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INFORMATION TECHNOLOGY FOR IMPROVEMENT OF PATIENT REFERRAL SYSTEM FROM PRIMARY CARE TO SECONDARY AND TERTIARY CARE IN SERBIA: "THYRONET"- ELECTRONIC THYROID CONSULTATION NETWORK

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Abstract. *Estimated 80% of all referrals to Tertiary Care for Thyroid disease in Serbia are deemed unnecessary or ill-timed by the specialty care providers, and detract from time and effort available to treat the remaining appropriate referrals. Documentation on patient treatment rarely is delivered from Primary Care to the Specialty Care center, necessitating costly duplication of laboratory and radiology testing. Documentation from the Specialty Care center often does not return to the Primary Care center, rendering follow up care more difficult, and denying Primary Care clinicians the opportunity to learn from each case. A deployed web-based electronic consultation system is proposed to alleviate the problems noted above. Appropriate organizational interventions will be designed into the pilot project to overcome inertial resistance to change, monitor utilization, and proactively ensure cost-effective systems implementation. The use of an electronic system will optimize the time a specialist spends with a referred patient, as complete diagnostic workups will have been completed and this needy patient will not be competing for specialist time with inappropriately referred patients. Additionally, modern database information supports detailed data analysis to observe clinical patterns and treatment effectiveness.*

Key Words: *electronic consultation system, organizational change, telemedicine, thyroid disease*

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BACKGROUND AND SIGNIFICANCE

Health Informatics and the WHO Perspective

Information and Communication Technology can be of great assistance to healthcare professionals in the process of diagnosis, treatment, monitoring, medication prescription, referral, information retrieval and communication, documentation and transactions. Innovations from the information technology industry, applied to health care, can be grouped into the following categories:

- *Public information on health*: health care services and providers, health care policies, legislation, news/information about health and medicine.
- *Health information exchange for administrative purposes* between organizations, patients, patient-health insurance, hospitals, clinics; health authorities.
- *Telehealth/Telemedicine*: investigation, monitoring, management of patients using remote access to patient data and information [provider to provider or provider to patient].

Over the years the terminology in health related information technology has changed and continues to change. The World Health Organization (WHO) has addressed this issue with an alternative idiom, Health Telematics, (1) which is a composite term defined as:

- *" health-related activities, services and systems, carried out over a distance by means of information and communications technologies, for the purposes of global health promotion, disease control and health care, as well as education, management, and research for health."*

THE SERBIAN PERSPECTIVE ON HEALTHCARE AND NEED FOR HEALTH INFORMATICS

The healthcare status in Serbia has been comprehensively analyzed by World Bank experts in April 2003 (Project Appraisal Document) (2). In summary, the document states: *"Despite all the difficult factors during the 1990s (economic crisis, war, sanctions, bombing) in the former Republic of Yugoslavia (FRY) (excluding Kosovo), all vital indicators improved during that time period according to data based on household surveys conducted by UNICEF in 2000. Under five mortality rate decreased by 29.5 percent while infant mortality rate decreased by 31.5 percent to 11.23 deaths per l000 live births in 2000. Today, life expectancy at birth is estimated to be 69.8 years for males and 74.5 years for females. Access of the population to improved drinking water sources and sanitary means of excreta disposal is almost universal and vaccine preventable diseases are under control. When looking at causes of death, the picture is clearly one of a developed and transitional country with high levels of heart disease, strokes, and cancer. Smoking is estimated to cause 30% of the mortality in Serbia. Poor nutrition is another major risk factor."*

The strategy is outlined in a Health Country Assistance Strategy (CAS) and was endorsed by the Government of Serbia. The objectives of The Serbia Health Project have been defined as follows (3):

"*To build the capacity to develop a sustainable, performance oriented health care system where providers are rewarded for quality and efficiency and where health insurance coverage ensures access to affordable and effective care.*"

In accordance with the Government's strategy for improving the efficiency of healthcare delivery while maintaining quality, Health Telematics has the potential to improve healthcare through the use of information technology in the following ways:

- To improve access to high quality specialty care, especially in rural and poor communities;
- To improve service and quality of health care;
- To improve productivity and efficiency in the health sector;
- To use the opportunities of IT to distribute information to the general public and health care professionals and to increase the level of knowledge;
- To improve working conditions and personal planning for health care professionals.

