehensive requirements study should be completed. A requirements study defines what a system is supposed to do in a concrete manner such as where functions lie, how functions are connected, and how data will flow. Its absence is akin to building a house without a blueprint. This is necessary to ensure that all developers of systems are operating on the same basic premises related to what the system will do and look like, and to assure future General Services Administration (GSA) approval of delegated procurement authority for purchase of hardware and software. (See Appendix C for a draft scope of work for a requirements study.)

**OPTION 1**

One developmental option for IHS, favored by in-house development staff, is to continue enhancement of PCIS, using PCIS as the core of the new system, as illustrated in Exhibit II-3. Under this option, the expansion of PCIS would be the central building block of systems design. IHS would acquire inpatient systems from the public or private marketplaces, custom design and develop a cost accounting system, and custom develop linkages* into PCIS, the Health Accounting System (HAS), and the new inpatient systems. This requires substantial work, technical expertise, and a high degree of risk to determine precisely what is needed and how it would all fit together. It would retain the

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* This refers to custom programming to get one systems component to communicate with another systems component.
PCIS in its present form, which is the only truly positive aspect of this approach. This option implies that PCIS will be the central building block in the design and implementation of a totally integrated agency-wide system. This is akin to the notion of building a mansion around a single room.

**OPTION 2**

A substantially different developmental option strongly recommended by Macro is to purchase commercially available, integrated software, as summarized in Exhibit III-1. Commercially available software already integrates medical management and cost accounting data, and much less custom programming would be required. Custom linkages would have to be developed to HAS and to provide PCIS-like capabilities; however, a cost accounting system would not have to be reinvented. Macro believes that IHS is likely to incur lower risks, costs, and delay by purchasing and modifying off-the-shelf products, after a requirements study has been completed. It should be noted, however, that the development of custom linkages almost always takes more time and effort than originally planned, no matter how simple the linkage appears.

Whatever approach is adopted, IHS central management must make an aggressive commitment to implementing the integrated system. In the absence of such a commitment, IHS may choose to defer development of a cost accounting system until changes in its funding and reimbursement mechanisms compel its adoption. In this respect, IHS would mirror the private sector, which did not adopt integrated cost accounting systems until forced to by prospective reimbursement.

**RECOMMENDATION 1: COMPLETE THE REQUIREMENTS STUDY**

Adequate specifications and documentation for an integrated, distributed, IHS-wide management information system do not exist. The IHS five-year systems plan lacks the specific detail necessary to proceed with development or acquisition. This plan was never intended to be a requirements study, as stated in a memorandum dated 6/22/83 from the Director, IHS: "This is a strategic ISP plan, not a detailed plan for the agency."
EXHIBIT III-1

HHS, Office of the Assistant Secretary for Planning and Evaluation

RECOMMENDED OPTION

Custom Program PCIs Features

Custom Linkage

Custom Program Contract Care Interface

Custom Linkage

Buy Available Software

Inpatient Medical Care Data

Outpatient Medical Care Data

Cost Accounting Data

Custom Linkage

Custom Program H.A.S. Interface
Specifically, the plan does not definitively catalog functional capabilities and operational parameters, specify where particular responsibilities and databases will reside, provide definitions of data sets nor diagrams of information flow, nor size the desired system.

The five-year systems plan was conceived under a decentralized, rather than distributed, philosophy. Each of the Areas was allowed substantial flexibility in defining its priorities and requirements. The result is a conglomeration of more than 20 individual plans, without any integrative component.

Appendix 8 of the plan contains over 20 individual system plans and updates for various IHS Areas, Service Units, and offices. A few of these individual plans do contain a high level of specificity and documentation which would allow one to proceed with acquisition or development of a local system only.

The individual plans also contain needs assessment information collected under the decentralized assumption. Much of these data are valid for a distributed system as well, so that IHS does not need to repeat this step in completing the requirements study.

Without a completed requirements study, IHS should not independently proceed with acquisition or large-scale development. Appendix C provides a draft scope of work for such a study.

**RECOMMENDATION 2: EVALUATE AVAILABLE OPTIONS**

In light of the findings of the completed requirements study, IHS should evaluate its options. Issues that could be resolved during the requirements study include the following:

- How should contract care and tribal health systems be included in the system?
- Can the IHS Registration System, as currently designed and implemented, meet the need for unique patient identifiers?
- Where will management functions such as billing and accounts receivable be located?
• Where will all major functions within the distributed processing concept be located?
• How many Area data processing centers will be required?
• What is required for the design of the general ledger and its interface with HAS?
• What encounter and transaction forms are needed; what data are required, and how would the data flow?
• Where is there a need for dedicated hardware?

