Association for Information Systems
AIS Electronic Library (AISeL)

ICIS 1999 Proceedings

International Conference on Information Systems (ICIS)

December 1999

Bethesda Healthcare Systems: Physician Information System

Susan Carter
Florida Atlantic University

T. Grandon Gill
Florida Atlantic University

BETHESDA HEALTHCARE SYSTEMS: PHYSICIAN INFORMATION SYSTEM

Susan L. Carter
T. Grandon Gill
Florida Atlantic University
U.S.A.

The *Bethesda Healthcare System*s*: Physician Information System* case presents students with the opportunity to consider information systems from the viewpoint of a major healthcare provider. Bethesda Healthcare System (BHS) determined it had a strategic need to improve the communication process between the BHS and the doctors and among the doctors themselves. In the past few years BHS had begun working toward this goal by adopting a Physician Information System (PIS). However, further development on this system had come to a standstill until a decision could be made on the future direction of the PIS. To break this paralysis, BHS needs to make a choice among many alternatives. This case presents five possible alternatives and addresses many issues that affect the choice. Students are asked to help the Corporate VP of Strategy make a recommendation to BHS on which alternative to select. In doing this, they are faced with many issues that are not quantifiable. Thus the decision is not clear cut and allows the students to see the difficulty in making IT related decisions.

Kenneth Peltzie, Vice President of Corporate Strategy for the Bethesda Healthcare System (BHS), was deliberating on the recommendation he would make to BHS's board and other executives. The decision that they made would have major implications for the way in which relationships between doctors and the organization were managed electronically. Several years before, as part of a move toward reducing paperwork, cutting administrative costs, and avoiding unnecessary delays, the Boynton Beach, Florida-based non-profit BHS, which consisted of Bethesda Memorial Hospital and several satellite facilities, had implemented the RADIANT system (formerly known as IMS MEDACOM™ Networks). This system, to which doctors could connect using ordinary phone lines, provided electronic access to many routine types of information, such as patient data, lab results, and scheduling confirmations. The system had proven to be a qualified success, with most doctors who routinely used the BHS facilities taking advantage of the system. More important from a cost perspective, nearly all of the largest practices employed the system. The system had shortcomings, however. To avoid software and hardware conflicts, BHS recommended doctors keep a PC dedicated to RADIANT in their offices. Also, the degree to which RADIANT interfaced with BHS's other information systems was limited. While such integration was theoretically possible, it required both considerable expertise in using the RADIANT scripting language and a high level of understanding of existing BHS systems. Currently, that combination of skills was hard to find in-house. Even when the system could be updated, it was hard to communicate the new capabilities of the system to the user community. Finally, RADIANT's use of older-technology text-based screens and dial-up connections neither enticed new doctors onto the system nor encouraged existing users to utilize a wider range of the system's capabilities

With less than a year remaining on a five-year license for RADIANT, BHS's decision about physician information systems was becoming urgent. Peltzie was considering the following options: (1) the status quo (i.e., staying with RADIANT as currently employed with probable upgrade to the Windows 95 version), (2) continuing to use RADIANT but outsourcing administration of the BHS communications center; (3) upgrading to an Internet-based version of Kinetra that was about to be introduced, (4) switching to VHAseCURE.net™, a competing product that had been developed by the Volunteer Hospitals of America (VHA), or (5) developing their own home-grown communications system using dynamically-generated web pages that doctors could access.

No matter what decision was made on the physician information system, it would ultimately have a major impact on his goal of transforming BHS into a paperless organization. Thus, the decision on how best to accomplish electronic integration of doctors' offices with BHS needed to be made in concert with the organization's overall strategy.

HEALTH CARE INDUSTRY

Many players make up the healthcare industry: patients, payers (patients, insurance companies, government), and providers (doctors, hospitals) of health-related services. Prior to the 1980s, patients were viewed as both consumers, of services and customers buying services. As consumers when they needed care they went to a provider of their choice. Insurance companies then acted in the role of payer, taking care of a prespecified percentage of patient costs. In the 1970s, a movement toward "managed care" grew out of a concern for cost containment. Managed care led to new types of health insurance organizations, including preferred provider organizations (PPOs) and health maintenance organizations (HMOs) where the employers were the customers. In addition, the period from the 1960s to the 1990s saw a huge increase in government-sponsored healthcare programs, primarily Medicare and Medicaid. While some traditional insurance plans still existed, paying a set percentage of costs no matter what health-related service providers were used, PPOs and HMOs (and, to a lesser extent, government programs) provided agreements with specific providers and limited their insured to seeing only those providers. When non-designated providers were used, companies either refused to reimburse patients or extracted heavy penalties.

With the growth of managed care, the process of supplying health-related services became increasingly complex. Not only did patients have to utilize designated providers (who typically had contracts with more than one managed care organization), but they also had to follow plan guidelines with respect to covered services. Some companies, for example, actively promoted ambulatory care. Ambulatory care took patients out of the in-patient status in the hospitals and put them in outpatient facilities run by the hospitals or separate organizations. As a result, procedures formerly done in the hospital now had to be done in non-hospital settings to qualify for full reimbursement. Managed care organizations were not only selling insurance, but effectively controlling the type and quantity of care given. In some cases, the decision about what constituted appropriate care was taken totally out of the doctors' hands. For example, the length of a hospital stay for certain medical events (such as childbirth) was set by the provider, not the doctor. Not only did this take the decisions away from the doctors, it also caused a public outcry. As a result, the government increasingly became involved in the healthcare industry in another role—that of a regulator.

