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# Implementation of a Healthcare Information System in Lithuania

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## Abstract

*This paper presents a general overview of the process of implementing a hospital information system in Lithuania, one of the post-Soviet transitional economies in the Baltic Region. This country was chosen in order to illustrate an example of the many issues and tasks undertaken by a new member of the European Union to reorganize its healthcare system to provide an improved level of care previously unavailable to its population under Soviet administration. This reorganization focused on the European Union eHealth action plan that defines a number of targets. The first target was for all member states to develop roadmaps for eHealth by the end of 2005 in anticipation for supporting the deployment of health information networks based on fixed and wireless broadband, mobile infrastructures, and Grid technologies by 2008. This eHealth strategy, called Baltic eHealth, would develop a trans-national digital eHealth infrastructure based partly on existing data networks. This paper presents how a teleradiology application was implemented within this eHealth program into a healthcare system with limited resources but needing to improve service quality while expanding its capacity to meet increasing demand.*

## **Introduction**

The process of reorganizing and improving the Lithuanian healthcare system began in 1990 when it regained its independence from the Soviet Union and continues to this day, even after its accession into the European Union (EU) in 2004. In order to restructure their organizations to remain viable within these new constraints, healthcare system administrators are realizing the need to utilize more effective management methods. One of the priorities of this reorganization effort was the improvement of the knowledge base and consultation ability of physicians in the diagnosis and treatment of medical-surgical conditions at Kaunas Medical University Hospital, a large urban hospital in Kaunas, Lithuania where most of the nation's medical and nursing practitioners are educated. The purpose of a recent local healthcare information technology (IT) initiative, known as the Litmed Project, was to improve the quality of medical education, diagnosis, and treatment across distance, beyond the academic and/or hospital setting. Developing an IT system for storing and accessing images from telemedicine system archives connected to medical instruments for integration with a pathology laboratory system for eventual expansion to an electronic medical record (EMR) system is the ultimate goal of the national eHealth strategy for Lithuania.

## **Background: Country and Healthcare Sector**

Lithuania is the southernmost and largest of the Baltic countries. It covers 65,000 square kilometers and has a population of about 3.7 million. After severe social and economic shocks in the initial years after independence, the economy stabilized and growth began in 1995. After independence and during economic transition, aggregate health indicators for mortality and morbidity further

deteriorated in comparison to its period under Soviet occupation. Lithuania was incorporated into the European Union in 2004. However, even after accession, there is still a gap in health status compared to EU countries due to the fact that the Lithuanian health system suffers from problems similar to other countries in the post-Soviet regions that include excess hospital capacity, weak primary health care, over-reliance on hospital inpatient treatment, outmoded equipment, inefficient purchasing practices, high level of corruption, and inefficient use of facilities and economic resources (Lithuania Health Report No. PID6544. Retrieved, August 14, 2006, from <http://www-wds.worldbank.org>).

Overall, healthcare reform in countries of the former Soviet Union is still slow and fragmented. Although healthcare providers are anxious to acquire technological advancement within their individual practices, they are also anxious to see improvement in the total quality of clinical practice, service provision, and overall organizational management. However, their ability to monitor and control costs, to develop and implement professional practice standards like those being used in Western countries, and to manage and develop human resources, is rudimentary. Sustainable programs for system improvements are hampered by changes in governance and policy at the MOH (national) level and the managerial ability and strength of commitment to change programs by leadership at the organization (local) level (Cholewka, 2004). However, demands by practitioners and patients for advanced technology and improved healthcare services, as well as the burgeoning use of economic accountability standards by government, investors, and regulators, are helping to drive the healthcare sector's transformation. According to the World Health Organization (WHO), post-Soviet transitional economies still have inadequate

information management systems in place for financial and management accountability, monitoring, and evaluation of national and local system operations (World Health Organization, 2002).

In general, a recent paradigm shift has occurred within the healthcare sector throughout the world from an obsession with curing diseases to an interest in prevention; from problem identification toward outcome-specification; to systems designed for patients rather than physicians; from isolation to networking; from the bottom-line and profit to community good; and from competition to collaboration (Cholewka, 2006). In tandem with these goals, is the major focus of the WHO for restructuring post-Soviet healthcare systems for sustainable development that directs the reorganization of medical care towards health promotion, prevention, and primary healthcare through the application of eHealth strategies. The WHO defines eHealth as “the use, in the health sector, of digital data – transmitted, stored and retrieved electronically – in support of health care, both at the local site and at a distance” (WHO Department of Essential Health Technologies, 2004). But Richardson expands this definition by implying that eHealth is “not only the application of new technologies, but also a fundamental re-thinking of healthcare processes based on using electronic communication and computer-based support at all levels and for all functions both within the healthcare service itself and in its dealings with outside suppliers” (Richardson, 2002). By definition, this eHealth strategy would most likely have to incorporate community participation and intersectoral cooperation and involve four categories: clinical application (telemedicine), healthcare professional continuing education, public health information and education for patient empowerment, and public health policy development (Richardson, 2002).

