

An Aging Population: Challenges to the Electronic Health Record Development and Health Informatics Community

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ABSTRACT

Baycrest Centre is one of the largest Academic Health Centres in Canada serving the aging population. As such, it has very complex information management (IM) requirements. Recently, a research project was carried out to determine the extent to which electronic health record (EHR) technologies are available and implemented within long-term care (LTC) organizations of comparable dimensions. Data collection included Internet searches and telephone interviews with targeted technology vendors and facilities. Results showed that although there are many superficial similarities between LTC and acute care, care delivery models and processes are so different, and the IM and EHR needs so unique, as to require different technology solutions and information management approaches. However, progress in development of relevant LTC solutions has been slow – 70% of vendors have chosen not to participate in LTC applications development. LTC facilities also expressed frustration with the fact that implementing an EHR is an extensive and expensive process, and yet there is minimal evidence to lobby for its implementation. Research to date has shown that benefits cannot be measured on a return-on-investment basis. Empirical data remain limited, and most benefits have historically been of a qualitative nature. Given the lack of evidence and a viable technical solution, it is not surprising that most LTC facilities have struggled to advance in the implementation of EHRs. This article presents a number of challenges to both the vendor and health informatics communities. Without appropriately addressing these challenges, relevant solutions for IM in LTC will fail to meet the well-established and much-discussed demographic of an aging population that is growing exponentially.

BAYCREST CENTRE IS ONE OF THE LARGEST Academic Health Centres in Canada serving the aging population. It is an Academic Centre affiliated with the University of Toronto. Undergraduate, graduate and postgraduate students come to Baycrest to gain clinical, practical and administrative experience in their chosen field of study. The Rotman Research and Kunin-Lunenfeld Institutes housed at Baycrest promote effective care and improved quality of life for the elderly through pure biological and applied research in aging, geriatrics and gerontology.

The Centre encompasses specialized geriatric services; long-term residential care; ambulatory, day and community programs; Baycrest Hospital (composed of 300 complex continuing care, rehabilitation and psychiatric beds); a Home for the Aged (an LTC facility with 472 beds); Baycrest Terrace (a 204-apartment complex with support services for older adults); and the Elm Ridge Group Home for Seniors (a 14-bed home offsite). Other programs for the elderly include Day Care, which provides onsite activities for seniors living in the community, Special Day Care for individuals with cognitive impairment, and services of the Regional Geriatric Program. A Life Lease condominium opened recently with 120 units.

Community-based services are offered, including Baycrest Home Care Service (nursing, homemaking and personal care services); a Community Recreation Program (offered within seniors' apartment buildings); a Seniors Support Program (telephone and group support services to caregivers and elders); and care to seniors in Toronto Homes for the Aged (medical and dental services). Partnerships for clinical and support services are also in place outside Toronto. For example, geriatrician services are provided to Northern Ontario communities. Some of these are made possible by Telehealth initiatives.

As a result of Baycrest's span of involvement in service delivery, education and research, its IM requirements are very complex. In addition, its vision of "Reaching Out, Reaching North

and Knowledge Management" places significant demands on the organization to provide an infrastructure that manages information as a strategic resource. Given these challenges, Baycrest completed the development of an Integrated IM Strategy. This direction will enable Baycrest to deliver services beyond the walls of the organization through the use of technology and informatics structures. The strategy has three main thrusts: (1) Enterprise-wide Decision Support – Clinical and Business; (2) Reaching Out (Telehealth, Web); and (3) Knowledge Management.

As part of the strategic planning process, a research project was undertaken focusing on three areas. First, it conducted a high-level review of the LTC environment and the challenges facing this sector. Second, it researched a number of vendors to determine technologies available to service LTC IM and EHR needs. Third, it benchmarked Baycrest's IM systems and EHR capabilities against its peers in the LTC market. The outcomes of this research enabled the senior management team to make informed decisions on what IM and EHR strategic directions to pursue. This article provides a summary of how this study was conducted, the findings of the research, and a discussion of the implications of the study's results to Baycrest and the LTC and the health informatics sectors.

MATERIALS AND METHOD

A review of the literature and best practices research of peer organizations, and selected vendor technologies, was conducted in order to determine the extent to which EHR technologies are available, and implemented, within LTC facilities similar to Baycrest. The key mode of data collection included Internet searches and telephone interviews with targeted vendors and facilities. Technologies relating to the EHR that were investigated included the following:

- Integrated patient management system.
- Clinical data repository.
- Data warehouse with on-line analytical processing tools.
- Decision support.