The dynamic nature of the healthcare industry meant that suppliers of healthcare services needed to be extremely adaptable to survive. They had to be able to customize their billing to the procedures of each different payer. They had to be able to change rapidly as each payer changed. They had to keep current with new medical technologies and procedures—and the rules governing the uses of the technologies and procedures, which changed daily. And, of course, they had to do their best to improve the condition of their patients.

Hospitals

Hospitals are the most complex health service providers. Hospitals are characterized by a complicated organizational structure, an extensive division of labor, and an elaborate system of coordination of tasks, functions, and social interaction. They are comprised of many departments such as emergency services, surgical services, imaging services, and maternity services, to name just a few. Authority in the typical hospital is shared by a triad: the board of trustees, doctors, and administrators. This sharing typically leads to a delicate balance of power between the factions, which is in turn influenced by other factors, such as hospital ownership (e.g., profit vs. non-profit, secular vs. church-affiliated, public vs. private, independent vs. part of a chain).

Because hospitals are extremely dependent on the community they serve, there is no such thing as a "standard" hospital organization. Common to most hospitals, however, is an extensive division of labor. Paradoxically, while many of activities performed in a hospital are highly departmentalized and specialized, they are nonetheless highly interdependent. Nearly all of the activities that affect the well being of a patient interact with each other. To further complicate matters, the hospital has little control over its workload or over its patients. The flow of work is variable and irregular, so coordination through mechanical

standardization—as is done in a typical assembly line—is not possible. As a result, a great need for intercommunication among task specialties exists.[1]

One major challenge to management is that hospitals typically have little control over some of their key players—most notably, doctors. Doctors play a pivotal role since hospitals only provide the services ordered by the doctors. Most doctors, however, are not employees of the hospital. Instead they have privileges with the hospital, which means they may order services. In effect, hospitals provide a work place for the doctors and staff who provide the services. In turn, the hospital has several main responsibilities: first, to provide the services properly; second, to facilitate the providing of the services; and third, to investigate and handle matters if a doctor makes a mistake. For example, doctors need to be able to access all available existing data about a patient in order to make the best decision as to which procedure to order. The hospital has to be in a position to supply such data.

Hospital revenues come primarily from payments from insurance, the government, and patients (although donations may also play a role in non-profit or church-affiliated hospitals). Rather than being paid based on actual charges for services, today's hospitals usually are paid based on diagnosis, average per diem, or a percentage of the charge. Unfortunately, there is virtually no agreement across different payers regarding what fees are appropriate for a given circumstance.

Information Systems in the Healthcare Industry

Prior to the mid-1970s, the expense and complexity of computer technology made it impractical for all but the largest hospitals to own their own computers. Most hospitals, therefore, had to rely on paper-based information systems, sometimes supplemented by terminals supplied by vendors, such as American Hospital Supply Co. During the decade that followed, technology prices and the advent of PCs and networks led to a rapid automation of hospital core applications (patient accounting, general accounting, and order entry). By the late 1980s, however, few straightforward automation opportunities remained. Hospitals then turned their attention to more complex applications, including clinical systems, systems to aid in the care of the patients such as clinical decision support systems and computer-assisted patient care. Such clinical systems, however, could not work in isolation. Instead, they needed to be integrated with the existing administrative and financial systems.

An approach used to achieve such integration was the development of Clinical Data Repositories (CDR), a.k.a. Clinical Data Record. Such CDRs were, effectively, central databases of information that could be accessed by many different systems. One type of CDR, for example, contained the information, primarily administrative, related to the hospital patient record. By the late 1990s, this type of CDR could display patient-related data, but was limited in its ability to provide comparative data and manipulate that data. A more ambitious CDR held an interactive medical record. Ultimately, this type of CDR was intended to fully automate the patient's medical record, allowing information such as digitized x-rays, EKG readouts, and scanned paper documents to be attached—although few systems had incorporated all if these capabilities by the late 1990s. In the past, vendors had developed these two types of systems independent of each other. At the time of the case, however, hospitals were placing increased pressure on vendors to merge the two types of CDR. At the same time, concerns existed regarding inadequate response times, lack of physician input into their design, questions of data ownership and security, and the failure of vendors to demonstrate a fully operational installed system.[2]

The transition in healthcare information systems usage occurred during a period of turmoil among the suppliers of these systems. In period between 1995 and 1997, for example, over 1,500 applications became obsolete as a result of vendor acquisitions of competitive products. In addition, even if a product was not eliminated as a result of a competitive acquisition, the acquiring company often decided to cut back on new system development—effectively eliminating the product's long-term viability. As a result, healthcare enterprises were routinely required to expend resources to acquire replacement systems. Another major change leading to the replacement of existing systems was the emergence of the Internet and the use of intranets (internal networks that utilized Internet protocols and software). These communications technologies served to redefine the "healthcare competitive

[1]Source: Kurt Darr and Jonathon S. Rakich, *Hospital Organization and Management Text and Readings*, National Health Publishing 1989, pp. 22-33.

[2]Source: Ronald Johnson, Session 34: Trends in Health Care and Health Care Systems, The Healthcare Information and Management Systems Society, 1998.

landscape to link healthcare practice, management and automation in a new model of Internet team medicine."[3] The Internet, with its widespread availability and easy access, made communication among users cheaper and, more importantly, much more convenient. Regional healthcare organizations in particular found that they no longer had to design and maintain their own wide area networks to establish communication between members.