However, in order to satisfy increasing consumer demands for better healthcare within available resources, Jones et al (2006) believe that policy makers must ensure the effectiveness of eHealth by steering the right mix of eHealth applications to achieve the goal of increasing benefits at stable costs and supporting investment in eHealth by providing the appropriate legal and economic investment environments that facilitate innovation (Jones et al, 2006). Thus, eHealth complements the WHO focus on the sustainable development of primary health care, that is, a participatory process that involves the community in the design and implementation of healthcare promotion and development activities. In 1978, the concept of Primary Health Care was adopted in the Alma Alta Declaration at the World Health Organization-UNICEF Conference at Alma Ata (now Almaty), Kazakhstan as follows:

Challenges society to address the socio-economic causes of poor health and makes provision for basic health needs,

Encourages community empowerment (ensuring that people are fully able to manage resources that are available to them),

Provides comprehensive quality health care including promotive, preventive, curative, rehabilitative and palliative services,

Demands concerned and accountable health worker practice,

Prioritises the people who are most disadvantaged ensuring that health care is accessible, equitable and affordable to all,

Recognises the importance of integrated service provision from primary to tertiary

levels of care within a coherent health system, and

Promotes inter-disciplinary, multi professional and intersectoral collaborative teamwork for development (National Progressive Primary Health Care. Retrieved August 14, 2006, from <http://www.hst.org.za.pphc/phcdef.htm>).

Tisch and Wallace (1992) stress that in order for development to be sustained the following issues must be addressed:

Projects should utilize existing local leadership instead of creating new structures that may not be socially or historically sustainable,

Projects should stress intersectoral participation,

Accountability for project implementation should be intersectoral and not merely the responsibility of a few people,

The donor agency and project staff should practice an open management style that includes project beneficiaries to help ensure a wide base of participation and support,

Existing institutions should not be bypassed to create new institutions (except when these institutions prove to be inefficient and ineffective),

Projects should build local capacity to provide technical assistance services, and

Since sustainability is not an automatic by-product of project activities, it should be consciously planned and nurtured (Tisch & Wallace, 1992, p. 42).

In some cases sustainability efforts can be eased through government decentralization of the control of the functions of the healthcare facility to allow greater efficiency of operations. By controlling finance, personnel, and operations locally, facility managers can react faster to environmental changes and make decisions that are advantageous to the organization and community. In order to evaluate the outcomes of operational management decisions, it is essential to establish management information systems that will require investment from various sources including the state, private business, and other investors. Information technology applied to healthcare services is seen as the means to improve the safety and quality of healthcare services. eHealth directed to healthcare delivery encompasses applications that directly support the prevention of illness and disease, patient diagnosis, and patient management and care. These applications include tele-consultations, tele-referrals, forward storage concepts, e.g., tele-radiology and tele-prescriptions, and electronic patient records (WHO Department of Essential Health Technologies, 2004). eHealth becomes the means to transform healthcare services by linking the many sources of data held by multiple healthcare organizations to provide a comprehensive health record with universal standards for content, security, and portability.

The use of eHealth strategies complements the

WHO main focus on primary healthcare. eHealth applications connect practitioners and clients to primary health centers and connect these centers to referral centers in hospitals for the exchange of data, ensuring access to appropriate, cost-effective healthcare (WHO Department of Essential Health Technologies, 2004). Tele-consultations, especially using tele-radiology, connect the isolated practitioner or community health worker with an appropriate specialist for the exchange of digitalized X-ray images, and bring the diagnosis to the primary healthcare level. It is hoped that these tele-consultations will reduce the need for patients to attend hospitals, saving time and money throughout the healthcare system. Hospitals can then focus their resources on patients who need more involved, acute care services.

### **European Union and eHealth Strategies**

The EU, like the United States, is experiencing a socioeconomic transition with profound changes affecting quality of life and quality of work. The EU's central objectives for economic growth and better jobs is driving this transition in the wake of the incorporation of new member states of the former Soviet Union, as well as other factors. In order to reach these objectives, it has been recognized since 2002 that Information and Communication Technologies (ICT) play a crucial role in this strategy (Lisbon Strategy, 2002). The EU health strategy (eHealth, also called ICTs for Health), proposed in May 2002, describes the application of ICTs across the full range of functions that affect the health sector (European Commission web site. Retrieved, February 21, 2004, from [http://europa.eu.int/information\\_society/qualif/health/index\\_en.htm](http://europa.eu.int/information_society/qualif/health/index_en.htm)). This eHealth action plan has a dual approach: 1) to make the most of new information and communication technologies in the health sector and 2) to obtain a better

integration of eHealth policies and activities. It is hoped that this approach will provide a framework for exchanging best practices and experience and enable the eventual development of common solutions to shared problems through the dissemination of health information and data.