Macro believes strongly that Option 2 should be adopted after the requirements study is completed. We believe that approximately three-fourths of IHS's required functional capabilities are available in off-the-shelf products, and that this approach is likely to be less costly in both time and money. Commercial products have been field tested and are operational in hundreds of locations.

In-house design, development, and testing of a cost accounting system is much riskier in our opinion. It has taken 15 years to develop PCIS in its current form. IHS's programming capabilities are concentrated in a very few individuals, any of whose departure would create significant developmental problems. IHS's in-house approach assumes that the agency has, and will continue to have, enough technical staff to build, test, and install the system (in addition to their other duties).

IHS is advised to pursue its own course, independent from the VA's schedule or approach. The addition of available VA modules will not significantly enhance IHS's ability to have a system with cost accounting and distributed capabilities. Most VA modules are still under development, and the VA is currently seeking outside developmental support.

**RECOMMENDATION 3: DISCONTINUE ENHANCEMENT OF PCIS**

PCIS is a unique system, whose major function is to issue consolidated health summaries. As an integrator of information from a variety of input sources, and as a tool accepted by IHS clinicians, PCIS has proven its usefulness. Built and modified by
IHS systems personnel over a 15-year span, specifically for needs defined by IHS clinicians, PCIS capabilities are not inherent in commercially available systems.

Any IHS system to be developed or purchased, therefore, must contain PCIS capabilities, which will ultimately represent some 10 to 15 percent of the data processing capabilities of the overall system. Macro recommends that PCIS continue in its present configuration and mode of operations, until such time that its capabilities are replaced by the "new" system. This assumes that the Option 2 approach to development is adopted. This also assumes that planned enhancements for PCIS will not be undertaken. It will be necessary to jettison the planned enhancements for PCIS because IHS systems staff will need to be integrally involved in the requirements study and the design and implementation of an adapted, commercially available system.

RECOMMENDATION 4: ESTABLISH AND MAINTAIN A CONTINUAL PLANNING PROCESS

Systems development within IHS should be viewed as a continual process. Monetary and personnel support should be provided to refine and update the system continuously based on user needs and state-of-the-art developments.

To implement the system designed through the planning process, IHS needs to have a single focal point for systems development decisionmaking. Such an individual should be technically proficient, and must be given the commensurate authority as well as accountability to respond quickly as tactical decisions are required. Without such a focal point, implementation timeframes will be lengthened to account for a multiplicity of inputs and decisionmaking by committee. This was one of the primary lessons of the IHS RADEN experience.

4. NEXT STEPS

Regardless of the approach taken, IHS central management should make an aggressive commitment to an integrated system. Until now, IHS's systems development can be described as a "collection of largely incompatible data systems of limited utility at most levels..." (5-Year Plan, p. 11). Unless changes are made in the current course of action, these less than optimal results are likely to continue.
IHS operates its service delivery system within a philosophy of decentralization that emphasizes the prerogatives of the tribes to define their needs. This philosophy should not be applied to systems development. To achieve the desired optimal system, IHS Headquarters must specify a comprehensive set of core data requirements. Provided these requirements are met, each Area and Service Unit would have the flexibility to design additional applications to meet local needs.

The following are the suggested next steps for IHS system development:

- Complete the system requirements study and continue enhancement of PCIS (6 months)
- Secure GSA delegation of procurement authority (12 to 24 months; may be started at once)
- Conduct an options analysis in light of the findings of the system requirements study (3 months)
- Develop, issue, and award a test RFP (6 months)
- Develop, install, and test system (9 months)
- Evaluate the test system (9 months—including 6 months of operational experience)
- Implement system IHS-wide (24 months)

A task implementation schedule for these next steps is presented in Exhibit III-2.
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<td>6. Evaluate test system</td>
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<td>7. System-wide implementation</td>
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APPENDIX A

METHODOLOGY
STUDY DESIGN AND TASKS

Because of a rigid initial time constraint—a 15-week period—the study relied heavily upon existing information emanating from IHS and other Federal agencies, information obtained from interviews with knowledgeable government officials and individuals within the private health information system vendor sector, and the contractor's own knowledge and experience.