A final challenge to implementing healthcare information systems—particularly clinical systems—was long standing in nature: gaining acceptance by the doctors and other healthcare providers who must use them. Since the first computer appeared in a hospital, resistance from users had been commonplace. In some cases such resistance stemmed from general discomfort with information technology. More often, however, it was a result of new systems requiring that changes be made in "the ways they [doctors] have traditionally recorded, retrieved, and utilized clinical data."[4] Because of the complex managerial relationships in hospitals and healthcare enterprises, it was nearly impossible to force doctors to accept a new system. Only substantial benefits (to the doctor) from using the system, coupled with widespread acceptance by peers, could serve to motivate doctors to make the required change.

BETHESDA HEALTHCARE SYSTEM

Bethesda Healthcare System was located in Boynton Beach on the Gold Coast of Florida, a region of rapid growth. Because of this rapid growth, and because of a large retired population with an above-average requirement for medical services, the need for medical care in the region had grown dramatically since the 1960s, with no end to growth in sight. Where once a few isolated hospitals existed, many hospital groups were established, the majority of which offered services at more than one physical location.

Background

In 1959, Bethesda Memorial Hospital opened its doors and began serving the Southeastern Palm Beach County Hospital District as a tax-assisted entity. To enhance its competitive posture, in the mid-1980s the hospital was restructured as a private, not-for-profit corporation known as Bethesda Healthcare System (BHS). This new corporation managed all of Bethesda's services. Over the years, to keep up with the needs of the community, Bethesda Healthcare System grew and, by the late 1990s, included Bethesda Memorial Hospital, Bethesda Health City, Bethesda Women's Health Center, and Bethesda Professional Plaza. These facilities were in multiple locations throughout the city of Boynton Beach, Florida.

Bethesda Memorial Hospital (BMH) was a fully accredited private community-based hospital offering a full array of healthcare services. More than 400 physicians, representing over 30 areas of specialty, were affiliated with the hospital. One of a number of satellite facilities, Bethesda Health City offered "the convenience of a mall setting with family doctors, specialists, and healthcare professionals working together in one location" according to the hospital's web page. It offered a variety of services under one roof so patients did not have to travel from place to place. Bethesda Women's Health Center specialized in treating the physical, emotional and social aspects of healthcare for women of all ages. Bethesda Fitness Center, in addition to being a gym, provided physical therapy and assisted patients with recovery and rehabilitation. Bethesda Professional Plaza was an office complex primarily intended to house medical professionals in a variety of specialties. (See Exhibit 1 for a list of services.)

Exhibits 2 presents the organization charts for BHS.

BHS was a member of the Voluntary Hospitals of America (VHA), a nationwide network of community-owned healthcare organizations and physicians. Among the functions the VHA performs for its members are consolidated purchasing and information transfer, allowing smaller community hospitals to mimic the buying power of their larger urban cousins.

---

[3] Source: Steve Fink and Gary Gorden, Session 23: Healthcare and the Internet: Using Internet Technology to Create Competitive Advantage, The Healthcare Information and Management Systems Society, 1997.

[4] Source: James G. Anderson, "Clearing the Way for Physicians' Use of Clinical Information Systems," *Communications of the ACM*, August 1997, pp. 83-90.

IS Department

The 36 IS employees at BHS were divided into three groups, with about equal numbers in each. Its Technical Services group was responsible for PC support, all hardware and software maintenance throughout the facility, and network and database administration. The Operations group kept the mainframe running 24 hours a day, seven days a week. The third group, the Analysts, developed the applications, built screens, and generally supported the customers with application problems. Applications included but were not limited to financial, administrative, and clinical systems. BHS customized SMS-supplied software to meet its clinical needs. Among the modules used by BHS were On-line Patient Care Documentation (PCD), Order Processing, and Lifetime Clinical Record (LCR). The nurses used PCD for charting the plan of care for a patient, assessments of the patient, and the patient's vital signs. The Order Processing system was used by the unit clerks and the nurses to enter doctors' orders, which were then sent to the ancillary departments (such as Radiology). Once the orders were carried out, the results were put back into the system.

One major challenge that BHS faced was making the Lifetime Clinical Record (LCR) electronically accessible to the doctors. At present, the physicians had to print out anything they wanted. IS wanted to provide better access for the physicians, primarily through the development of the Physician's View. The Physician's View would be the doctors' equivalent to the nurses' PCD. Eventually, the Physician's View would provide the physicians with the ability to place orders, look up results of tests on-line, etc. BMS's Information System's director, Leslie Durham, stated that one major goal was to make these systems interdisciplinary. At present, many departments such as physical therapy, respiratory therapy, and occupational therapy were not tied into the system. These enhancements were to be phased in.

RADIANT SYSTEM

For many years, BHS under Peltzie's guidance had been attempting to eliminate paperwork in the hospital. In the past, voluminous paperwork, such as transcripts of physicians' dictated notes, lab, pathology, and radiology reports, would be printed out and put in the doctor's mailbox in the doctors' lounge. The result was a system fraught with waste, both for BHS—who had to generate the paperwork—and for doctors, who had to sort through it.

In 1994, BHS instituted a computer system intended to eliminate much of this paperwork and make the communication process between BHS and the doctors' offices easier. It contracted to use the IMS MEDACOM Networks system (which became known as RADIANT), to serve as a communication system between itself and the doctors' offices. The two-way network linked healthcare services with physicians, and physicians with other physicians, allowing the exchange of messages. The system permitted both computer-to-computer and computer-to-fax message exchanges. Computers and modems were installed in approximately 200 physicians' offices with a few more communicating through fax machines. While BHS dealt with approximately 400 physicians, the 200 physicians using RADIANT represented the majority of the hospital's revenue generators. Additionally, they were the main recipients of reports. The remaining doctors still picked up their reports from their mailboxes. Interestingly, the IS department was not responsible for the RADIANT system. Instead, that responsibility fell on the Marketing department.