The European Commission (EC) has supported research & development into e-Health since the 2nd Framework Programme (1989-1990). The report comprises the EC eHealth Action plan for Europe 2004-2010 and was issued at the EPSCO Health Council in June 2004. The action plan includes a sequential set of actions to be taken by EU member states and the Commission from 2004 through 2010 in three target areas:

Common challenges including setting national roadmaps for e-Health, deploying e-Health systems and health information networks (broadband, wireless, grids); setting targets for interoperability and the use of electronic health records; clarification of legal framework.

Pilot actions accelerating implementation of e.g. tele-consultation, e-prescription, e-referral, tele-monitoring and tele-care.

Evaluation, confirmation of benefits and dissemination of best practices (European Commission web site. Retrieved, February 21, 2004, from [http://europa.eu.int/information\\_society/qualif/health/index\\_en.htm](http://europa.eu.int/information_society/qualif/health/index_en.htm)).

The main objectives of the action plan are to improve access and boost quality and effectiveness of eHealth

services offered in Europe, and enhance the European eHealth industry by making eHealth systems and services more interoperable and integrated. EU countries are planning to assign 4-6% of the health care budget to IT needs, especially orienting it to patient- centered research and innovation projects (Information Technologies for human health – clinical decision support. Retrieved, August 15, 2006 from <http://tmc.kmu.lt/projects.htm>).

Essential target dates for EU member states listed in the e-Health action plan include:

"To develop a roadmap for e-Health by the end of 2005;

Setting up a European Union public health portal by the end of 2005;

Identifying a common approach to patient identifying data by the end of 2006;

Identifying interoperability standards for health data by the end of 2006;

Supporting the deployment of health information networks based on fixed and wireless broadband and mobile infrastructures and Grid technologies by 2008; and

By end 2008, the majority of all European health organisations and health regions (communities, counties, districts) should be able to provide online services such as tele-consultation (second medical opinion), e-prescription, e-referral, tele-monitoring and tele-care (Open Clinical: Knowledge Management for Medical Care, 2006).

At present, a public health portal has been set up to complement the existing European Commission public health web site ([http://europa.eu.int/information\\_society/qualif/health/index\\_en.htm](http://europa.eu.int/information_society/qualif/health/index_en.htm)). This portal will build health capacity by providing citizens, patients, health professionals, policy makers, and other interested stakeholders with a single, pan-European access point for data and information on public health-related areas from various community, regional, and national web sites. The ultimate outcomes of this eHealth plan are: the measurement of better access to healthcare; more efficient, cohesive services; improved productivity of the healthcare sector; more common usage of e-health technology by health professionals, patients/clients, and citizens; more adequately resourced budgets; an increased competitiveness within the healthcare industry, and the generation of jobs within the EU. The EU eHealth policy priorities include:

Building on the European health insurance card with added functionalities such as medical emergency data and secure access to personal health information;

Developing Health Information Networks to speed the flow of health information through the healthcare system; and

Putting health services on-line such as information on healthy living and illness prevention, electronic health records, tele-consultation, and e-reimbursement (<http://www.telebalt.ee>).

### **TELEBALT and Litmed IT eHealth Strategies**

As a means to meeting these EU eHealth policy objectives, the TELEBALT Project was established by the EU. The TELEBALT initiative addressed the issue of European integration of the Baltic States of Estonia, Latvia, and Lithuania into the European Information Society Technologies (IST) and promoted the wider goals of European integration by facilitating the dissemination of scientific, educational, environmental, and business information to encourage mutual knowledge, understanding, and cooperation. In addition, it was hoped that as a result of this project the market potential for IST telematics applications and products will progress significantly both in the EU and the Baltic States' markets (<http://www.telebalt.ee>). In conjunction with this project, a web site has been developed for each of the Baltic States and focuses on a concrete area of application, that is, Estonia – unemployment ([www.telebalt.ee](http://www.telebalt.ee)); Latvia – tourism and social integration ([www.telebalt.lv](http://www.telebalt.lv)); and Lithuania – telematics for business and partnership promotion ([www.infobalt.lt/telebalt](http://www.infobalt.lt/telebalt)). At the 2003 TELEBALT Conference held in Vilnius, Lithuania, topics concerning the application of IT to health included: telemedicine and the way e-Health development would stimulate more active cooperation of the countries and citizens of EU, Central and Eastern Europe and the CIS and eliminate social, political, and economic barriers (<http://www.telebalt.ee>).

