THE VETERANS ADMINISTRATION'S APPROACH TO HOSPITAL AUTOMATION

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ABSTRACT

The Veterans Administration (VA) hospitals are taking advantage of their critical mass and the principles of decentralization to automate application areas in an integrated fashion. The hospital computer program that the VA is pursuing will soon provide for a comprehensive hospital information system for every VA hospital and provide VA's management officials with the information they need to manage the VA's nationwide health care system.

INTRODUCTION

The Veterans Administration (VA) has recently taken steps to become more effective through its mass, by using ANS MUMPS systems and principles of decentralization. It is creating a medical information system using an integrated patient data base built up from public domain modules. It is meeting its requirements by acquiring computers without locking itself into a single vendor, based on their performance in operating these ANS MUMPS based systems.

The size of this effort is substantial. The VA is currently procuring computer resources to support its 172 medical facilities. The hardware resources to automate all these facilities equate to dual processors (at a minimum) for each facility, over 12,000 video display terminals and 6,000 printers, and about 93 billion bytes of disk storage.

The VA's mission of providing quality health care in the most efficient manner possible becomes more challenging as workloads increase and constraints are imposed on fiscal and personnel resources. The effective use of computer technology to meet the challenges has become one of the VA's major priorities.

Until now, the VA has had great difficulty in implementing computer systems in hospitals. These problems, which are complex organization ones in nature, have resulted in a lack of adequate and modern computer technology for the VA's hospitals.

The opportunity has always existed in the VA to develop modern computer support for critical application areas, such as patient registration, admission/discharge/transfer, pharmacy, clinical laboratory, radiology, dietetics, etc. Furthermore, the opportunity has always existed for the innovative use of computers to assist in the clinical treatment of patients. Because of its size, diversity and availability of resources, the VA poses as a potential laboratory for computer development in the health care field.

Complex organizational battles over the years prevented the VA from seizing its opportunity. However, despite these battles, a small tight-knit group of creative individuals were developing software to handle critical clinical and administrative hospital functions. These individuals worked in a number of VA hospitals across the country and became known as the "Underground Railroad". Their computer systems, largely as a result of Ted O'Neil's foresight, were developed with strong considerations for portability and device independence.

This group was certainly not encouraged by the VA's central management in Washington. Despite a lack of funding and encouragement, the applications were developed using a common data dictionary the group had devised. The "underground" functioned as a close network of bright and dedicated people who developed programming conventions and data element standards for the VA primarily at conferences like MUG and SCAMC. Their creativity and persistence have made MUMPS the VA's predominant programming language and data management system for hospital applications.

The failure of the VA to implement computer systems throughout its hospitals, let alone function as a laboratory, finally reached a point where a breakthrough was needed to shake the VA out of its doldrums. On February 18, 1982, the VA administrator provided the leverage that was needed to put the VA on the right path by directing that computing for the VA's health care operations would be decentralized to the maximum extent possible and be the total responsibility of the Department of Medicine and Surgery.
The decentralization order means that hospital directors are responsible for operating their own computer systems. However, because of Federal ADP procurement regulations and economies of scale, procurement of computers for the program were recently done through large "bulk" purchases. These procurements were centrally organized and managed but their specifications were developed by a team of experts from our hospitals. These teams of experts were also responsible for evaluating the many proposals that were received.

THE SCOPE AND METHOD OF THE VA's PROGRAM

The VA's hospital automation program and its principles of decentralization recognize that an automation program for VA hospitals will never succeed if directed centrally with little or no input from the hospitals across the country. The hospitals' creative energies are necessary for application development, for managing and operating the computer systems, and for overall program decision-making.

The attempt to automate all the VA's hospitals presents a large scale operational challenge. Past attempts to centrally direct and manage automating this operation has repeatedly met with failure. Decentralization is an approach that provides a means of exploiting the economies and organizational power of "bigness", while simultaneously allowing the productivity of "smallness".

The decentralization of the VA's hospital computer program extends to all aspects of its health care delivery. From top management in Washington to the system's regional directors, district directors and hospital directors, and all the way to the medical professionals (physicians, nurses, and other clinicians) who are actually delivering care, all have a role in providing computer support to the hospitals.

The advantages of decentralization are:

- The speed with which decisions can be made
- The democracy of management and its informality
- The absence of a gap in the executive group between the "privileged few" and "great many"
- The supply of good and experienced leaders
- The absence of "edict management" wherein nobody quite knows why he does what he is ordered to do.

The VA plans to use decentralization to identify dedicated, creative and highly motivated individuals who can contribute to making the VA modern in its use of computer technology and helping it become the creative laboratory environment it always had the potential to be.

THE TOOLS FOR DECENTRALIZATION

ANS MUMPS is well suited for our applications because of its easy and simple methods of program creation, modification and debugging. Our developers work closely with the clinician and in a relatively short period of time produce a product that can be useful for the hospital. They freely design both the content and structure of data to best fit the applications, with strict adherence to the data dictionary.