This short-term evaluation focused on four key areas:

- Review of documentation of IHS' existing structure and management information systems
- Documentation of IHS' intentions, plans, and progress toward an enhanced management information capability
- Review of activities under way in other Federal agencies to develop health care management information systems
- Preparation of a statement of work for a request for proposal (see Appendix C)

TASK 1 REVIEW DOCUMENTATION ON IHS' EXISTING STRUCTURE AND MANAGEMENT INFORMATION SYSTEM

This task called for a rapid review and analysis of existing information and documentation on the current IHS structure and operations and the information systems in place to support this structure and operations. Reports and manuals constituted the information base for this review. In addition, the contractor visited automated IHS installations in Albuquerque and Tucson.

TASK 2 DOCUMENT IHS INTENTIONS, PLANS, AND PROGRESS TOWARD AN ENHANCED MIS

This task entailed the delineation of IHS automation activities, including the existing degree of automation and plans for future automation. Particular attention was paid to the applications currently automated and transactions volume for these applications, as well as the hardware and software in place or planned supporting these applications. In addition, the applications desired to be automated were documented. This was accomplished through interviews with IHS employees.
TASK 3  REVIEW ACTIVITIES OF OTHER FEDERAL AGENCIES TO DEVELOP HEALTH CARE MISs

This task included a brief but intense examination of the activities undertaken, under way, or planned by the Veterans Administration and the Department of Defense to develop health care management information systems. Special attention was paid to the type and form of automation under way or planned; applications in place, under way, or planned; processes used to facilitate development; and vendor support of the automation and applications.

TASK 4  PREPARE STATEMENT OF WORK FOR A REQUEST FOR PROPOSAL

Using the information gathered and materials developed in the previous task, a draft statement of work for a request for proposal was developed to include the following:

1. An overview of IHS and its operations
2. IHS goals and objectives for the system
3. General systems specifications
4. Task plan
5. Schedule of deliverables

WRITTEN MATERIALS REVIEWED

1. Memorandum to Task Force for Management Information System Development from Director, IHS, dated 11/2/83
2. Indian Health Service, Automated Data Processing 5 Year Plan
   - Statistical report on number of hospitals, clinics, and extended care facilities providing OP services (IHS source)
   - Statistical report on number of OP visits (IHS)
   - Estimated Service population report (IHS)
   - The Central Office and Regional Office Dispersed Terminal Network
4. TRIMIS Fact Sheet
5. Industrial Cost Accounting Addendum to HSA Accounting System, dated 7/1/82.
7. Information and documentation for commercially available software from the following vendors:
   - American Medical International
   - Compucare, Inc.
8. Minutes from Cost Accounting Task Force Meetings, dated 1/30 to 2/1/84.

9. Cost Accounting System presentation to Dr. Graham, dated 1/27/84.

10. GSA's Telecommunications Procurement Program (IMTEC-84-10), GAO, June 11, 1984.


12. OMB Circular A-108

13. OMB Circular A-109


16. Report 96-835, House of Representatives

17. Report 98-147, House of Representatives

18. Public Law 96-511


INTERVIEWS AND MEETINGS

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<td>Walt Wolford and David Selby</td>
<td>IHS HQ and Oklahoma Area Office</td>
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<td>Clayton Curtis, Bill Mason, Ted Garrett</td>
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<td>Jim McArthur, Bob Dolan, and Jim Smith</td>
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<tr>
<td>6/18</td>
<td>Jim Mitchell and Bob Thurmond</td>
<td>IHS HQ</td>
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<tr>
<td>6/25</td>
<td>Walt Wolford, Ted Garrett, Clayton Curtis</td>
<td>IHS HQ, Tucson</td>
</tr>
<tr>
<td>8/9</td>
<td>Jim Mitchell</td>
<td>IHS HQ</td>
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APPENDIX B

ACQUISITION REQUIREMENTS OF THE FEDERAL GOVERNMENT
ACQUISITION REQUIREMENTS OF THE FEDERAL GOVERNMENT

There is now a long-standing history of the centralization of authority, policy, and procedures for automatic data processing (ADP) systems development and procurement within the Federal Government. Public Law 89-306, the Brooks Act, enacted in 1965, established the General Services Administration (GSA) as the focal point for the review of requests for authority to acquire information technology. 1/ The Paperwork Reduction Act of 1980, Public Law 96-511, was enacted to strengthen further the centralization of information management functions in both the Office of Management and Budget (OMB) and GSA. Specifically, the objectives of the Act were to: 2/