Another outcome of this eHealth strategy was the Litmed IT Project; a project initiated to establish a partnership between Sweden and the Kaunas Medical University Hospital in Kaunas, Lithuania, for long-term IT development for healthcare services in the Baltic Region with future expansion to other post-Soviet nations, namely,

Poland, Belarus, Ukraine, and Russia. The duration for this Litmed IT Project was from December 1, 2002 to December 31, 2003.

### **Scope of Litmed Project**

The scope of the Litmed IT Project was to cover the concept of eHealth as defined in the context of eEurope, that is, the application of information and communications technologies (ICT) across the whole range of functions and services which, one way or another, affect the health of citizens and patients, specifically:

- Delivery of care to patients by healthcare professionals,
- Health-related information, and

- Electronic trading of healthcare goods, for example, tele-radiology for diagnostic purposes (eHealth Standardization Focus Group, 2004, p.3).

Within this framework, EU member states establish contacts with newly accessed healthcare entities, in this case, Sweden with clinics for specific specialties in Lithuania and the other Baltic States, for the continuous development of information content and usability of shared medical information databases (Evaluation Report - Litmed I. Retrieved, February 23, 2004, from <http://www.litmed.net/report.php>). It was hoped that interoperability between information systems would be established to reduce costs and increase unimpeded access to quality, cross-border healthcare as EU expansion is promoting increased mobility of its citizens (eHealth Standardization Focus Group, 2004, p.7). According to the eHealth Standardization Focus Group (2004), top priorities for the application of ICT to health identified from national strategies and policies appear to be:

Health/patient records including the medication record;

Transfer of prescriptions;

Communications between hospitals and primary care particularly results requests and reports and referrals;

Protecting personal information, e.g., using public key infrastructure and professional data cards; and

Reducing clinical errors, e.g., through the use of e-prescribing systems with decision support (eHealth Standardization Focus Group, 2004, p. 9).

It was expected that this Litmed IT Project would provide a model for continuation of national healthcare system restructuring and primary healthcare development programs. The objective was to improve access and quality of the primary healthcare system through investments in infrastructure, equipment, and training of practitioners (primary healthcare system gatekeepers) and auxiliary healthcare staff. In addition, it would strengthen the capacity of the Lithuanian Ministry of Health to effectively manage project activities, monitor implementation progress, achieve development objectives, and administer procurement and loan expenditures. This strategy was expected to establish conditions for the continued restructuring of healthcare services on a sustainable level nationally (Lithuania- Health Project, Report No. PID6544. Retrieved, August 14, 2006, from <http://www-wds.worldbank.org>).

### **Goals of Litmed IT Project**

In line with the Europe eHealth strategy, the short range goals of the Litmed IT Project included:

Installing medical imaging equipment for use by various medical specialties.

Creating capacity for database storage of medical image information.

Creating the ability for physicians to edit information relating to diagnosis during the project.

Publishing distance learning/education courses with assistance from Euromed Networks AB.

Assisting the Baltic States in the development of Internet-based medical education and medical reference databases to increase specialist competence.

Computerizing the Pathology Department laboratory system to assist with the management of procedure/test ordering, analysis, and compiling statistics for diagnostic, treatment, and reporting purposes. It is hoped that this improved clinical practice and communication capability will stimulate professional academic exchanges, demonstrations, and seminars between the Scandinavian and Baltic States (Baltic MedWeb I Mission. Retrieved, February, 21, 2004, from <http://213.131.135.6/BalticMedWebPublic/RMP.ro?-DB=BMW.fp5&-Lay=web&-Format=...>).

Long range goals included:

Enhancing the understanding on how health care in the Baltic Sea Region can be supported by telemedicine;

Developing general methods and infrastructure for telemedicine in this region;

Developing specific telemedicine services; and

Forming a support organization for telemedicine development in this region.

Development of telemedicine services in Lithuania has great importance for the Lithuanian health care system. The use of distance training and consultation, using modern telemedicine techniques, would provide professional exchanges between clinical experts for clinical decision support services to Lithuanian and other post-Soviet practitioners for reducing preventable disease, improving quality of health care, and increasing professional expertise (through clinical decision support) of practitioners through. Along with support of clinical processes using telemedicine, and specifically, using tele-radiology, it was hoped that that this cooperation between Swedish and Baltic pathologists would generate business opportunities for pathologists in the Baltic Region with Swedish suppliers of medical information technology services. Collaboration between Swedish and Baltic pathologists would also facilitate building a regional pathology network and encourage study tours, seminars, and other practitioner capital building activities.