In total, the acceptance of the RADIANT system at BHS had been good and was growing. For example, in January 1996, 13,608 messages were passed through RADIANT in BHS. By February 1998, the monthly volume of messages had grown to 47,522 (see Exhibit 3). The types of information conveyed in these messages varied widely. Some might be routine (e.g., discharge notices, transcribed reports) whereas others might be time critical (e.g., radiology and other test results). Exhibit 4 contains a sample message listing.

Functionally, RADIANT served as far more than a simple e-mail system. At the heart of the system was the ComCenter™, which redirected mail traffic, much of which was computer generated. For example, reports were sent by computer to the ComCenter and were then sent, without human intervention, to the appropriate doctor's office. The ComCenter also acted as the intermediary between various relays, which served as automated message routers, and the doctors' offices—verifying the addressee of the message and then forwarding it on. The entire messaging process was highly automated. Once a doctor had become part of the system, reports were sent to them automatically. In addition, since all report traffic was routed through the ComCenter, no two PCs ever had to be directly connected.

Beyond the delivery of reports, data could be transmitted to the doctors as it was being generated. For example, the fetal heart monitors could be linked so that the fetal heart strips were sent to the doctors' offices in real-time. Additionally, RADIANT was routinely used to support centralized scheduling of outpatient appointments.

Internally, the RADIANT system had little built-in medical functionality or built-in connectivity to other medical systems. What it offered instead was a scripting language that allowed developers to create forms for user requests, reports to display information, and requests used for exchanging information with other connected systems. The availability of a scripting language permitted the system to be customized to the needs of the various users, with each department (potentially) developing its own scripts to serve its specific needs. Although BHS had many scripts in place, the number of application scripts that could be developed in the future was huge. One factor inhibiting such development was the knowledge that if RADIANT was replaced by another system, all scripts would probably have to be completely rewritten for the new system.

In acquiring RADIANT, BHS elected to purchase the ComCenter license and, as a result, was responsible for all installation and maintenance of the system at both BHS and the physicians' offices. BHS used the DOS version of RADIANT, electing not to upgrade to the Windows 95 version for several reasons. First, many doctors' offices did not have the up-to-date computer hardware required to run Windows 95. Second, BHS has had frequent technical problems getting the relays to work with their mainframes. Such problems provided users who were not enamored with the system an excuse to complain, and it was felt that the disruption caused by a system-wide upgrade would only add to the problem. Finally, because BHS was nearing a decision point regarding whether or not to change physician information systems, it did not make sense to further upgrade RADIANT before that decision had been made.

The uncertainty regarding its future use was just one factor preventing RADIANT from being used to its full potential. RADIANT's under-utilization at BHS was also due to the complete lack of connections between some departments and RADIANT. Thus, scripts were unavailable to a large number of users who could have applied them. Even users having access to the system were not necessarily using it to its full potential. Indeed, Peltzie felt that both internal personnel and doctors underused the system since they did not always recognize that delivering information was part of their mission. Individual departments had always operated independently of each other, and were therefore not really concerned with the needs of other departments.

Peltzie was also concerned that doctors did not always recognize that easily accessible data can be key to a successful medical practice. Instead, Angela Scites, the RADIANT coordinator, and others who had conducted field installations had frequently found both the doctors and their staff resistant to the changes that using the system effectively required. Since keeping the office staff content can be extremely important to a well-functioning office, doctors were often reluctant to initiate changes that disrupted well-established office routines. Many office managers, in turn, found reasons to be uncomfortable with the new system. Some were simply unhappy with any new technology. Others seemed to be afraid that that the system would take over their jobs or cause them more work. Furthermore, such fears were not entirely unfounded. For example, when BHS switched from leaving the reports in the doctors' mailboxes in the hospital lounge to sending them electronically to the doctors' computers, it shifted the responsibility for handling the reports from the doctors to the staff. Another problem was that some offices still had antiquated systems and had no interest in updating them or in acquiring a new system—even though BHS provided the computers needed.

PHYSICIAN INFORMATION SYSTEM: THE NEXT GENERATION

Since BHS had entered into its five year RADIANT agreement, the company had been renamed Kinetra and had become jointly owned by EDS and Eli Lilly & Company. With the existing agreement about to expire before the end of 1999, and many development projects being held up until the future of BHS's physician information system was clear, Peltzie recognized that a decision had to be made soon. He perceived that there were a number of paths that BHS could follow.

Alternatives

Six possible alternatives had been uncovered during BHS's initial attempts to identify possible solutions to the physician information system problem. These were:

Status Quo: BHS could renegotiate the contract with Kinetra, possibly upgrading to the Windows-based version. A number of factors made this alternative attractive. First, with Kinetra being jointly owned by EDS and Eli Lilly & Company, the product had the financial backing of two large companies. In addition, EDS had extensive experience with electronic commerce solutions for a wide range of healthcare organizations.

Status Quo, but Outsource: Even if the status quo option were selected, there were two possible choices to consider. Currently, BHS took responsibility for all ComCenter functions, meaning that BHS performed all installations and all maintenance, both in-house and at physician sites. Another possibility was for the ComCenter to be outsourced.

Major System Upgrade: A third alternative under consideration was the acquisition of a major new system that was about to be introduced by their current vendor. In February 1998, Kinetra announced its new product Odysent™, an adaptation of its medical communication networking capabilities for the Internet browser-based system. The Kinetra web page describing the system stated that "registered and authenticated users will be able to view clinical and administrative reports, save these reports into an archive database, and subsequently retrieve these reports based on user defined search criteria." In addition, the system was reported to provide access to MedCite, a compilation of medical research.