- Electronic documentation management.
- Connectivity – Intranet, Internet.
- Miscellaneous enabling technologies such as: graphical user interface, data entry modalities, multimedia capabilities, alternative service providers, vendor Web-enabled applications, and service/knowledge portals.

The availability of these technologies for the LTC sector was the primary topic of discussion with the vendors. Vendor/technology research was focused in two distinct areas: (1) niche players whose core business is specific to LTC – four vendors; and (2) industry players with revenues over C\$50 million – seven vendors. Participating vendors for this exercise were selected on the basis of the following criteria:

- “Best of Breed” status by benchmark reports; for example, KLAS Reports.
- Healthy market performance – review of 1999 fiscal year-end EDGARs from Stock Exchange Commission (SEC).
- Key analysts within U.S. and Canadian private industries and selected healthcare organizations.

An interview guide was designed for the phone interviews as part of the facilities research, comprising a series of questions that established the following:

- Scope of services the organization provides – continuum of geriatric care.
- Academic and/or research affiliations.
- Stage of EHR evolution within an organization – clinical data repository, electronic medical chart, or electronic health record.

Facility research targeted 18 organizations representing the following areas:

- Integrated U.S. national LTC industry players – five Integrated Health Systems.
- U.S. local integrated healthcare facilities – three.
- Canadian acute facilities with LTC services – three.
- Canadian LTC facilities – two.
- Independent not-for-profit LTC facilities – five.

Facilities were selected and reviewed after consideration of the following:

- American Hospital Directory for similar size in terms of beds, visits and physicians/nurses.

- “Best of Breed” status by benchmark reports (JCAHCO, Top 100 Hospital Report, Contemporary Long Term Care Magazine).
- Healthy market performance – review of 1999 fiscal year-end EDGARs from Stock Exchange Commission.
- Verbal references from key analysts within selected U.S. and Canadian healthcare organizations.

Discussion of Results

LTC ENVIRONMENT RESEARCH

The results of the LTC environmental scan clearly demonstrate the lack of attention given to the IM and health informatics fields within the LTC sector. Even though it is well established that world demographics are resulting in an increasing population of age 65 and over, the field of health informatics has not begun to address this population’s unique information needs in the healthcare realm.

Current philosophies of “Aging in Place” require a new look at information technologies and their ability to enable seniors to stay at home and receive services in a non-institutional environment through Telehealth and Tele-Home Care. This approach to service delivery requires a significant paradigm shift to the creation of EHRs. However, Canada has significantly under-invested in IT in the LTC and home care sectors. As a result, organizations do not have the capacity to build the required infrastructure needed to support information needs for the booming aging population. Elder care is complex and characterized by a multiplicity of social and non-medical information needs. Acute care settings are typically driven by rapid throughput. Alternatively, LTC settings have patient records spanning anywhere from three to 20 years with very different dimensions than a single encounter for heart surgery or emergency room services.

One question often discussed in the literature is, “How different are LTC information system needs to those of acute care?” In fact, LTC system requirements have been misunderstood. LTC application systems are no more complex than acute care applications. Key

workflow processes are common to both acute care and LTC – clinical assessment and care coordination/planning, orders/results/reporting, admission/discharge/transfer and billings/accounts receivable. Automation of these workflow practices is highly desirable in both acute care and LTC to support workflow efficiencies and to reduce time, duplication of documentation and adverse drug events. There is no clinical significance to indicate that automation is required in one sector more than another. The need for detailed information for clinical decision-making exists in both sectors and can have serious and adverse effects if not completed in a timely manner.

Within each of the workflow processes, however, the associated activities, the manner

and frequency in which they are executed, and by whom, are different. A key consideration in this difference lies in the fact that within acute care, clinical resources are primarily sourced from within the facility, whereas in LTC, clinical resources are outsourced. Hence, there is a greater need by LTC facilities to rely on external interfaces to ensure the continuous and consistent flow of clinical information between systems. Unfortunately, this integration is limited due in large part to the lack of well-developed internal network infrastructures and IT support staff within LTC facilities. Table 1 outlines a comparison of acute and LTC system requirements. Overall, there are similarities between LTC and acute care information requirements at a workflow process level. But it