"(1) Reduce the information processing burden on the public and private sectors by requiring the development and implementation of uniform and consistent information policies and practices;

(2) increase the availability and accuracy of agency data and information;

(3) expand and strengthen Federal information management activities;

(4) establish a single focal point for information management within the Office of Management and Budget which will have specific authority, responsibility, and accountability to the President, the Congress, and the public for Government-wide information policy and oversight; and

(5) decrease the paperwork burden on individuals, businesses, State and local governments, and others outside the Federal Government by vesting that OMB office with the authority to approve or deny all agency forms for collecting information."

The Department of Defense Authorization Act, 1982, 3/ underscored the objectives of the Brooks Act: "(1) ADP resources should be procured as economically and efficiently as possible; and (2) only those resources should be procured which are needed and which can assist the management of government programs." The Paperwork Reduction Act Amendments of 1983 underscored the notion that ADP procurements should be "fully competitive." 4/

2/ Ibid., 1-2.
Parallel with the ADP consolidation activities described above, a host of initiatives have been undertaken to strengthen and systematize the procurement process itself. The Commission on Public Procurement, created by Public Law 91-129 in 1969, studied methods to promote the economy, efficiency, and effectiveness of procurement by the executive branch. In its report, the Commission made 149 recommendations to improve Federal procurement to maximize competition, obtain reasonable prices, and assure accountability of public officials. In 1974, the Office of Federal Procurement Policy (OFPP) was created within OMB to provide overall direction for procurement policy, regulations, and procedures within the executive branch. The OFPP Act Amendments of 1979 directed development of a comprehensive, Government-wide, uniform procurement system by OFPP. This development effort has been highlighted by the Federal Acquisition Regulation issued in April 1984.

A related development, specifically regarding the information technology area, was the issuance of OMB Circular A-109 in April 1976. Circular A-109 established procedures to be followed by the executive branch in acquiring major systems. These procedures include:

- Mission analysis
- Evaluation and reconciliation of needs in context of agency mission, resources, and priorities
- Exploration of alternative systems
- Competitive demonstrations
- Full-scale development, test, and evaluation
- Production
- Deployment and operation

The key element is the exploration of alternative systems, which includes as a cornerstone the development of a system acquisition strategy and plan. This must be developed in light of the mission analysis, which must include a requirements analysis. OMB notes that the system acquisition plan should have specific considerations such as reliance on the private sector and use of contracting as a tool.

The Institute of Computer Sciences and Technology of the National Bureau of Standards recently has noted that the objective of any procurement is the identification and acquisition of the most appropriate and cost-effective computer

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systems available to meet the specified requirements." This must be done according to an established process involving six main components:

- Studies and approvals
- Definition of user requirements and technical specifications
- Evaluation plan and strategy
- Preparation and release of the Request for Proposal
- Evaluation of proposals
- Selection and contract award
STATEMENT OF WORK FOR REQUIREMENTS STUDY

BACKGROUND

The purpose of this procurement is to perform a user requirements study for a fully integrated medical management and cost accounting system for the Indian Health Service (IHS).

The Indian Health Service provides, either directly or through its contract health service vehicle, the health care needed by all Indians and Native Alaskans, estimated to number 909,000 in 1984. To accomplish this service delivery mission, IHS is organized into 12 Area Offices, which are further divided into 98 Service Units. Ten of the twelve Area Offices and approximately 80 percent of the Service Units are located west of the Mississippi River.

IHS directly operates 47 hospitals, 72 health centers, 12 school health centers, and 71 health stations. A number of tribes, under contract with IHS, operate an additional 4 hospitals, 50 health centers, and 204 health stations.

In FY83, IHS directly provided over 3,250,000 ambulatory visits. Almost two-thirds of these were provided in hospital outpatient facilities. Another 230,000 outpatient visits were provided by contract health service physicians. In addition, IHS directly provided 77,000 hospital discharges, with an average length of stay of 5.2 days. Another 25,000 discharges, with an average length of stay of 4.8 days, were provided by contract health service hospitals.

