Forging a Partnership in Information Systems

The Case of Vancouver Hospital

By Murray Martin and Danny Tulip

Healthcare is a peculiar business. For a start, even though it's been called the world's biggest industry, one on which Western nations spend close to a tenth of their national income, it can't really be called a "business" at all (except perhaps in the United States). Traditionally, hospitals, unlike other entities of similar size, have had little or no access to capital or investment financing. Thus, planning for such an institution's future depends on the whims and benevolence of external bodies. The prevailing social and political climate in recent years has meant that the long view has rarely been taken, particularly with respect to capital equipment funding, always an easy target. This shortsightedness has taken its toll, and many hospitals' capacity to provide safe and effective healthcare is jeopardized because of outdated facilities and crumbling infrastructure. Vancouver Hospital and Health Sciences Centre (VHHSC, more commonly called Vancouver Hospital or VH) is no exception.

Western Canada Dry

One of the largest teaching hospitals in Canada and the largest tertiary-care referral centre in the West, VHHSC is the end

Vancouver Hospital and Health Sciences Centre is the largest tertiary-care hospital in western Canada and the primary adult referral centre for the province of British Columbia. Years of absorbing cost increases and of under investment in infrastructure have resulted in the hospital staff working in antiquated buildings with dysfunctional equipment and technology, particularly at the Vancouver General Hospital site. A 1996 freeze on provincial capital investment made replacing or updating existing information systems virtually impossible through traditional means. Hospital research showed that implementation of an integrated Patient Care Information System (PCIS) would not only track and simplify patient records but would enhance patient care through standardized care protocols, work redesign, and a library-like access to information (and generate enough future savings to pay for itself). After much deliberation and background research, and with the approval of the Ministry of Health, the hospital entered into a $41 million public/private venture that is the first of its kind in Canada: a partnership with BC Tel in which the telephone company invests $15 million in computer hardware and software along with communications expertise and the hospital provides the clinical input or intellectual property. The remaining $26 million for the project comes from a Royal Bank of Canada loan, made available to the hospital at a highly competitive interest rate, payable over 10 years.

point for the sickest patients in British Columbia. Cancer, the neurosciences, immunology, transplantation, trauma and tissue repair, burns, reconstructive orthopedics, ophthalmology, respiratory medicine, multiple sclerosis, Alzheimer's Disease, sleep disorders, spinal-cord injuries, sports medicine, and psychiatry are only some of its specialty and sub-specialty areas.

Vancouver Hospital became a "corporate" entity in 1993 after a Royal Commission on Healthcare and Costs (1991) led to administrative changes in the structure of healthcare delivery: regionalization. The BC Ministry of Health closed Shaughnessy Hospital, moved most of its programs to Vancouver General Hospital, and then merged VGH with University of British Columbia (UBC) Hospital to create VHHSC. In late 1997 two additional sites were integrated: the BC Rehabilitation Society (GF Strong Rehab Centre and the George Pearson Centre) and the ambulatory programs of the Arthritis Society.

This sprawling $500 million a year hospital now has 1900 beds; admits over 37,000 acute-care patients and deals with 81,000 emergency visits annually; and provides in excess of 300,000 ongoing ambulatory care, outreach and outpatient

services. Over a five-year period VH has tallied 1.3 million patient-days for some 160,000 of the most acutely ill inpatients in the country. Through enhanced patient management the average length of patient stay was reduced to 8.3 days in 1997/98 from 9.1 days in 1991/92. Other amendments and realignments made since 1993 to streamline services and reduce costs include

- streamlining administrative costs and rationalizing service delivery;
- consolidating purchasing practices with another Vancouver hospital, St. Paul's;
- improving labour utilization and reducing the labour force by 10% or nearly 600 full-time equivalents (FTEs); and
- installing energy-saving equipment.

Nevertheless, without capital investment to offset the nearly $48 million in efficiency improvements, more cuts are potentially dangerous, for the organizational infrastructure is down to its bare bones. At Vancouver Hospital we suffer from the reality that many of our facilities and much of our equipment is seriously old. Over 20 years ago, in 1978, the Laurel Redevelopment Plan outlined the need for replacement facilities at VGH, which was considered substandard even then. Construction began on Laurel Tower in 1989; unfortunately, the piecemeal allocation of ministry funds stalled the project and a provincial capital-spending freeze in June 1996 resulted in over two-thirds of the building remaining a shell.