Table 1: Acute versus LTC IT System Requirements

Clinical Process	Acute Care	LTC
1. Assessment & Care Planning	<ul style="list-style-type: none"> • Discipline-specific critical pathways for well-defined clinical groups • Case mix groups based on medical diagnoses • Focus on arrest and control of medical symptoms & conditions • Focus on patient 	<ul style="list-style-type: none"> • Interdisciplinary management of a standardized care plan, e.g., minimum data set • Resource Utilization Groups • Focus on functional activities of daily living • Focus on not only resident, but family
2. Orders & Results/Reporting	<ul style="list-style-type: none"> • Physician order entry of diagnostic and therapeutic tests • High-volume tests from multiple dept.; results are required immediately or within a short time span • Orders comprehensive • Clinical departments are usually in-house 	<ul style="list-style-type: none"> • Reliance on interdisciplinary orders • Low-volume tests from one or two depts; results can be completed over weeks, not hours • Orders by exception • Clinical departments are outsourced or referred out for execution & completion
3. Admission, Discharge & Transfer	<ul style="list-style-type: none"> • Multiple across various settings within a day • Resource utilization statistics based on average length of stays, resource intensity weights, and complexity of co-morbidities • Bed management review highly optimized; high turnover • First come, first serve; maximize admission to optimize potential bed days; elective and emergency encounters • General patient history 	<ul style="list-style-type: none"> • Minimal and usually between fixed settings • Resource utilization statistics focused more on case mix indexes, classification levels, and presence or absence of specific clinical entities, e.g., disruptive behaviours, urinary incontinence • Periodic leave of absences of residents; hospital holds • Priority-based waiting lists with referral tracking based on unit characteristics for admission onto bed – criteria-based admission • Detailed resident history and patterns; contact information complex related to power of attorney, living wills, and financial issues
4. Billings & Accounts Receivable	<ul style="list-style-type: none"> • Patient-managed finances • Health Insurance Plan, Fee for Service, some private pay • Departmental charges; billing upon discharge • Global Funding; hospital-specific cost allocation 	<ul style="list-style-type: none"> • Resident Trust Fund • Per diem rate; some private pay; coordination of resident participation with government support • Monthly payments with some advance private pay • Prospective payment systems based on resource utilization groups

is evident that the activities within each of the workflow processes are different. Hence, the IM and EHR needs are unique as to require different information systems.

VENDOR/TECHNOLOGY RESEARCH

Historically, clinical information system investments in LTC have lagged compared with those of hospitals and integrated delivery networks. This lag in spending is due to several reasons: (1) LTC facilities in general have less access to capital to invest in technology; (2) there have been fewer perceived requirements for automation in LTC compared to other care settings; and (3) less attention has been paid to information systems from LTC senior management. In fact, the LTC industry has not been known for significant investment in IT. Many if not most LTC facilities have legacy-based systems developed in-house to meet short-term needs. However, some facilities in the United States have begun to install integrated enterprise-wide management systems due to the move towards more prospective payment schemes (PPS) by government.

Currently, the LTC environment is composed of small, boutique-sized vendors. Applications developed by some of these vendors have emphasized the financial and administrative aspects of healthcare over the clinical needs of health professionals related to care planning and coordination, results/reporting, physician order entry, care pathway and automation, and clinical decision support. These vendors typically have completed system implementations for stand-alone facilities and, for the most part, have had limited experience in meeting the integration needs of large national and regional LTC providers. Integration for some of these vendors has focused on the financial aspects of LTC facilities, with functionality generally limited to basic financials (i.e., billings, accounts receivable and general ledger). These applications, however, have not typically been integrated with clinical applications.

In the past, vendors have not focused on investing and developing integrated solutions specific to LTC due to the lack of profitable business cases. This is changing, however. LTC

facilities are no longer composed of the traditional single facility with provision of one to two clinical service programs. Most small and local LTC facilities have merged or been acquired by large, private LTC national and regional providers. Other facilities have positioned themselves alongside medium to large academic facilities or community health centres to form large and more vertically integrated delivery systems.

Overall, LTC facilities are shifting to reflect a more comprehensive continuum of service. Care is no longer viewed as an episode, but as a continuum where care management and continuity of services is not only desired but also expected by residents and their families. These include, but are not limited to, community-based care (e.g., home nursing services), assisted and supportive-living services, and sub-acute care programs. As a result, LTC vendors are being pressured by these LTC facilities to develop applications to support the LTC EHR and IM connectivity needs of a comprehensive and complex LTC environment.