### **LITMED Stakeholders**

“All who are, or may be, affected by a healthcare information IT resource (application)

are considered “stakeholders” in it since each has a unique interest and perspective of what constitutes benefit” (Shortliffe, Perreault, Wiederhold, & Fagan, 2001, p.285). Stakeholders in this project include the Swedish government, Stockholm County Council, Skane Region, Uppsala University, Lund University Hospital, TietoEnator Trigon AB and Informationslogik AB (project management); Euromed Networks AB, Sweden, and Siemens Solutions Medical, Germany (hardware and software developers); Lithuanian Ministry of Health, Kaunas Medical University Hospital (KMUH) executive management, IT Department, Pathology Department, physician pathology specialists; Lithuanian and Swedish patient populations as well as Lithuanian and Swedish IT technologists and support personnel (Project Management - Litmed II. Retrieved, June 8, 2004, from <http://www.litmed.net/management.php>). However, the primary users of the system were designated as physician pathologists, specifically, ophthalmologists and otorhinolaryngologists from Lithuania at KMUH and their respective colleagues in Sweden at Lund University Hospital. They receive IT technical support at both institutions (Evaluation Report - Litmed I. Retrieved, June 8, 2004, from <http://www.litmed.net/report.php>). Specific areas of common clinical interest to be addressed would be distance education, shared research and technical evaluation, handling of medical referrals and consultations, developing procedures for routine testing and analysis of results, and compiling statistics for follow-up care (The

Litmed Telemedicine Project. Retrieved, June 19, 2006 from <http://www.bmii.ku.lt/~litmed/project.php>).

### **Benefits for Litmed Stakeholders**

Physicians would be able to improve the quality of their medical education, diagnosis, and treatment abilities across distance through tele-consulting. They would also be able to give better and more effective treatments because the information stored in databases could be used for education, clinical consultations, research and development, reference, physician accountability, and quality assurance purposes. The overall goal, other than a successful completion of this pilot project, is further IT business opportunities between Sweden, Lithuania, and the other Baltic States for eventual IT program expansion to other post-Soviet countries (Evaluation Report - Litmed I. Retrieved, February 23, 2004, from <http://www.litmed.net/report.php>).

### **Project Team and Skill Sets/Characteristics of Members**

An IT laboratory center had already been established in Kaunas where Swedish IT technology was installed and personnel trained through prior Baltic Billion Funds projects. This laboratory provides the conditions necessary for Swedish suppliers of healthcare IT services to make use of KMHU for study tours, demonstrations, seminars, new business ventures, as well as to facilitate this project.

The project team was broad-based and interdisciplinary. Members consisted of stakeholders (see listing in previous Stakeholder Section) from all segments of the healthcare spectrum and worked together, under the

direction of a project management team, to articulate the needs of system users, to define the standards of use, and to monitor implementation funding. Issues related to organizational change, that is, affecting organizational culture and hospital-wide routine and business practices were not discussed (Evaluation Report - Litmed I. Retrieved, February 23, 2004, from <http://www.litmed.net/report.php>).

### **Implementation Plan with Timeframes**

**Phase I (Baltic MedWeb I, 2001):** installing five workstations in KMH Pathology Department. Operational support through Kaunas University of Technology for building and operating a telemedicine infrastructure for storing and exchanging medical pictures within a contained geographical region, the Baltic States of Lithuania, Estonia, Latvia, and Sweden. The main goal being, the establishment of high quality image databases for storing images within the four chosen medical disciplines (Information Technologies for human health – clinical decision support. Retrieved, August 14, 2006 from <http://tmc.kmu.lt/projects.htm>).

**Phase 2 (Baltic MedWeb II, 2002):** connecting the images created during Phase I (Baltic MedWeb I), that is, Electronic Medical Record/EMR (Melior system) with Picture Archiving and Communication System/PACS (Migra system). PACS is an image system that embraces all modalities (X-ray, CT, MR, nuclear medicine, ultrasound) and links users with display workstations over a high speed network to an image server, an archive, printers, and radiology information systems (RISs).

**Phase 3:** Agreement made in August 2003 with the Lithuanian Ministry of Health by TietoEnator Trigon AB to

develop a national eHealth strategy for Lithuania, extending to university hospital units performing primary care. At present, information about progress with this strategy is not readily available (Evaluation Report - Litmed I. Retrieved, February 23, 2004, from <http://www.litmed.net/report.php>).

**Phase 4:** seeking continued funding for ongoing maintenance and future system hardware and software upgrades, and research into the best way to organize and manage the system when faced with advancing technology and training, licensing, and/or accreditation requirements.

### **System Functionality**

The following is a listing of the teleradiology system's basic functionality features determined by practitioner stakeholders:

- Selection of images.

- Scanning of images from selected specialties.

- Installation of images and registration of diagnoses and comments.

- Testing the educational materials for ease of reference and quality control.

- Building the information content of databases.

Ending the project with a fully-operational system and producing a project summary report (Baltic MedWeb I Mission. Retrieved, February, 21, 2004, from

<http://213.131.135.6/BalticMedWebPublic/RMPro?-DB=BMW.fp5&-Lay=web&-Format=...>).