VHAseCURE.net: The Voluntary Hospitals of America Inc. (VHA) was an alliance of more than 1,600 member organizations. In the mid-1990s, it had created an IT Solutions (ITS) department, which subsequently showed rapid growth. The mission of the ITS department was two-fold: to assess and endorse vendors' healthcare applications and to co-market approved products to members at a substantial discount. In August 1997, the ITS department had launched VHAseCURE.net, a private network that linked intranets of separate organizations together in order to provide a secure electronic environment for conducting business. The network was often used to do medical research and consulting and allowed clinical data and other confidential information to be exchanged on its secure channel. It had also announced that it would soon be able to supply such results to physician offices, although such capabilities were not currently available.[5]

As an active and enthusiastic member of the VHA, BHS had already committed to use VHAseCURE.net to provide compilations of medical information, such as articles, books, etc., in an easy to use format. Given it would already be in use at BHS, the question then became whether or not VHAseCURE.net should be adopted to handle the communications with doctors as well.

Internet and BHS-created Web Pages: A fourth alternative potentially available to BHS would be to develop its own in-house system using the Internet as its communication channel. Doctors could be given user names and passwords to get them into the system. Information could then be delivered to doctors in the form of computer generated web pages containing relevant results.

Investigate Other Alternatives: A final possibility available to BHS would be to extend the current contract for a limited period, thereby allowing further alternatives to be considered. While postponing the decision seemed initially attractive, Peltzie felt that the uncertainty regarding the future of the system had already done much to hamper new development and was, therefore, loath to extend the duration of that uncertainty.

Evaluation Criteria

In deciding among the available alternatives, Peltzie recognized that pure financial criteria would have to take a back seat. Few of the benefits of such a system were tangible and easily quantified. The primary benefits were more often qualitative than quantitative. For example, how did you put a dollar value on delivering better information faster to the doctors? Although some hospital administrators had attempted to use ROI to measure the value of IT, such attempts had fallen out of favor with top executives of healthcare organizations. Indeed, according to a recent survey by Coopers & Lybrand and Zinn Enterprises, 72% of recent IS expenditures were justified based on supporting the strategic initiative while only 8% were justified based on ROI.[6]

---

[5]Source: MargaretAnn Cross, "Assessing VHA's Aggressive Software Endorsement Effort," *Health Data Management*, February 1998, pp. 109-120.

[6]Source: John Morrissey, "Info System Evangelists," *Modern Healthcare*, February 23, 1998, pp. 70-90.

Instead, BHS began to establish a set of criteria against which the different physician information system alternatives could be measured. These criteria are listed in Exhibit 5. A summary of the five major options across each of these criteria is provided in Exhibit 6.