In the EU, "The European Fourth Framework Program for Research and Technological Development" and "The Global Healthcare Application Project″ dedicate many sections to healthcare and contain many health informatics projects (2, 3, 4). Numerous programs have already demonstrated the feasibility and utility of health informatics systems (5, 6, 7). Currently there are widespread health informatics programs in the United States of America and throughout the world. Health Informatics projects have been very successful in developing countries (8, 9) and their clinical and economic utility has been demonstrated in neighboring Croatia and in Kosovo (10, 11). Clinical applications of health informatics can be done in all areas of patient care (12, 13) provided by real-time and/or store-and-forward technologies (14, 15) ranging from telephone and fax machines, e-mail, chat rooms, discussion boards, audio- and video-conferencing. Administrative applications include recording (16, 17) and sharing of billing summaries, electronic connections to pharmacies, etc. Remote medical instruments include various types of imaging technologies (18), pressure sensors, haptic feedback devices and robotics. Educational applications focus on continuing medical education for professionals and patients (19) including tele-mentoring. Further, there exists substantial evidence that a byproduct of telemedicine implementation is substantial continuing education for all participants.

PROPOSED PROJECT OBJECTIVE

The overall project objective of the proposed health informatics project in Serbia is to develop a cost-effective, highly efficient Thyroid consultation and referral system from primary care to secondary and tertiary institutions. It would be a readily accessible, store-and-forward web-based system developed for use in Serbian institutions and in compliance with the goal of optimizing the relationship between primary, secondary and tertiary levels of care. The aspects of security and privacy for the individual patient would also be implemented and assured.

PROJECT PLAN (RATIONALE AND METHODS)

An important first step in this project is the development of a pilot program implementing web based consultation in a patient referral system. The pilot program proposes implementation of an electronic consultation and referral system between the Thyroid Gland and Metabolism Institute in Zlatibor and the Endocrinology University Clinic in Belgrade. Thy-

roid Gland and Metabolism Institute in Zlatibor consists of hospital facilities (400 beds) and out-patients unit (ambulatory part). It is a combination of a local (regional) primary health institution (for out-patients) and specialized hospital (second and tertiary level). Thyroid disease patients from the surrounding area (population of approximately 2,000 000 people) are reefed to Thyroid Gland and Metabolism Institute in Zlatibor.

Rationale

The Thyroid Gland and Metabolism Institute in Zlatibor exemplifies an excellent model for rationalization of a patient referral system, since almost 100% of the patients who enter the Institute are being referred to specialist consultations. The current patient referral system to specialist clinics in Serbia represents a major problem. From the authors unpublished data (research conducted in Thyroid service in Zajecar by graduate students of School of Management) some 50-80% of all patients referred to specialist consultations were unnecessary. All those consultations present a superfluous burden to the specialist services and enormously increase costs in diagnostics. Those consultations are expensive and time consuming for both the Health Service and patients in terms of travel costs, lost days of work, etc.

Thyroid diseases are **common-** (5–20% of the American population have some thyroid abnormality depending on the indicator chosen; that is 20 million people in USA including many who may not be aware of their condition; they are more prevalent than diabetes (16 million people in USA (20,21)), **disruptive** (impair physical and mental performance, produce morbidity, and pose special risks for pregnancy and the developing fetus and neonate (22,23), **expensive -** (thyroid hormone- T_4 is among the most commonly prescribed medications in the United States; testing of thyroid function is a routine laboratory procedure costing millions of dollars annually; the effects of iodine deficiency on the thyroid alone cost one country (Germany) an estimated annual $1 billion (24); and **treatable -** highly satisfactory therapies exist for all the common problems: hyperthyroidism, hypothyroidism, nodules, cancer, and iodine deficiency; Many are also **preventable –** the consequences of iodine deficiency are readily avoided by optimal iodine nutrition (25); appropriate diagnosis and treatment can keep at bay the effects of hypothyroidism on human development; avoidance of excess iodine can prevent many of its complications, including goiter, hypothyroidism, hyperthyroidism, and autoimmune disease.