According to H.C. Fisk of TheVirtual Image Courier,

Teleradiology adds a functional layer to the HIS/RIS/PACS hierarchy and is profoundly impacting the nature and speed of image sharing by acting as a virtual courier, transferring images around the world. This system allows users to communicate information in PACS to those outside the network by electronically transmitting both the images and the consultative text to a variety of users, including referring physicians, consultants, affiliated hospitals, and practitioners' home offices, as well as, ambulatory surgery centers, independent imaging centers, and orthopedic groups . . . Many healthcare executives mistakenly believe that if they use teleradiology, they're using PACS; however, teleradiology is an output method, not a linking system. PACS is not a required element for teleradiology, which also can be purchased as a stand-alone system (Fish, H.C., The Virtual Image Courier. Retrieved, August 14, 2006 from <http://www.medicalimagingmag.com>).

### **System Customization**

Design of the system considered the language requirements of the users, that is, the translation of system information from Swedish and English into the Lithuanian language, the business practices of the Lithuanian physicians, and was flexible enough to allow the physicians to customize their entries, that is, it allowed the physicians the capability to edit the information as it was being added to the system. This ability consisted of registering diagnosis and entering additional comments relating to analysis (Evaluation Report - Litmed I. Retrieved, February 23, 2004, from <http://www.litmed.net/report.php>).

### **Equipment Needs**

All hardware and software were needed to initiate and complete the project as the KMH had no such

resources and system infrastructure in place. The system needs for the project were as follows: 1) hardware needs: Image Database Server, MigraPro workstations, including wagons, computers, monitors, cameras (built-in and remote-controlled), microphones, motorized microscopes, connector equipment, and 2) software needs: audio/video interfaces, auxiliary interfaces, Internet browser with web possibilities through MigraWeb linked to a Local Area Network (LAN) for searching, viewing, and editing image database, sending E-mail, education/reference administration, and video conferencing. Also capability to link with an Electronic Medical Record system (Melior system) in the future (See Attachment) (Baltic MedWeb I Mission. Retrieved, February, 21, 2004, from <http://213.131.135.6/BalticMedWebPublic/RMPro?-DB=BMW.fp5&-Lay=web&-Format=...>).

### **System Confidentiality and Security Issues**

Access to and use of system was only allowed for authorized users. However, the laws and policies of these collaborating countries regarding the transmission and/or other means of communicating and using patient information were not disclosed.

### **Education and Training**

Seminars, interviews of participants, visits by Lithuanian hospital personnel to Swedish hospitals using telemedicine equipment and healthcare information systems, and team-building and project planning sessions were held prior to the implementation of the project to prepare stakeholders for project issues and to integrate project goals with user needs. Interviews were administered on two different occasions; soon after the system was installed and in the final phase of the project. These

“interview s,” developed by managers of the KMH Pathology Department, were actually multiple-choice questionnaires that also contained open-ended questions to obtain more detailed information from participants (29 healthcare personnel from the Pathology Department). There was no information available about computer, special equipment, or system training sessions held for Lithuanian staff in preparation for this initiative (Evaluation Report - Litmed I. Retrieved, February 23, 2004, from <http://www.litmed.net/report.php>).

### **System Cost**

The Swedish Riksdag (parliament), by approving and allocating SEK 2 billion to the Baltic Billion Funds 1 and 2 (through the second “Baltic Sea Billion” or OM2), contributed in founding this telemedicine collaboration between the Lithuanian healthcare system and Sweden from December 1, 2002 through December 31, 2003. The main purpose of the Litmed Project (other than stimulating economic strength of Swedish companies in the Baltic region) was to construct telemedicine pilot workstations for training and demonstration purposes in KMH. The project, now completed, had a budget of 4,320,000 SEK, or approximately US\$36.8 Million, (1 SEK [Swedish krone] = \$7) with approximately 40% (\$12,000,000) from Sweden and the remainder funded by other partners/stakeholders in the project (\$10,500,000) with Informationslogik AB, the largest single contributor at 25% (\$7,500,000). Financing provided refurbishment of health facilities, medical financial information systems, technical assistance, and national training and fellowships. Funds were disbursed over a 4-year period. (Project

Description – Litmed II. Retrieved, February 23, 2004, from <http://www.litmed.net/project.php>).

### **System Maintenance - Operational and On-going**

Funding for equipment purchases, project management, and implementation of this IT system were provided through the Swedish government and other European Union organizations. Information available indicates that there was no funding for continuing the project or for maintaining equipment or Internet connections after completion of the Litmed Project on December 31, 2003 unless the World Bank or other funding sources are found to do so (Project Management - Litmed II. Retrieved, February 23, 2004, from <http://www.litmed.net/management.php>).