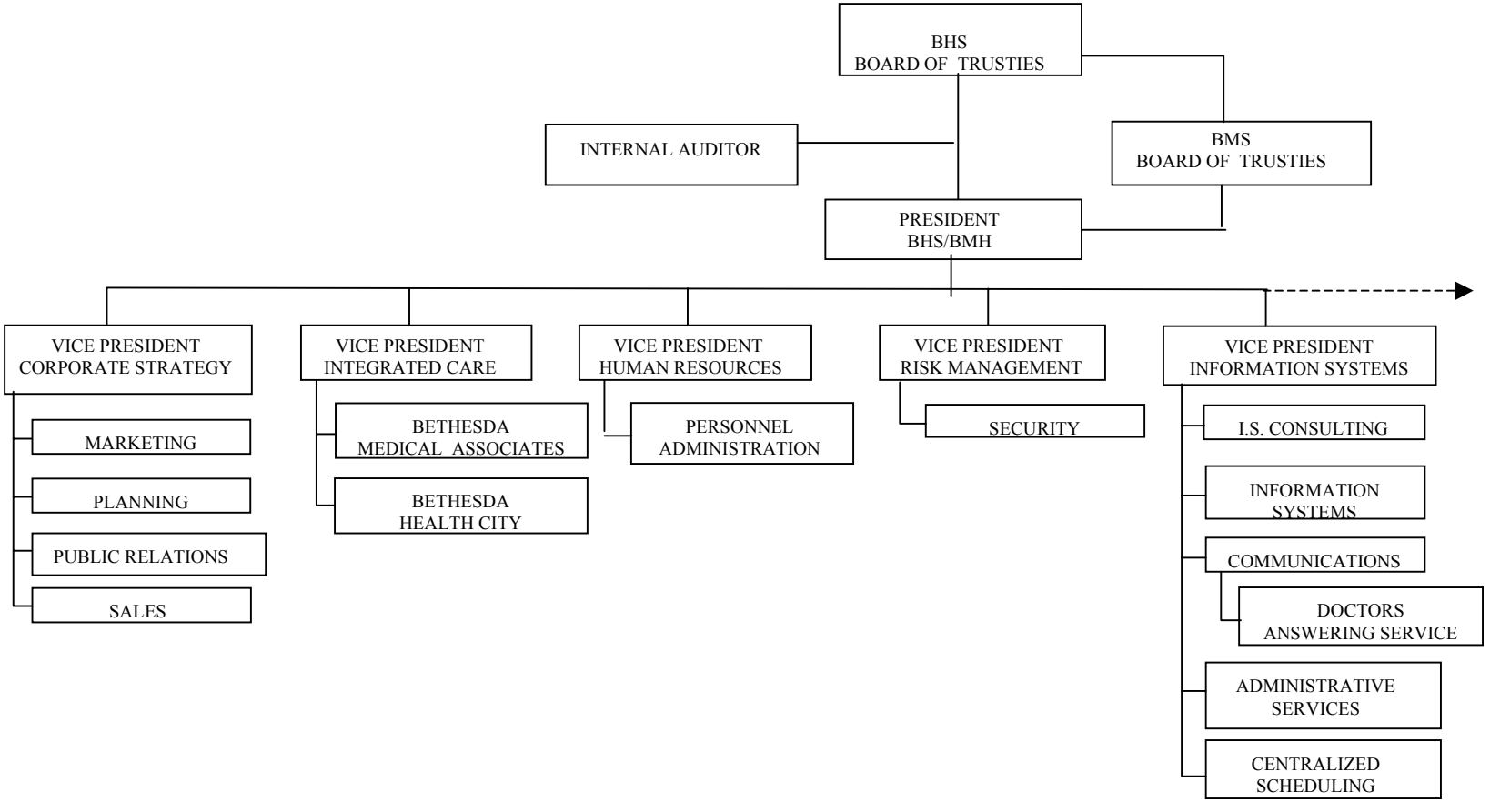
THE HOSPITAL OF THE FUTURE

While the current contract would not expire until a year and a half from now, the physician information system decision needs to be made soon. There is a significant cost in putting off the decision: paralysis. Already further development on the RADIANT project has, for all intents and purposes, been put on hold until BHS knows if it will continue with RADIANT or not. As a consequence, BHS was not taking advantage of the ability to improve its workflow and its communication processes. In making the decision, Peltzie recognized that it would be dangerous to focus too narrowly on the specifics of each individual option and only on today's demands. Ultimately, the system would become just one component in a completely electronic hospital: a hospital where printouts, film, and blinking equipment displays were all captured directly into the central information system, analyzed, and then disseminated to the appropriate individuals. The ability to communicate with doctors was obviously going to be central to such a system, but would be only one component of it. Unfortunately, many of the other components had not yet been built—or even imagined, in some cases. Peltzie sensed that if they got the physician information system decision "right" now, they would save themselves a lot of headaches in the future. But, for the present, he faced the challenge of selling his recommendation to the BHS board and other executives. And then, the even more daunting challenge of selling it to the doctors…

Exhibit 1
List of Services

Bethesda Memorial Hospital	Bethesda Health City
Comprehensive Cancer Care	Family Health Center
Cardiac Care Services	Walk-in Care Center
Rehabilitative Services	Pediatric Care Center
Emergency Services	Women's Health Center
Bethesda Home Care Network	Medical/Surgical Specialists Center
Maternity Center	Same Day Surgery
Neonatal Intensive Care Unit (NICU)	Laboratory/Radiology
Pediatrics	Healthy "U" Education Center
Genetic Counseling Services	Comprehensive Rehabilitation
Department of Psychiatric Services	Comprehensive Optical Services
Center for Advanced Imaging	Oral and Maxillofacial Surgery
Same Day Surgical Services	Hearing and Speech Services
Transitional Care Unit	
Hyberbaric Medicine	
Physician Referral Service	

Exhibit 2
Bethesda Healthcare System



Approval

Exhibit 2
Bethesda Healthcare System (continued)