Thyroid disease prevalence in Serbia has not been systematically investigated. Some calculated extrapolations of various prevalence or incidence rates against the population of a particular country or region based on US Census Bureau, Population Estimates 2004, and US Census Bureau, International Data Base, 2004 (Extrapolated Statistics) estimated 216,518 patients with autoimmune thyroid disease (some 50% of all thyroid disease patients) in Serbia (based on population of 10,825,900). Relevant data from Serbian region Timok available from Thyroid register (26) established in 1970, provides information about annual incidence of thyroid disease with estimated prevalence of around 8% (27).

Almost all procedures routinely used in thyroid disease diagnostics are available at the Thyroid Gland and Metabolism Institute in Zlatibor (clinical biochemistry, radio immune tests, ultrasound, nuclear medicine) – except for aspiration fine needle biopsy of the thyroid. Almost all therapeutic procedures are also available (medications, radioactive iodine) – except for thyroid surgery. Unfortunately, current physician and staff education levels and ex-

perience at the Institute are at the primary care level. Specialty care consultations are provided by the referent (University) institutions from Belgrade (300 km distance). These specialists travel to Zlatibor to review practically all in-patients and outpatients during their weekend visits. They usually have around 200 consultations per visit (averaging two minutes per patient). Thus, the quality of this type of consultation is less than ideal.

The Thyroid Gland and Metabolism Institute in Zlatibor serves the population of around 2,000,000 people (North Montenegro, East Bosnia included) and is estimated to have over 15,000 thyroid patients. The number of annual specialist consultations is around 20,000 and the number of diagnostic tests is around 60,000. In order to improve the present situation at the Thyroid Institute in Zlatibor in terms of quality and efficiency of health care, this project will implement a web based store and forward telemedicine system that will connect the Institute in Zlatibor with a tertiary University Clinic in Belgrade in the initial phase, and subsequently with other existing specialized thyroid institutions in Serbia. Information technology interventions in health care have been found successful in terms of cost effectiveness as well as in patient satisfaction.

Thyroid disease can be especially suited for electronic data collection and transfer, due to the large number of diagnostic tests required, and the requirement of these values for diagnostic determination. Large and potentially complex imaging workups are unusually not necessary, nor are lengthy case history presentations, both of which require additional time and technical complexity in the already overburdened primary care setting. Referral necessity can be determined most often through the completion of a 10 or 15 question consultation form, which provides the consultant with enough information to decide on referral to tertiary care, or continued management in the primary care setting.

METHODS

Technical

We propose a pilot project for the installation and configuration of an electronic, web based thyroid consultation and patient management system, based at the Ministry of Health in Belgrade (see figure 1). After installation of the hardware and software, specialists in Thyroid Disease will create the web based protocols for referral of patients to Tertiary Care centers for Thyroid treatment. A small group of physicians at the Primary Care center at the Thyroid Gland and Metabolism Institute in Zlatibor will receive training on using the system, and filling out forms for patients that they feel will require consultation and possibly referral to the specialists. Cases that are submitted via the system will be reviewed by a clinical case manager, to ensure they are completed properly, and then triaged and referred to available Thyroid specialists. The specialists will review the findings, and interact electronically and securely with the referring provider and other specialists as necessary.

In the case of a referral, treatment provided by the specialists will be documented in the system for archival purposes, and reviewed by the patient's primary care physician.

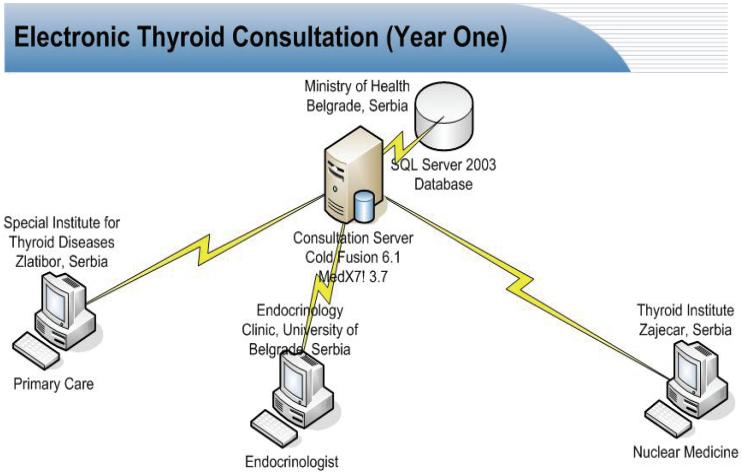

Fig. 1. Schematic of first year consultation network.