It was not expected that there would be any new construction or any increase in recurrent costs. Instead it would include refurbishment and consolidation of facilities as well as retraining and/or redeployment of staff. This would result in efficiency gains and increased quality and quantity of healthcare services. The project is also not expected to generate significant incremental costs. Any incremental costs were expected to be offset by savings from improvements in efficiency (Lithuania- Health Project, Report No. PID6544. Retrieved, August 14, 2006, from <http://www-wds.worldbank.org>).

### **“Fit” of Application to Clinical Practice**

The IT system did “fit” to the clinical practices of the KMH and the KMH pathology department and to business development goals of the Swedish government, physician colleagues

at the Swedish partnering hospital, and system developers.

The project goals also fit within the general goals set for national healthcare reform by the Lithuanian Ministry of Health. The Lithuanian physician participants indicated in their questionnaires that there was good collaboration during the project and that a good relationship or “synergism” was achieved that will encourage the development of future projects together with their Swedish collaborators. In addition, the project was completed under budget and within the time estimate (Evaluation Report - Litmed I. Retrieved, February 23, 2004, from <http://www.litmed.net/report>).

### **Drawbacks of System**

Although considered successful, the Litmed IT pilot project was developed, implemented, and maintained as an isolated IT project. The IT system was structured to serve only a few users, namely, radiologists, ophthalmologists and otorhinolaryngologists, from Lithuania at KMUH and their respective colleagues in Sweden at Lund University Hospital pathology departments. The system and users were isolated from interacting with other healthcare disciplines within the organization. It is therefore difficult to judge how relevant the results of this pilot project would be if expanded to include more departments within the hospital. Reevaluation of organizational systems (system analysis) would need to be performed in order to determine the effects of expanding the IT system hospital-wide, or at the least, to additional departments. An expanded

system would then have to address the functional needs of other stakeholders and users, i.e., departments, and interdisciplinary users, as well as underlying organizational culture issues (Whitten, Bentley & Dittman, 2004).

### **Evaluation of Return on Investment of System**

An IT system is successful as long as it fulfills and continues to fulfill the short-term and long-term goals set forth in an organization's mission statement, its management structure, its function, and its business focus (Whitten, Bentley & Dittman, 2004, p.270). However, if this IT system is being planned for expansion, "systems [development and] testing will ensure that application programs written and tested in isolation work properly when they are integrated into the total hospital system" (Whitten, Bentley & Dittman, 2004, p.722). In addition, preparation of the rest of the organization is needed. Therefore, project reports, meeting minutes, and results from questionnaires used in the pilot phase should be reviewed by project managers and an interdisciplinary task force to determine issues that need to be addressed to prevent future problems. Because an expansion of this system represents a departure from the way business is currently conducted, a project manager must help users cope during transition by preparing and training them as system implementation progresses. Evaluation studies should also be conducted throughout the program to be sure participants (users and stakeholders) are satisfied with progress of the project. Coordination of the project should be managed by a cross-functional

(interdisciplinary) Project Management Team and Project Manager (Billows, 2002). It is very important that the various adopter categories of stakeholders and users are involved in all aspects of the project, that is, those who are the innovators, early adopters, early majority, late majority and laggards. All have their particular “manners and rates at which they respond to innovation or change” – and contribute to a successful completion of any project (Young, 2000, p.138).

### **Conclusion**

All participants (stakeholders) agreed that the Litmed IT Project was successful in improving physician practice and in establishing positive, collaborative IT relationships. In addition, the overall vision for this project to develop the Kaunas University Medical Hospital as a premier IT center in the Baltic Region for telemedicine had been accomplished. However, much work is needed to procure additional grants from the EU, WHO, and other IT investors to fund the maintenance, improvement, and eventual expansion of this local IT center into a launching pad for a national and region-wide EU eHealth initiative for the use of information technology in healthcare.

In addition to the political will and cooperation of all stakeholders in this eHealth reengineering process, a very important factor that should be addressed regarding the sustainability of management reform programs, is the issue of a high level of corruption that existed, and still exists, at every level of organization and government entity in these post-Soviet nations (Hirschler, 2001). Through trial and error during the reengineering of post-Soviet transitional healthcare systems, the World Bank has learned the

following lessons that should be applied to future reform process in these post-Soviet nations:

- Health reform is a lengthy, politicized process;
- A careful sequencing of reforms is necessary;
- A shorter project linked to a smaller, more realistic set of reforms is likely to be more effective;
- Participation of stakeholders (lawmakers, medical community, and the public/community) in the reform process is critical;
- Simple investments with simple implementation arrangements are more likely to succeed; and
- It is important to provide implementation support by strengthening managerial capacity of all stakeholder including program managers and Ministries of Health (Lithuania- Health Project, Report No. PID6544. Retrieved, August 14, 2006, from <http://www-wds.worldbank.org>).