Today, medical staff still struggle in our older facilities to care for seriously ill patients without adequate oxygen, suction, and electrical services, and must transport large numbers of these patients through miles of underground tunnels linking inpatient units and scattered diagnostic facilities. The various departments do their best to stay efficient in the face of minimal (or no) patient holding or preparation areas, resulting in significant add-on costs for patient portering, and to guide patients through this frustrating, delay-ridden system. Meanwhile, they are confronted daily with a near-empty 17-storey tower in which the Province has, to date, invested $137 million. Finally, in July 1997, we received a commitment from both the Ministry of Health and the Greater Vancouver Regional District that the Laurel Tower would be completed over the next four years and the remaining 460,000 square feet would, eventually, become operational.

With such obvious building and equipment deterioration it became clear to us at Vancouver Hospital that requesting any financing for computers, technology, or communications was futile. Yet our VGH site is the only major hospital in Canada operating without an integrated Patient Care Information System (PCIS). Information must be transferred manually around a pavilion arrangement of 18 buildings scattered over an area covering more than six city blocks. On admission, a patient's profile is first entered into a database in Admitting, whereupon it must be entered in 21 other databases on the ordering of drugs, X-rays, lab tests, nutrition services, psychiatric or surgical services, and so on. We cannot even contemplate the transfer of data among the hospital's four sites (up to seven miles apart) or to any other facility within the Vancouver/Richmond Health Region.

Yet as the most cursory *Medline* search reveals, a judicious and intelligent use of computer technology not only streamlines information and

ameliorates patient care but helps to reduce errors, eliminate delays, expedite treatment, and otherwise assists doctors, nurses, and other healthcare providers (see references). Computerization is also instrumental in creating standardized care protocols that save time and money. So at Vancouver Hospital the question became, How could we raise the necessary funds to implement this much-needed technology?

Investing in the Future

Healthcare capital funding in BC has traditionally been subject to a complex series of review and approval processes within the Ministry of Health and the Greater Vancouver Regional Health District (GVRHD) which vary depending on the nature and size of the project proposal in question. Hundreds of proposals vie for funding from a limited pool of resources. In recent years, this funding has been so deferred that in 1995/96, only $3 million was available for a provincial equipment base estimated in excess of $1 billion. Viewed in the context of the $195 million replacement value of the hospital's equipment asset base, this translates into a replacement cycle of *26 years*. A 1996 consultant's report used words like "critical" to describe the situation, noting: "There are circumstances, which exist in this Centre caused by using poor equipment, which are becoming intolerable. *The Consultant wishes to extend a genuine fear for what may be in store for this healthcare facility if funds are not made available for immediate equipment replacement* ... major breakdowns, closures and injuries are on the horizon" (italics ours). And this was just the equipment list. Information systems weren't even on the list. Less than $1 million was invested in information systems annually before 1996, most of which involved the replacement and maintenance of aging and inefficient departmental systems and technology. Yet industry benchmarks suggest that an organization the size of VH should invest approximately $8 to $10 million per year on information systems.

We recognized the need for an integrated Patient Care Information System (PCIS) as early as 1990, but it was not till 1993 that we seriously began to consider how we could acquire it. Our first step was to amass information: we sent representatives from caregiver user groups to hospitals in the United States comparable in size to VGH. We then quantified the potential benefits of a patient care system with the assistance of Portland, Oregon-based consultants Fleming Associates Ltd. Fleming, chosen for their familiarity and experience with two major clinical information systems, TDS and PHAMIS-LastWord, concluded that a PCIS would provide sizable and realizable benefits to VGH. In June 1993 Fleming's study, entitled *Vancouver General Hospital PCIS Cost Benefit Study* (there had been no amalgamation with UBC Hospital at that point), was presented to the Board with recommendations from a multidisciplinary task force to select PHAMIS-LastWord. PHAMIS (now IDX Systems) was newer in its life cycle and promised a functionality that clinicians could only dream of.

In addition, a cost/benefit analysis for a *Functional Status Quo* scenario (i.e., costs for a replacement system to maintain current practices initiated in 1981) was completed for comparison purposes. We used a zero-based approach; namely, we assumed that any benefits resulting from upgrading the status quo would also apply to the LastWord solution; therefore, only *additional* benefits realizable from a fully implemented, functionally rich PHAMIS-LastWord installation were included in the PCIS *Implementation* scenario. These additional benefits were outlined in the Fleming report and were primarily in the realm of labour (nursing and ancillary) costs.