In FY84, out of a total IHS budget of $770 million, $278 million was spent directly on hospitals and clinics, another $158 million was allocated to contract health care, and an additional $150 million was directed to the tribes.

Over 50 different information systems are used within the IHS network of providers. Most of these systems stand alone, with no ability to integrate with other systems. Some are specially designed to meet the needs of a particular facility or tribe. Many of the systems are Departmental requirements, such as the Health Accounting System (HAS), Contracts Data System, Grants Data System, Personnel System, Payroll System, and Supply System. Others have been developed internally within IHS over time, including the Patient Care Information System (PCIS), Ambulatory Patient Care (APC) System, Contract Health Services System, Dental System, and Equipment Inventory System. Various equipment is used at several operational levels, including microcomputers, minicomputers, word processing systems, key tape machines, and telecommunications circuits. Of particular relevance to this procurement are the PCIS and HAS.
A. PATIENT CARE INFORMATION SYSTEM (PCIS)

Under development for some 15 years, the purpose of the Patient Care Information System is to integrate outpatient, community health, and prevention functions of IHS and to issue consolidated health summaries. PCIS is currently operational in the Alaska Area, Billings Area, and the Tucson Area (Sells Service Unit); however, only Tucson operates in an on-line mode (Alaska and Billings use microfiche for health summaries). The remainder of IHS uses the Ambulatory Patient Care (APC) system for similar functions.

PCIS is designed to emphasize outpatient care, collecting only limited information from inpatient episodes. Written in COBOL, as currently configured, the system uses batch input with data collection at the Service Unit level, data entry at the Area level, data processing at the IHS Data Processing Services Center (DPSC) in Albuquerque, and data output on-line to Tucson and on microfiche to Billings and Alaska. PCIS has a very limited capacity for billing; it can be used to bill some Medicaid programs and private insurers, but cannot be used to bill under Medicare Part A.

A variety of enhancements are planned for PCIS by IHS systems staff. These include data entry at the Service Unit level on personal computers, database management and processing at the Area level on minis, and a translation of PCIS into MUMPS.

B. HEALTH ACCOUNTING SYSTEM (HAS)

The purpose of the Health Accounting System is to monitor Health Resources and Services Administration (HRSA) obligations and funds flow. HAS allocates funds to accounting points (Area Offices) on the basis of approximately 20 "sub/sub activities," such as hospitals and clinics, dental, sanitation, and mental health. Area Offices transmit their HAS data directly to the Parklawn computer, bypassing IHS Headquarters. Parklawn manages the overall database, and sends a copy of certain data elements to DPSC, which generates reports desired by IHS.

HAS employs common accounting numbers (CANs) as cost center identifiers through the "CAN explosion." The system also incorporates a Document History Record (DHR), which obligates funds for contractual services or products. The "piggyback" system provides expenditures by vendors by object class for contract care.

HAS does not include personnel or payroll functions, which are actually separate systems. It should be noted, however, that personnel and payroll information are integrated with HAS data to generate necessary financial reports.

C. GENERAL SYSTEMS REQUIREMENTS

The objectives of the integrated information system are to:

1. Improve medical and program management
2. Improve third-party billing capability
3. Facilitate comparisons with other private and governmental health care programs

4. Facilitate potential to serve non-Indians

IHS's desired information system is built on the principles of integration and distributed processing. Integration refers to the synthesis of patient care and financial or accounting information. This integration is essential to support medical management and cost control objectives under DRG reimbursement.

Distributed processing refers to the hierarchical networking of the information system. Under this data processing concept, data processing functions are assigned, i.e., distributed, to those organizational units where the responsibility for performance of the operational function resides. For example, data processing functions related to patient admission/discharge would be performed at the organizational unit directly responsible for these operational functions. In distributed processing, information generally flows upward, while reports flow downward within the system. All operational components of the service delivery system are connected from a data processing perspective. Distributed processing is central to the new system's ability to provide timely reports, to be maximally useful to IHS personnel, and to support IHS Headquarters' information requirements.

IHS's desired functional capabilities for the new system are presented in Exhibit 1 under the following categories: patient administration, medical/health information, clinical services support, management support, operations accounting, and central accounting. The 24 functional capabilities listed are minimal requirements.

Exhibit 2 lists IHS's desired operational capabilities for the integrated system under the following categories: distributed processing, organizational concept, hardware/communications, and system operations. This system is designed to work 24 hours a day, 365 days a year, using microcomputers, minicomputers, and a central computer integrated through a hierarchical network.