The VA's File Manager was developed by George Timson to meet the need for a database system and a set of application generators or utilities that a variety of users could use in an interactive mode. The File Manager is a powerful tool that provides users, even those who have little or no programming experience, an ability to define applications and massage data to meet their own needs. It also serves as a model for dialogue control, database design and application coding.

The VA is now using ANS MUMPS in the great majority of its development activities for the clinical and administrative functions of the hospitals. This has permitted us to be vendor independent. Any hardware manufacturers who support ANS MUMPS may provide equipment resources for the VA's Decentralized Hospital Computer Program. Transporting applications programs from one computer manufacturer to another can be accomplished with minimal disruption to the operating environment and our applications code.

The foundation for our development approach has two components:

- A common database structure as represented by the data dictionary
- Conventions mutually agreed upon and adhered to involving:
  - Programming style and techniques
  - User/system interaction methods.

The VA hospital applications which have been developed with ANS MUMPS are tightly integrated by modern principles of database design. Data descriptions are "roadmaps", providing the clinician, the clerk, the programmer and the computer with a common view of the information being manipulated. From the perspective of management, the database approach allows many different users and analysts at different sites to participate in the evaluation of new applications.

The data dictionary describes key data elements and structures pertinent to CORE applications in a database, rather than forcing the complete specification of "one big system". At the same time, the databases help users, analysts and managers to understand the similarities in a variety of data-handling jobs. A psychologist exploring diagnostic categories and a pharmacist putting his formulary in order both use the same ANS MUMPS.
and File Manager programs to do their jobs, because both the diagnoses and the drugs are instances of data files.

**THE VA'S OBJECTIVES**

As all of us in the computer industry are aware, significant changes have been taking place in information technology over the past few years. The development of user responsive software and economical micro- and minicomputers with significant computing power has encouraged the approach of placing computer resources in the hands of users.

For the VA hospitals it is much simpler to process data where it is used or where it occurs and then consolidate it into summaries for central management information. This concept, often referred to as distributed processing, forms the basis for our hospital computer program.

This approach promises to be the most responsive to user needs, not only because the computer is located in the hospital but also because software will be developed in the clinical environment.

In order to achieve the objectives of the hospital computer program, a strategy has been devised which emphasizes the immediate delivery of effective support to the maximum number of VA hospitals.

The objectives of the program over the next five years are to provide the following:

1. Computer support for the critical hospital functions to improve service to the veterans
2. Increased participation of clinical users
3. Creation of an integrated management information system for the VA's Department of Medicine and Surgery (DM&S)
4. More effective management of ADP and information resources.

Achieving these objectives will ensure that computer support continues to be expanded and becomes more responsive to users at all levels while, at the same time, the overall management of information resources becomes increasingly more effective.

**THE VA'S PLAN**

The VA's plan involves multiple phases each consisting of application development, implementation and proliferation. Each phase will build on its predecessor in terms of computer hardware and hospital applications. The sheer enormity of the VA hospital system necessitates this phased approach.

The program encompasses three types of software applications: standard applications, management information and local applications of choice.

To provide support in the areas of critical need, two levels of standard applications have been identified for implementation in the hospitals and these are known as Initial CORE and Full CORE. These CORE programs, selected from software developed the following:

- Initial CORE provides for the medical administration functions of patient registration, admission/discharge/transfer (ADT), clinical scheduling, and also provides for outpatient pharmacy functions.
- Full CORE provides the additional functions of inpatient pharmacy and clinical laboratory and extends support to the wards and work stations.

Enhancements to the hospital information applications are in the planning and early development stages for areas such as nursing, radiology, dietetics and mental health.

**FUTURE PLANS**

Our plans for future hospital application developments are for phased evolution of support to provide a totally integrated hospital information system for all VA hospitals.

The creation of an integrated management information system for the Department of Medicine and Surgery (DM&S) is one of the long-range objectives. The strategy is to automate the operating or functional areas of the hospitals first, since management information is based on operating data. As functional areas are automated, more and more management information will be generated by the hospital systems to those VA elements requiring it. A number of the hospitals are currently generating reports and magnetic tapes for centralized data needs automatically. In keeping with its mission, the VA has chosen to automate patient care support areas initially, so that an integrated management information system can evolve naturally from an escalation of these operating data.

As our hospital information systems and management information systems grow, we will be exploring ways to network various information systems within the hospital environment. Networking various data systems within the hospital for providing an information system to meet a hospital's total needs represents our ultimate goal. Through communications capabilities, management information can be reported in a "bottom-up" manner through the VA's health care system hierarchy. Management information reporting points begin at the service level in the hospitals and progress upward to the hospital directors, medical district and medical regional directors, and finally to central management levels.

In order to meet these totally integrated hospital data needs, we are looking into the use of local area networks. These networks would provide flexibility and interfaces to connect compatible hospital data systems, computers, work processors,
and office automation equipment. Local area networks are still in their early stages of development and use, but they hold considerable promise for future use in our hospitals. We intend to conduct tests and prototypes of local area networks in some of our hospitals in the immediate future to determine how we might best use this technology.