Using a 10% discount rate and an estimated ten-year post-implementation life span, we found that upgrading the current system would result in a negative cash flow of $16.7 million (net = $12.0 million); whereas the same evaluation for a PCIS *Implementation* scenario would result in a positive cash flow of $89.9 million and a positive net present value of $16.3 million. Computing further, we found that the new PCIS produced an internal rate of return of 16%, assuming a ten-year life post-implementation per 1994 figures.

The Board gave its approval to begin contract negotiations with Seattle, Washington-based PHAMIS Incorporated. It also accepted the guidelines of the PCIS Selection Task Force, headed by respirologist (and now one of the three Clinical Services vice-presidents) Dr. David Ostrow, and recommended that:

- senior management must *unanimously* support the implementation of the PCIS from initiation throughout implementation and commit the necessary resources (time, money, people) to sustain it;

It eventually became obvious, after a frustrating year of letters, faxes, memos and meetings, that we were not going to get the funding we needed for a PCIS from a government whose main priority had become deinstitutionalization and moving away from acute care to community care; so we began to cast around for other forms of funding.

- a *hospital-wide* commitment, not only on the part of healthcare providers but all levels of clinical and administrative management be sought;
- adequate and appropriate resources be made available to the project (people, equipment, facilities);
- a solid foundation for a permanent computer-based patient record be laid, with all software modules being implemented facility-wide within one continuous time frame;
- a broad-based PCIS Implementation Steering Committee composed of representation from healthcare, technical (IS) personnel, administrative and operational support be struck to guide the process and be given the autonomy and resources to successfully manage the PCIS as proposed;
- once implemented, the PCIS will be an integral part of a healthcare worker's daily activities and as such all patient caregivers must utilize the system;
- post-implementation support be established through a PCIS Ongoing Management Committee to provide direction and ensure continuity, and a successful transition; and
- the PCIS Implementation Steering Committee (and its successor, the PCIS Ongoing Management Committee) be given significant input into the selection of key ancillary departmental computer systems.

These guidelines were to safeguard against what seems to happen only too often in the adoption of Information Systems (IS), when the technological tail ends up wagging the dog. At Vancouver Hospital we realized that installing any new system could not possibly work without consultation and staff buy-in throughout the process; therefore people and clinical goals had to guide implementation. Our goal, after all, was to enhance patient care not hinder it; provide savings, not create more costs in sagging morale and stretched-to-the-limit personnel. An integrated PCIS was not to be something presented as a *fait accompli*, but had to be an evolving, organic process in which staff played the most integral role.

Spare a Little Change?

As complex and multi-factorial as the PCIS process, were the external forces governing its implementation. Three months after its approval, in August 1993, came the government-mandated merger described earlier in which VGH became VH-City Pavilions and joined with UBC Hospital (VH-UBC Pavilions), while also adsorbing many of the programs formerly offered by Shaughnessy Hospital. Nevertheless, contract negotiations with PHAMIS, a cooperative effort between various hospital directors, were kept on track and began in October 1993. The Board approved the finalizing of these negotiations on January 25, 1994. Their completion was slated for March, pending approval of the financing strategy, which at that point, it was still assumed, would come from the traditional, government source.

We formally presented our business plan to government in the spring of 1994. Nothing happened. It eventually became obvious, after a frustrating year of letters, faxes, memos and meetings, that we were not going to get the funding we needed for a PCIS from a government whose main priority had become deinstitutionalization and moving away from acute care to community care; so we began to cast around for other forms of funding.

Coincidentally, BC Tel came to us for input regarding a new business venture it was considering the purchase of BC InfoHealth, a service bureau dealing with basic IS functions such as hospital payroll and financial services. As essential as these functions are, the real challenge for the strategic placement of IS in healthcare, we feel, lies in electronic patient records and clinical systems. It's a complex, demanding area requiring input and buy-in from both clinicians and IS specialists: something hitherto lacking in the implementation of many hospital or clinical systems. If BC Tel really wanted innovation, we felt, that was the sphere to become involved with.