Limited access to episodic clinical records and care plans will be replaced by shared access to longitudinal information across different services and across various clinical settings. Facilities reflective of this trend in the United States include: Genesis Health Ventures in Kennett Square, Pennsylvania; Jewish Home and Hospital in New York City; Miami Jewish Home in Miami Beach, Florida; Hebrew Rehabilitation Center for the Aged in Boston, Massachusetts; Masonicare in Wallingford, Connecticut; North Shore Long Island Jewish Health System in Long Island, New York; and Philadelphia Geriatric Center in Horsham, Pennsylvania. Examples in the Canadian health system include: Lakeridge Health Corporation in Oshawa, Ontario; Sudbury Regional Hospital in Sudbury, Ontario; Trillium Health Care Centre in Mississauga, Ontario; and Providence Health Centre in Scarborough, Ontario.

Research shows that 30% of vendors are in the early stages of development of computerized patient records, enterprise resource systems and outcomes analysis/reporting for LTC. Certain vendors are trying to respond to the

LTC market quickly by adapting acute care software applications. Vendors are also simultaneously working with LTC facilities to develop appropriate systems specific to LTC work processes. For example, some vendors have, in the last year, developed a module specific to LTC, which encompasses MDS-RUGS III and care planning functionality. However, starting with an acute care system and adapting it to serve the aged is unlikely to result in something that truly meets the needs. A different paradigm is required when developing technology that will serve the LTC population.

A dilemma facing these vendors is that, as they develop solutions for existing needs, LTC facilities rapidly develop additional functionality requirements. Another distractor for large, top-choice vendors is the current low levels of customer satisfaction they are experiencing in the acute care sector. Managing a large customer base with a magnitude of features, while introducing/testing Web-based technology, has made their ability to profitably service their customers very difficult. Given these challenges and business risks associated with the LTC sector, it is not surprising that 70% of vendors have chosen not to participate in LTC applications development. LTC vendors in general are slow to upgrade and enhance their existing systems to meet the level of sophistication and integration needed in LTC care environments.

Large clinical application vendors such as McKessonHBOC, Cerner Corporation, QuadraMed, Per Sé Technologies, Meditech, and Epic Systems Corporation are attempting to meet the needs and address the issues of the LTC environment. These vendors have developed or are currently developing large, enterprise-wide application systems specific to LTC. The involvement of these vendors in LTC has been driven by the expansion of LTC services within vertically integrated healthcare delivery systems, creating the need for common registration systems, master patient indexes and clinical documentation systems. Such delivery systems are capable of financially supporting such implementations. Functionalities within each of the vendor offerings vary. Each of the

vendors, however, has included key specifications to ensure that the systems are fully operable within LTC settings. These include, but are not limited to: adoption of open standards, interface to other health providers, service capture at the point-of-care, computerized physician order-entry, and rules-based engines for flexible and real-time clinical decision support. The vendors that have the highest likelihood of success are those that recognize that acute care systems will not work for LTC and that systems need to be built to reflect the clinical workflow issues of long-term-care providers. Some examples of these exist in the marketplace today.

FACILITY RESEARCH

Several key trends and common themes were noted among the facilities that were interviewed in this study. Providers are no longer buying costly and sophisticated systems/technology for unmet needs. Instead, facilities are shifting from developing/installing software to managing knowledge within their organizations. Budget pressures are forcing LTC facilities to spend less on systems and technology. In the more recent past, large-scale LTC industry providers have acquired/purchased numerous systems and technology due to the recent Y2K demands. Therefore, most, if not all, of these facilities possess unused "power" in their current systems and technology.

Some LTC facilities are adding Web-based technology features to draw value out of systems/technology already bought and installed. New computer tools deploying Web-based technology are supplementing and filling gaps in existing systems. In fact, some providers are investigating and reaping the benefits of five-year-old information systems before spending more on new software applications. A drawback to this option is that not all systems have sufficient power as initially proposed and the installed features to serve newer priorities in healthcare operations (e.g., a comprehensive clinical information exchange with physicians). Therefore, the trend in LTC is to lean towards demanding near-term value out of technology while developing people's skills and knowledge in IM, technology and decision support.

Another key trend among LTC facilities is the recognition of process redesign as being essential to successful selection, and eventual implementation, of technology. LTC facilities are learning that automation will not solve what is still problematic – in fact, the processes associated with the provision of care need to be improved first and foremost. In other words, computerization of an inefficient care process results in an even more computerized, and inefficient, care process.