A number of special capabilities must be built into the system to assure reliable cost accounting data. These include the standardization of common data elements across Service Units, such as uniform cost centers, uniform coding structures, and a unique patient identifier. Transactions must be captured on both a cost center and patient-specific basis. The databases must be integrated through communication linkages between medical management and accounting systems.

SCOPE OF WORK

A. GENERAL REQUIREMENTS

1. Independently, and not as an agent of the Government, the Contractor shall furnish all necessary labor, materials, supplies, equipment and services, and perform the work set forth below.

2. All work under this contract shall be monitored by the Government Project Officer (GPO). The Contractor's performance and the quality of services hereunder shall be subject to inspection and acceptance by the GPO.
## EXHIBIT 1

### IHS DESIRED FUNCTIONAL CAPABILITIES

<table>
<thead>
<tr>
<th>Category</th>
<th>Functions</th>
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</thead>
</table>
| **1. PATIENT ADMINISTRATION** | - Registration/Identification  
                              - Third Party Eligibility  
                              - Inpatient Admission/Discharge/Transfer  
                              - Patient Scheduling                                                  |
| **2. MEDICAL/HEALTH INFORMATION** | - Health Summary Maintenance  
                                      - Discharge Abstracts  
                                      - Health Action Management  
                                      - Epidemiologic Analyses  
                                      - Results Reporting                                                   |
| **3. CLINICAL SERVICES SUPPORT** | - Order Entry  
                                      - Utilization Review  
                                      - Transaction/Procedure Reporting  
                                      - DRG Grouper  
                                      - Modules for Pharmacy, Laboratory, etc.                               |
| **4. MANAGEMENT SUPPORT**     | - Cost Analysis Reporting (by department, DRG, M.D., etc.)  
                              - Budgeting  
                              - Word Processing                                                      |
| **5. OPERATIONS ACCOUNTING**  | - Billing  
                              - Accounts Receivable  
                              - General Ledger/Subsidiary Ledgers  
                              - Accounts Payable  
                              - Management of Contract Care                                          |
| **6. CENTRAL ACCOUNTING**     | - Linkage with Payroll/Personnel  
                              - Linkage with Health Accounting System                                 |
1. DISTRIBUTED PROCESSING
   - Processing to occur where functional responsibility resides

2. ORGANIZATIONAL CONCEPT
   - Any entity within IHS to have access to any non-confidential data through on-demand inquiries
   - Automatic data transmission to higher levels
   - Automatic reports to lower levels

3. HARDWARE/COMMUNICATIONS
   - Micros, minis, and a central computer integrated through a hierarchy network
   - Various communication linkages to be employed

4. SYSTEM OPERATIONS
   - 24 hour, 365 day operations
   - Health summaries available from any part of system
     - Within Areas on-demand
     - Across Areas within 24 hours
   - Data transmission and processing at night
B. The monthly progress reports due at the end of each month shall detail progress made in implementation of this procurement, any barriers and/or problems in carrying out the work under this procurement, and the planned schedule of work for the subsequent month.

EVALUATION CRITERIA

The evaluation factors and assigned weights that will be used in the technical review of proposals are:

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Weights</th>
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<tbody>
<tr>
<td>1. Understanding the Problem—displays understanding of the scope and complexity of</td>
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<td>the systems application and the requirements of the procurement</td>
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<td>2. Technical Approach—demonstrates technical proficiency and the ability to meet</td>
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<td>project milestones</td>
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<td>3. Management and Personnel—demonstrates that proposed project staff have, by virtue</td>
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<td>of their training and experience, knowledge of the Indian Health Service, knowledge</td>
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<td>of the types of systems applications contemplated by IHS, and users requirements</td>
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<tr>
<td>study capability; also demonstrates adequate plans for managing the study and</td>
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<tr>
<td>assigned skilled staff to project tasks</td>
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<tr>
<td>4. Qualifications and Experience of the Offeror—demonstrates offeror's recent</td>
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<td>(five years) experience in the conduct of similar studies; the offeror's experience</td>
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<tr>
<td>will be assessed in terms of both the projects currently underway or previously</td>
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<tr>
<td>performed and the availability of staff from those efforts cited to work on the</td>
<td></td>
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<tr>
<td>subject project</td>
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