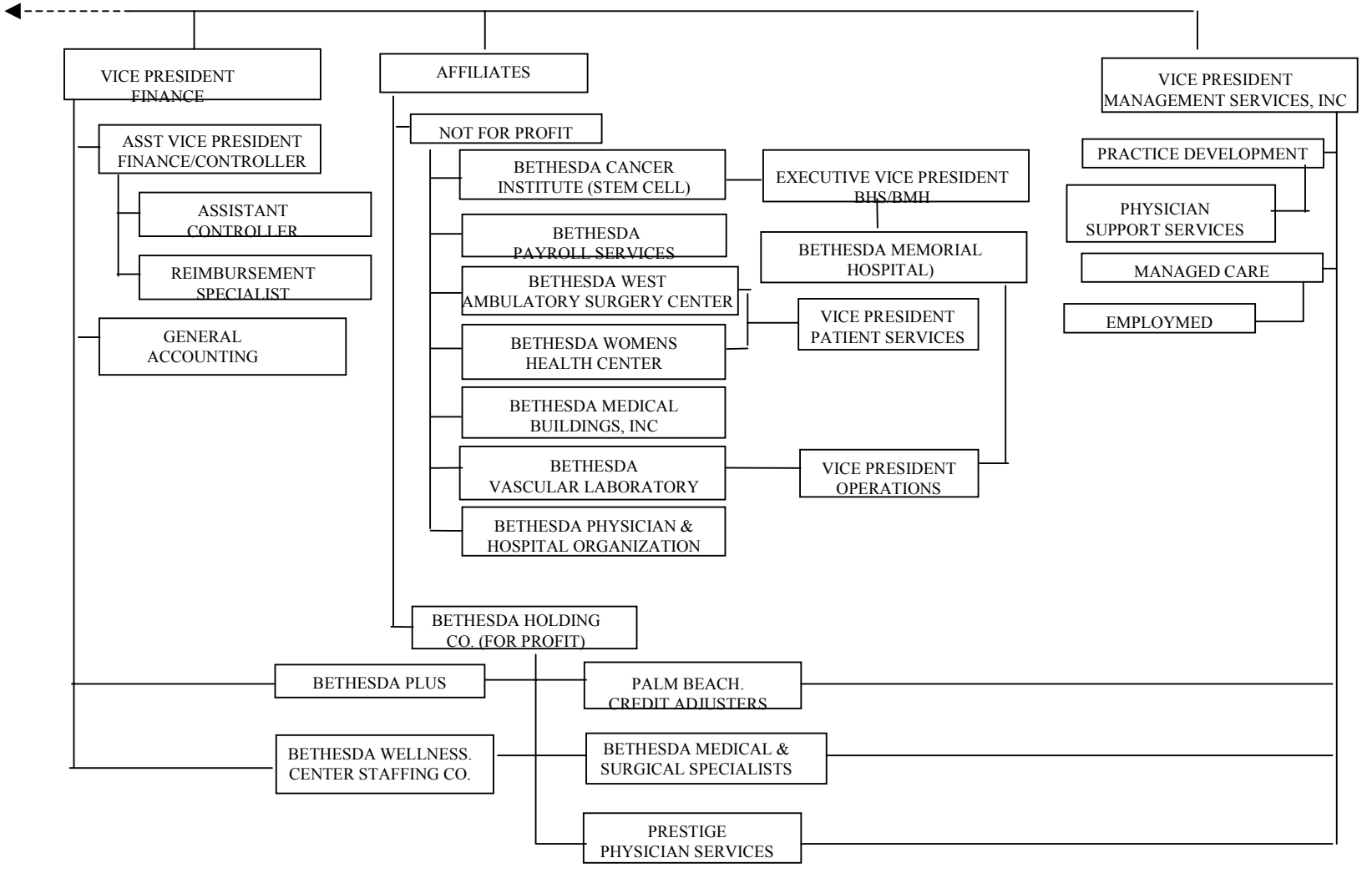


Exhibit 3
BHS Medacom Network
Monthly Message Volume

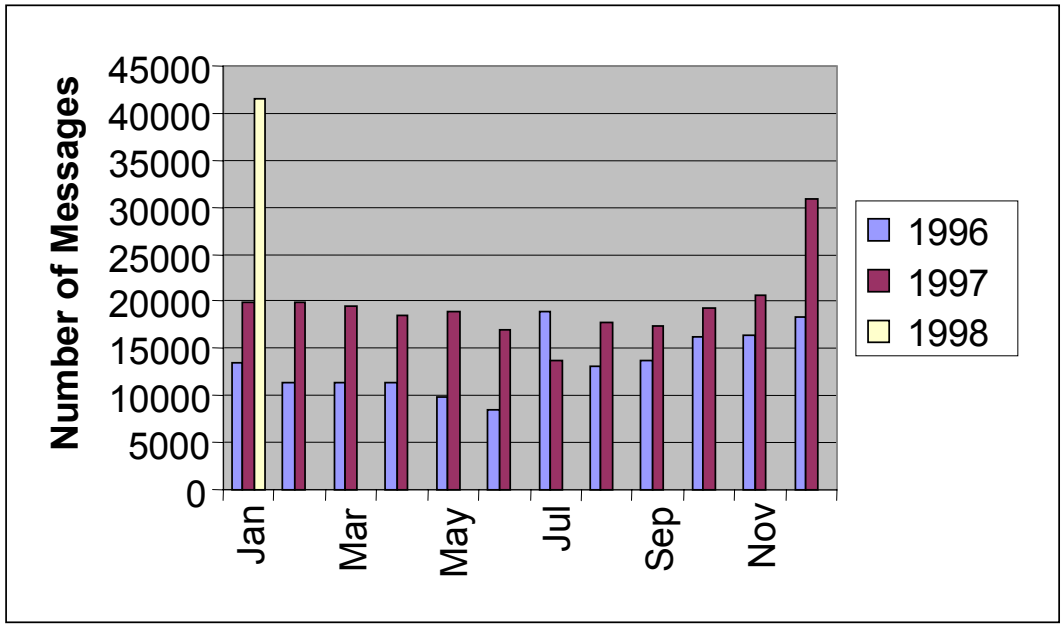


Exhibit 4

DAILY SUMMARY REPORT Fri Mar 06 09:20:20 1998

THIS REPORT REFLECTS INFORMATION GATHERED DURING Feb 1998

NOT LISTING ANY ACKNOWLEDGMENTS
NOT LISTING ANY MAINTENANCE MESSAGES

Date	Description	Count	Size	Average
Sun Feb 01	HIM Transcribed Report	88	483433	5493
	Lab Interim I/P	1	2291	2291
	Lab Daily Summary I/P	21	139165	6621
	20 Day Cum I/P	1	45629	45629
	Partial O/P	6	20104	3350
	Final O/P	15	47426	3161
	Admit Form	31	135192	4361
	Transfer Notice	36	62362	1732
	Discharge Notice	43	53780	1250
	Radiology Result	336	806837	2401
	Revised Admit Form	192	889248	4631
	Pathology Result	23	78087	3395
	General Message	12	12551	1045
	Total	805	2776105	3448
Mon Feb 02	HIM Transcribed Report	170	902751	5310
	HIM Cardiac Cath	1	3607	3607
	Lab Daily Summary I/P	18	122341	6796
	Partial O/P	14	43164	3083
	Final O/P	69	217238	3148
	Admit Form	102	510856	5008
	Transfer Notice	44	76448	1737
	Discharge Notice	62	77062	1242
	Radiology Result	567	1534023	2705
	Revised Admit Form	326	1524976	4677
	Pathology Result	48	195812	4078
	Results/Reports Request-	1	1445	1445
	Release of Medial Info	1	1486	1486
	Comprehensive Order Form	35	45749	1307
	O.R. Scheduling Request	3	4151	1383
	Unknown type ‘A41’	3	3585	1195
	Broadcast Message	6	13521	2253
	General Message	23	29731	1292
	Relay Status Report	22	149330	6787
	Total	1515	5457266	3602

Exhibit 5
Criteria for Judging Systems

- *Compatibility with the existing physician information system:* To what extent could code (e.g., scripts) from the existing RADIANT system be adapted for use in the new system? If it could not be used directly, how much effort would the conversion take?