## References

- A telemedicine co-operation project connecting the medical society in Lithuania, Sweden and other Baltic countries. Retrieved, February 19, 2004, from <http://www.litmed.net>.
- Baltic MedWeb I Mission. Retrieved, February, 21, 2004, from <http://213.131.135.6/BalticMedWebPublic/RMPro?-DB=BMW.fp5&-Lay=web&-Format=...>
- Billows, D., (2002). Managing healthcare projects. Denver, CO: The Hampton Group, Inc.
- Cholewka, P.A. (2006). An assessment of healthcare system reform efforts in post-soviet transitional economies. In Mudacumura, G.M., Mebratu, D. & Haque M.S. (Eds.), Sustainable Development Policy and Administration. Boca Raton, FL: Taylor & Francis Group.
- Cholewka, P.A. (2004). Factors affecting sustainable health care management programs in post-soviet transitional economies. In Mudacumura & Haque M.S. (Eds.), Handbook of Development Policy Studies. New York: Marcel Dekker, Inc.
- World Health Organization, Department of Essential Health Technologies. Strategy 2004-2007: eHealth for Health-care delivery. Retrieved August 15, 2006 from [www.who.int/ehd/ehethHCD](http://www.who.int/ehd/ehethHCD).

eHealth Standardization Focus Group. (2004). Report from the CEN/ISSS eHealth Standardization Focus Group. Current and future standardization issues in the e-Health domain: Achieving interoperability, Draft V3.1 with amendments by Mennerat, F., Klein, G. & Jensch, P.

Estonia – unemployment ([www.telebalt.ee](http://www.telebalt.ee)).  
Euromed Networks AB. Retrieved, February 21, 2004, from <http://www.euromed.se/eng>.

European Commission web site. Retrieved, February 21, 2004, from  
[http://europa.eu.int/information\\_society/qualif/health/index\\_en.htm](http://europa.eu.int/information_society/qualif/health/index_en.htm)

Evaluation Report - Litmed I. Retrieved, February 23, 2004, from <http://www.litmed.net/report.php>.

Fish, H.C., The Virtual Image Courier. Retrieved, August 14, 2006 from  
<http://www.medicalimagingmag.com>).

Hirschler, R. (2001). Interview with Nick Stern, senior vice president and chief economist of the World Bank. Transition Newsletter, 12(4), 1-4.

Information Technologies for human health – clinical decision support. Retrieved, August 15, 2006 from <http://tmc.kmu.lt/projects.htm>).

Latvia – tourism and social integration. Retrieved, February 23, 2004, from [www.telebalt.lv](http://www.telebalt.lv).

Lithuania – telematics for business and partnership promotion. Retrieved, February 23, 2004 from [www.infobalt.lt/telebalt](http://www.infobalt.lt/telebalt).

Lithuania Health Project Report No. PID6544. Retrieved, August 14, 2006, from <http://www-wds.worldbank.org>)

National Progressive Primary Health Care. Retrieved August 14, 2006, from <http://www.hst.org.za/pphc/phcdef.htm>.

Open Clinical: Knowledge Management for Medical Care web site. Retrieved May 25, 2006 from <http://www.openclinical.org/publicreportsE-health.html#eu2004>.

Project Description - Litmed II. Retrieved, February 23, 2004, from <http://www.litmed.net/project.php>.

Project Management - Litmed II. Retrieved, February 23, 2004, from <http://www.litmed.net/management.php>.

Richardson, P.P. (2002). E-health for Europe: The possible and the practical. Eurohealth, (8)2, 5-6.

Short informal notes from the round-table discussion after the Health Care Projects Dissemination Seminar on October 28th, 2003 (2003). Retrieved, February 19, 2004, from [http://www.litmed.net/NRT\\_031022.php](http://www.litmed.net/NRT_031022.php).

Shortliffe, E. H., Perreault, L. E., Wiederhold, G., & Fagan, L. M. (Eds.). (2001). Medical Informatics: Computer Applications in Health Care and Biomedicine. New York: Springer-Verlag.

The Litmed Telemedicine Project. Retrieved, July 12, 2006  
from <http://www.bmii.ku.lt/~litmed/project.php>.

The World Health Report 2002: Health systems: improving  
performance (pp. 23-72, 83, 89).  
World Health Organization: Geneva, Switzerland.

Tisch, S. & Wallace, M. (1994). Dilemmas of  
Development Assistance: The What, Why, and  
Who of Foreign Aid. Boulder, CO: Westview.

Whitten, J.L., Bentley, L.D., & Dittman, K.C. (2004).  
Systems analysis design methods (6<sup>th</sup> ed.). New  
York: McGraw-Hill.

Young, K.M. (2000). Informatics for healthcare  
professionals. Philadelphia: F.A. Davis Company.