Prospect

Upon successful completion of the first year of the program, four additional regional hospitals will be included in the consultation and referral network (see figure 2). Trainers will work with primary care staff to instruct them on the use of the system. Additional specialists will be included to respond to the increased consultation load. By the third year, all thyroid institutions will be included, as will all major primary care centers in Serbia (see figure 3).

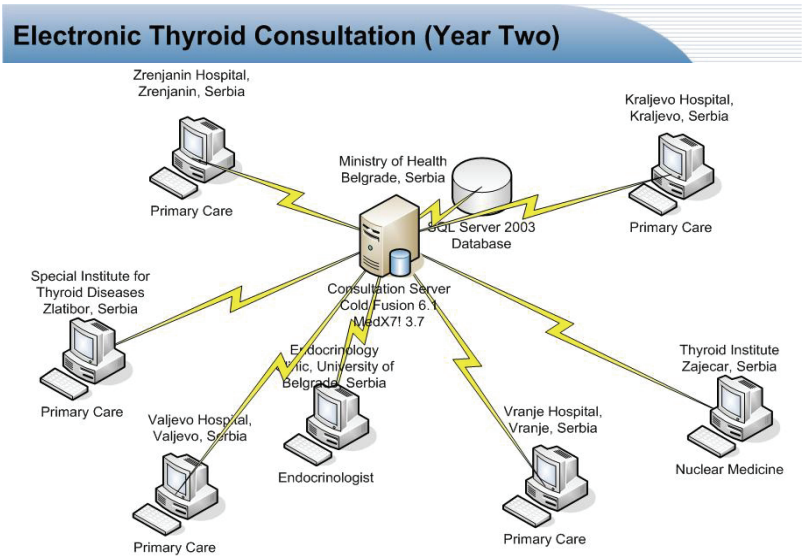

Fig. 2. Schematic of second year expanded consultation network

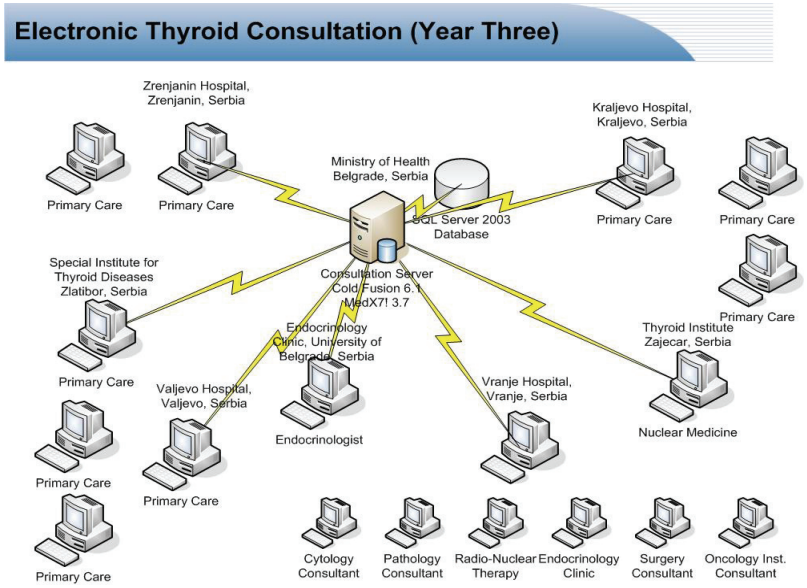

Fig. 3. Schematic of third year expanded Thyroid Network

ORGANIZATIONAL CHANGE/MONITORING SYSTEM UTILIZATION

All new technical implementations impact the social system which they become a part of. The technological innovation and the desire to diffuse it into the medical profession of the project region, must strategically engage stakeholders within its project scope, and be sensitive to cultural beliefs and the local values system. Of fundamental importance is a clearly articulated and hierarchically supported purpose that facilitates the change process (28,29,30).Continuous feedback loops maximizes stakeholder input, enhances the recognition for the need to change and indicate level of commitment to the process. Effective change requires that people not only believe that change is necessary but understand how change will come about and what the consequences will be. This is particularly true of Health Informatics systems (31, 32, 33). Not only do they hold the potential for increasing patient access, and enhancing the quality and timeliness of patient care, but they also hold the potential of altering the flow of clinical information and the potential to alter the loci of clinical decision-making. It is in the latter two areas that we find the roots of social resistance to the utilization of Health Informatics systems. The degree of this resistance varies from case to case, but is always present and more often than not results in low utilization rates of Health Informatics solutions after the initial "honeymoon period" of new implementations.

To overcome this serious problem, the design of the Health Informatics system needs to include both a priori Organizational Change effort to overcome latent resistance within the social system and an early-on and continuing evaluation component to assure accurate feedback of utilization rates on a continuing basis. Therefore, this project will include both an Organizational Change component during the initial implementation phase and a

continuous monitoring of system utilization. Additional Organizational Change interventions will be scheduled as dictated by downward trends in utilization rates. The Organizational Change program will involve group sessions with both Primary as well as Secondary and higher care-givers and their staffs at the onset of the pilot project, and thereafter as necessary. The monitoring effort will be continuous during the entire length of the project and include on-site observation during a 3 day period in time during the 0-3 month, 11-12 month, 23-24 month and 35-36 month time-line periods. Qualitative methodologies will be used as primary data collection techniques, with special reliance on structured interviews and field observations. Local professionals and students will be utilized to assist implementing the methodologies to facilitate cross cultural communications. Analysis of system utilization data will allow quantitative data cross-validation of the qualitative results.