Related to the need for process redesign is the movement towards regional healthcare operations. Hospitals and community services are consolidating into integrated health networks and, as such, have the potential of gaining benefits from economies of scale. However, a critical success factor in this partnership is the need to integrate IM processes along with clinical and financial data within, and between, care settings. Confounding this need for more integrated data to support cost-effective management of services is the number of disparate legacy systems and applications that currently exist within an enterprise. Unfortunately, the cost of replacing these systems with a new integrated solution is currently limited by the lack of support in terms of finances and information technology staff.

This situation has given rise to a recent trend in which some facilities are focusing on fully optimizing the functionality within existing vendor product installations. For example, a team of experts will review established activities in the organization, decide on ways to change or enhance an activity, and then tap the capabilities of the installed software to improve performance. Electronic IM solutions vary considerably among LTC facilities. Some organizations are still in a restructuring mode, with limited technology and non-automated clinical documentation systems. Those that have electronic information are moving towards integrating their systems and applications with larger acute care systems to optimize cost and efficiencies. Others develop “home-grown” applications, which lack an open architecture and do not support a Windows environment, or even outsource their applica-

tions to address absent or poor functionality. Only a small proportion of LTC facilities have opted for large-scale enterprise-management vendor solutions.

Those facilities that have decided to move towards an electronic patient record have had to decide whether to go with an enterprise-integrated solution versus a “Best of Breed” solution. Their decisions have not been made easily due to the wide variation in opinions on this issue. Some advisers have told facilities that unless they approach this in a totally proprietary manner they will not survive, while others believe that an open network is the only key to survival in the new healthcare environment and that LTC facilities should assume an integrated systems strategy and fill in the gaps with best of breed systems. Selection on the right strategy has been made even more difficult due to the lack of any tangible evidence demonstrating the value of electronic patient records.

Baycrest, along with a number of other facilities, has undergone its own studies to determine the business case for the EHR. The results show that empirical data remain limited and that most benefits have historically been intangible. Recent studies are beginning to indicate some cost savings in the areas of supply chain management, administrative/clerical functions and health record-keeping. However, few studies document direct patient care savings, but indicate some savings related to indirect care aspects such as order entry and medication administration/documentation. LTC facilities expressed their frustrations with the fact that the implementation of an EHR is an extensive and expensive process, and there is minimal evidence to lobby for its implementation. Research has shown that so far the benefits cannot be measured in dollars and cents. Given these discrepancies and the lack of a “best practice” for LTC, it is not surprising that most LTC facilities have made little progress with implementation of electronic patient records.

CONCLUSIONS

Overall, LTC facilities are facing environmental challenges no less significant than those being addressed by the acute care sector.

Baycrest, not unlike other large LTC organizations, has a greater need for information sharing and decision support (in the areas of clinical management, research and education) than ever before. Unfortunately, in general, relevant solutions to meet the needs of electronic patient records and knowledge management for the LTC sector are not currently suitable, available or affordable.

Both LTC facilities and vendors must take up the challenges discussed here to respond to the IM and EHR needs of the long-term-care sector. LTC facilities can start by taking on a more value-based business view of technology solutions. This is essential to moving forward in an ever-changing environment characterized by greater clinical demands and proportionately less funding. Key value-based technology success factors include the following:


1. Ensure a clear mandate, sufficient funding and support from both senior management and the board for moving towards an EHR as a strategic direction for the organization.
2. Invest first in implementing a solid and robust technology architecture, allowing for future growth.
3. Demand functionality designed for automation in lieu of manual employee work.

4. Closely monitor, and try to influence, vendors to develop relevant, viable and affordable solutions for LTC.

5. Establish mechanisms to clearly realize maximum value from technology investments and, most important, ensure that all change management issues are addressed throughout and post implementation.

In response, the challenges that vendors need to address include the following:

1. Recognize the complexity of LTC and rise to the challenge by providing solutions specific to this growing sector.
2. Do not “make fit” existing acute care systems, but rather develop new ones in partnership with experts in the clinical realm.
3. Develop pricing structures that recognize LTC funding.

Finally, we present a fundamental challenge to both the vendor community and health informaticians to consider the aging population as requiring a different paradigm. Without sufficient knowledge and application of LTC theoretical frameworks, *relevant* solutions for information management and electronic health records will continue to be a dream instead of a reality. 

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