Engaging in a Partnership

In stark contrast to the Province's attitude towards infrastructure and planning, BC Tel has long been investment-oriented, taking the view that today's risks are tomorrow's profits. "If you want to be a player, you've got to get engaged," BC Tel VP Jim Grey is fond of saying. This "lateral thinking" model was what originally attracted BC Tel to BC InfoHealth and made its executives receptive to VH's overtures on the PCIS. From the telephone company's perspective, the move was innovative and an effective means of gaining entry into an industry that, although largely information- and data-based, had hardly begun to dip its toes into the communications-technology waters. BC Tel saw a golden investment opportunity: a chance to get in on the ground floor in an area that few IS people knew anything about, with a partner that had the clinical expertise and intellectual capital that the process required. For its part, VH understood very well the benefits of the PCIS to the hospital in improving patient care, but lacked the necessary capital to pay for the IS expertise that implementation demanded.

So a partnership was born. BC Tel would invest its IS expertise and money for hardware and software with the intention of ending up with a product it could market elsewhere (since a system that would work for a hospital the size of Vancouver Hospital could go anywhere) and VH would invest clinical expertise and act as the testing ground for a truly functional, well tested, elegant PCIS.

In late 1995, VH and BC Tel, pending government approval, entered into a strategic alliance whereby BC Tel would invest

$15 million in project costs and work with clinicians at VH to develop the integrated PCIS. The hospital would pay for it through a "service" agreement arrangement. The company took on the risk of creating a system that was acceptable to VH: we had a very clear contract whereby we would only start to pay for the use of the system after it had been built, tested, and accepted by clinical staff (as per the terms of the original plan, which called for their input). (Payment, incidentally, would not be based on a unit of use, as with the telephone; it would be a basic fee. BC Tel would accept no profit; they took the risk of the development costs. Their profit would come post-VH, from marketing the system to other hospitals.)

Tentative agreement came from the Vancouver/Richmond Health Board in October 1995 to proceed with negotiations with BC Tel. We also asked Glen Clark, then Minister of Employment and Investment (now the NDP Premier of BC) whether he would support this public/private partnership. Clark said that, if we felt there was a real synergy between our clinical expertise and BC Tel's computing and telecommunications background, we should pursue it. Four months later, the Ministry of Health agreed that the service agreement with BC Tel did not violate the hospital's borrowing-authority limit and that VH could continue, pending approval of the Treasury Board.

But we weren't there yet. Even though BC Tel was making a sizable investment in both time and money, another $26 million was needed for systems infrastructure that the ailing VGH buildings simply did not have. We were literally moving from a completely manual environment of care delivery to an electronic one. We needed project staffing, workstations (we bought over 1000 PC's), clinician training, and, perhaps most distressing (in the face of the new, nearly empty Laurel Tower), we had to rewire and revamp old buildings to make the upcoming changes operational.

There are various hospital data systems, or data warehouses as they're called, now available to healthcare institutions; our problem at Vancouver Hospital is that we don't have the robust base, or the ability, to take on such a system without destroying what little we do have. Hospitals with sophisticated transaction-processing systems are in a position to add these data warehouses to their existing system which enables them to "slice and dice" to manage information. At VH we simply could not.

Given the size and scope of our institution, going at the job piecemeal would only be compounding the problem we started with: an crumbling and dysfunctional infrastructure. We needed cash, and government wasn't about to give it to us. In addition, we had experienced, with the Tower, the changing winds of government capital funding, and this was simply too important and far-reaching a process to risk tossing it into an uncertain funding sea.

Royal Backing

Where does one go to borrow money? To a bank. Except that public healthcare institutions, unlike even the smallest business, cannot borrow without permission from the Ministry of Health. It took us until April 1997, but eventually we received permission to borrow the remainder of the money from a bank: a first for any healthcare institution in BC. Together with the Treasury Board, we put the loan out to tender, and Royal Bank of Canada submitted the best bid.

Financially, Royal Bank saw Vancouver Hospital as a client with limited risk. With an annual operating budget of over $500 million (more if you factor in doctors' billings), a site that has been in existence since the turn of the century, and an acute-care function for the entire province of BC, Vancouver Hospital seemed to the bank a safe bet. The interest rate we negotiated was only marginally above government borrowing rates - without any government guarantee.