- *Compatibility with other BHS applications:* BHS has many systems already in use. To accomplish complete electronic integration, it would need to integrate the chosen system with the existing systems. Because the existing RADIANT scripts supported only a small fraction of potential uses for a physician information system, compatibility with the other BHS applications might be even more important than compatibility with the existing system.

- *Adaptability:* In the dynamic healthcare industry, it was critical that the system be flexible in the tasks it performed and adaptable to changes in the business environment.

- *Vendor stability:* To what extent was the vendor reliable and financially stable? Was there a danger that the product could be discontinued through acquisition, like so many other medical information system products?

- *Support:* What level of technical support and training did the vendor offer, with respect to both initial installation and ongoing requirements, such as updates and new installations?

- *Selling points:* For the new system to succeed, acceptance by both hospital staff and doctors is crucial. What features are offered that make it attractive to both doctors and hospital employees?

- *Cost:* What would be the initial cost of purchasing and installing the system? What ongoing costs would be incurred in keeping the system operational and up-to-date?

- *Personnel:* What type of personnel would be required to develop, install and operate the system? To what extent are the people with the needed computer skills already available in-house? How hard will it be to find and hire people with the skills that are missing in-house?

- *Security:* Much of the data in a hospital environment is of a sensitive, personal nature that patients do not want disclosed except to a select group of providers or insurers. To what extent could the integrity, privacy, and ethical use of the data contained in the system be guaranteed?

Exhibit 6
Evaluation Chart

	Status Quo—with possible upgrade to Windows version In-house	***Status Quo—with possible upgrade to Windows version Outsource***	***Major System Upgrade—Odysent***	***VHAseCURE.net***	***Internet and BHS-created Web pages***
Compatibility with existing physician IS	High	High	Designed to be comple-mentary to RADIANT, so if doctors are using RADIANT they can also use Odysent	Low	Low. Need to rethink everything. However, scripts can become specifications
Compatibility with other BHS systems	Best. Result of scripts created; scripts are the tools to get into the other systems	Good. Result of scripts created; scripts are the tools to get into the other systems	Medium. Some compatibility will come from scripts but they'll have to recreated to fit the new system	Low. Will likely require considerable rewrite as different scripting language likely to be required.	Worst. Everything will have to be figured out anew
Adaptability (Low 1 High 5)	1	1	3	3	5
Vendor Stability	High. Both EDS and Lilly have been around EDS has extensive experience with EC solutions Existing connectivity with physicians, pharmacies, hospitals is vast	High. Both EDS and Lilly have been around	High. Both EDS and Lilly have been around for a long time. EDS has extensive experience with EC solutions.	Medium. While VHA is stable, don't know VHA's level of commitment to networking product.	N/A. Can rely primarily on off-the-shelf technologies that are basically stable Not dependent on one particular vendor
Support	High. Can access EDS's regional technical support infrastructure; though it is possible that support will be discontinued in the future for DOS-based product	High. Can access EDS's regional technical support infrastructure; though it is possible that support will be discontinued in the future for DOS-based product	High. Will be accessing EDS's regional technical support infrastructure	Unknown	Virtually none

	Status Quo—with possible upgrade to Windows version In-house	***Status Quo—with possible upgrade to Windows version Outsource***	***Major System Upgrade—Odysent***	***VHAseCURE.net***	***Internet and BHS-created Web pages***
Selling Points	Can use existing scripts si minimal upfront development is necessary. People already know how to use it.	Reduce activities that BHS has to perform such as installations, script writing	Internet based Browser-based interface becoming increasingly familiar to doctors Accessible from physicians' homes Provides access to MedCite Standards-based approach TCP-IP for connectivity SSL2.0 for encryption	Internet based Browser-based interface becoming increasingly familiar to doctors Accessible from physicians' homes Provides access to compilations of medical information	Internet based Browser-based interface becoming increasingly familiar to doctors
Estimated Cost Ranking (Lowest 1 to Highest 5)	1	2	3	4	5
Personnel	Fewer new hires. Requires technologically and doctor friendly people to keep system running and doctors happy, but many of the necessary people are already employed at BHS	Fewer employees within BHS dedicated to system. Outsourcing may reduce number personnel needed to keep the system operational	More hires. BHS does not currently have employees with adequate training. However, many of the existing employees could be retrained with minimum effort. Requires technologically and doctor friendly people to keep system running and doctors happy	Higher need for new employees or extensive training of existing employees. Probably somewhat tailored to hospital environment.	Many new people needed. Need to hire programmers or consultants who are currently in high demand and short supply

	Status Quo—with possible upgrade to Windows version In-house	***Status Quo—with possible upgrade to Windows version Outsource***	***Major System Upgrade—Odysent***	***VHAseCURE.net***	***Internet and BHS-created Web pages***
Drawbacks	Technologically antiquated system on DOS and technologically limiting system on Windows 95 Lack of Internet connectivity Reliance on dedicated PCs in doctors' offices	Potentially distance BHS from its key customer base (doctors)	Not released yet (6/3/98) Odysent is a new product and often new releases come with a number of bugs A buggy system may alienate the users Will require doctors whose hardware is not WWW compatible to update the hardware	Capabilities provided by RADIANT were not yet available, but should be soon VHA's objectivity to choose software to support its various members It is an unknown system - not really sure what they would be getting - a PIS or an infrastructure for delivering one	Requires extensive programming
Security	High. Proprietary network	Medium. Proprietary network but outside company is maintaining it	High. Register and Authenticate users Limits users to various functions and access privileges	Unknown as of yet	Variable, will depend on what is built into the system