Although financing was not finalized until 1997, implementation of the IDX Patient Care Information System began in late 1996, and the initial modules of Admitting, Discharge, Transfer, Pharmacy and ER were activated in November 1997. Full activation of the 30-some modules will be phased in over the next 18 months. Operating savings, estimated at $15 million annually, will be generated by re-engineered patient care and work redesign, although some of these savings will be offset by additional system operating costs, e.g., the addition of a "Help" desk.

Tinkering in the Lab

Simultaneously, in early 1996, a parallel initiative, developing a new Laboratory Information System (LIS), was begun. A new LIS is a key component of restructuring laboratory services to position VH as the provincial leader in providing core lab services to other facilities in the region and throughout the province. Although the LIS is much too complex to discuss in detail here, its mention is necessary since it is a critical aspect of the PCIS implementation. This new system replaces the non-integrated, aging and dysfunctional information systems currently used in the labs and is also an integral link with the PCIS, making orders and results seamlessly transmittable in real time, and in timely fashion enhancing (and accelerating) patient care. Furthermore, without this system, no patient care system could operate in any rational fashion given the essential component that lab results play in the clinical field.

Laboratory re-engineering and a new LIS is expected to reduce annual operating costs by $5.5 million, representing 19% of

laboratory operating costs before restructuring. The reduction stems from increased efficiencies, consolidating services, automation, reduced material handling and duplication, as well as work redesign. Between the two major sites (UBC and VGH) Laboratory Services expects to reduce its staff by 90 FTEs, representing a 25% reduction in labour costs. The bulk of the project was implemented over a one-year period and total implementation costs are estimated at $10.1 million. The project has a payback period of 1.6 years and will yield an internal rate of return of 70%.

Redesigning Work

It is not possible to integrate automation and information systems without initiating work redesign. The entire purpose of computerization is to save time, labour, duplication, and to assist in clinical activities. The only effective way to do this is to fully engage those staff involved in these activities; this effort takes time, but in the end is the only way to ensure effective change. This process creates a dilemma for the staff in some cases, since the redesign will substantially alter either their own work or that of co-workers. We believe that an organization-wide work redesign initiative within Vancouver Hospital could substantially alter the work of as many as 1000 FTE staff positions if the services they provide were to be supported by state-of-the-art information systems. (Of those 1000 positions, 100 would be eliminated through natural attrition, 700 absorbed through redeployment within Vancouver Hospital to meet the strategic-direction priorities of our organization, and the remaining 200 redeployed through transfer to other facilities and organizations within the jurisdiction of the Vancouver/Richmond Health Board.) The challenge is to achieve these efficiencies while remaining a responsible employer. To that end, it will be necessary to retrain these individuals, since we believe that we are on the verge of a major labour shortage in healthcare.

More germane to the issue is the work process and the steps and decisions that individuals make in the course of their daily tasks in the hospital. Dr. David Ostrow, our physician champion, talks of the importance of extensive caregiver input into any new technology, an approach we have recognized at Vancouver Hospital right from the start through our committee recommendations. Too many hospitals have focused solely on the technology and not on the users. "Information is not an end unto itself. Neither, no matter how elegant, is the system," writes a BC physician in the Medical Post (May 12, 1998). "The single reason we need information (whether it's carved in tablets, scribbled on notepads or just a mouse click) is to make sure that physicians and nurses, the healthcare infantry out there at the sharp end, can make intelligent and immediate decisions about how to treat the sick and the suffering ... [But] how do we get our medical infoneeds across to techno-wizards whose understanding of bytes and programs is far superior to that of physicians whose simple mandate is to stamp out disease and save lives? Not easy."

The solution, as BC Tel discovered, is open dialogue, listening to clinicians' concerns, and valuing the intellectual capital which they bring. BC Tel Advanced Communication VP and General Manager Jim Grey freely admits that at the outset BC Tel had little sense of the extent or the complexity that implementing a PCIS entailed. But once caregivers realize the system allows them to do a better, more effective job (and that their input is not only welcome but actively solicited), their support is total. And in contrast to the inflexibility that provincial ministries of health often accuse clinicians of in the face of rapid change, when doctors, nurses, and other caregivers are allowed input change, their resistance is almost nil. As soon as clinicians realize that what you're doing is going to allow them to do a better job, says Grey, they come on board very quickly – much more so than people in other industries.

A Work in Progress

Ultimately, a PCIS will allow caregivers to deliver better patient care, not only the basic input (where information is entered directly into the system instead of instructions being given to a ward clerk, who then enters it), but also in terms of speed and accuracy. Clinical documentation, for instance, becomes instantly available anywhere in the hospital, which means that vital signs, for instance, need only be done once. Results reporting, which includes lab, pharmacy, and other test or procedure results, are quickly accessible. Perhaps most interesting is the linkage made possible in what is almost an electronic chart. More like a library than a mere record, the new computer workstation which houses the PCIS will also make it possible for bedside caregivers to access medical information online or to call up, on CD, textbooks and reference material such as the CPS or medical textbooks. This feature is a boon for a major teaching hospital like ours.

With the PCIS in operation basic savings accrue from less duplication and from less manual transporting of orders and information. Problems of illegibility (Thrush 1992) and issues relating to drug interactions and problems can be quickly caught, which not only makes operations more efficient but improves safety and the quality of care. Numerous studies have shown, for instance, that adverse drug reactions are more speedily seen with computerized surveillance. This feature reduces hospital stay: patients with adverse drug reactions tend to stay in hospital an average of 17 versus 14 days and have higher hospitalization costs (Evans 1992). A computerized laboratory alerting system significantly improves quality of care (Tate 1990), and computerized reminders to check high-risk patients have also been shown to affect patient care (Rind 1991). W. Friesdorf (1992) concludes: "Computing tools based on clinical thinking and adapted to different situations can ensure accurate, clear, and concise patient care communication among the members of the ... care staff." Good entry records can even create automated reviews, discharge notices, and other data-based tasks currently taking up clinicians' time.

Challenges and Frustrations

Installing and implementing new technology is always frustrating. Computerization is such a rapidly expanding field that by the time one system has been approved a newer one makes it obsolete. Individuals also tend to become quite passionate on the subject (witness the Apple/PC debate). At Vancouver Hospital, we found that there were always those who wanted to second-guess the decision. The inordinately lengthy period this decision took was also immensely difficult, especially given the monumental changes already brought about by regionalization; but on the plus side, this prolonged effort meant that over time three different reviews were done and all agreed that we had made the right choice. First, the original Fleming report clearly stated that the PHAMIS-LastWord system was the best one available; then, when BC Tel came on board, it contracted Ernst & Young to do an independent review. They confirmed the Fleming findings. Finally, when the Vancouver/Richmond Health Board was formed, it decided on its own review and hired Deloitte and Touche, who reiterated the superiority of PHAMIS-LastWord. Naturally it was gratifying to have our original plan thrice-corroborated; meanwhile, the process meant delays and further expense that we didn't really need.

What nearly did undermine the whole project was the sheer length of time it took and the administrative changes we had to weather throughout the process. Originally, our plan called for a system solely for VGH. A scant six months later we had to include UBC Hospital site, and incorporate a Meditech proposal which had been undertaken for UBC's computer-upgrade needs. This added a considerable level of complexity to our computations and took up an enormous amount of Finance Department time. An additional compounding factor was the number of changes, alterations, modifications and mergers, consolidations, and closures our organization underwent, which resulted in the business plan being revised and the numbers reworked, several times. Originally, we had factored in only the realizable labour savings in nursing and ancillary costs; but with the adding-on of UBC Hospital site, we had to expand our scope and include all possible savings and project any cost advantages that would come from automating both sites. It certainly didn't help that during the five-plus years it took to get the plan operational we dealt with four Ministers of Health and five different deputy ministers.

Nonetheless, the partnership with BC Tel has had an unexpected benefit: Even though we have had to accelerate implementation of the new system at the UBC Hospital site because of potential Year 2000 problems, we are saving money by avoiding significant upgrading costs to the old system.

It's been a long and sometimes arduous road - what one of our BC Tel partners calls "a journey of discovery." But we've made enormous strides in our understanding of both existing and possible systems, even as we've learned about the enormous potential that a truly sound, clinically based and comprehensive PCIS can have for hospital operations. We've undertaken a new way of funding a healthcare initiative and gained some autonomy in the process. While changes in healthcare and in provincial health policies did set us back, each backward step made us more knowledgeable and better-prepared for the next step forward when it finally came. The more components of the integrated Patient Care Information System that become functional, the more we realize we've only just begun to plumb the system's possibilities and its potential for research, improved administrative functions, greater efficiency and, most important, enhanced patient care at Vancouver Hospital. HQ

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