One unanticipated, but functional result of Health Telmatics systems such as that here proposed has been the continuing medical education of Primary care-givers by Secondary and higher care-givers. This learning has been seen to occur at both an individual as well as an organizational level (34). In addition to continuous utilization monitoring, a second effort will be undertaken to document both the individual and organizational learning which occurs as a consequence of the implementation of the proposed pilot Health Informatics system.

Specific tasks of this project are:

Technical:

Hardware and Software

- Identify Technical Points of Contact at both Referring facility and specialist locations
- Acquire Hardware and software.
- Installation of Server and Server Software. Configure Database.
- Conduct Alpha Testing of the system to ensure functionality.

Thyroid Consultation

- Collect draft protocols for Thyroid consults. Identify number of different protocols to be used.
- Develop evaluation tools. Pre-Utilization survey. Post-utilization survey.
- Identify potential "clinical champions" on both the referring and specialist areas.
- Begin beta testing the system with real patients
- Evaluate the Beta Test
- Make modifications to the Business Processes. Modify the protocols as necessary.
- Begin Thyroid Consultations.

Continuing Medical Education

- Gather Educational/Reference materials for use in CME
- Identify Instructors
- Identify agency to grant credits to participants over electronic medium
- Begin building content (PPT, audio files, small video files, case presentations, quizzes and tests, etc)
- Publish initial CME effort for beta testing

- Evaluate Beta Test
- Make modifications to process
- Go Live with electronic offering of Thyroid related CME
- Conduct evaluation surveys/satisfaction surveys. Gather data on usage.

Organizational Change/Utilization Monitoring

- Prepare organizational change interventions,
- Implement initial intervention at MH/Belgrade, II/Zajecar, SITD/Zlatibor
- Create Utilization Monitoring Data Collection System (UMDCS)
- Implement UMDCS
- Report tasks above for pilot program

SUSTAINABILITY PLAN

Our experience has shown that the earliest inclusion of each site's administrative and clinical leadership is imperative to ensure a smooth transition from donor funded effort to institutionally supported program. A lasting and meaningful organizational change ultimately comes from the individuals who are the building blocks of the organization. Prior to the first year implementation, sponsorship or sense of participatory ownership must be cultivated, strengthened and shared with each facility to ensure success of the pilot program, and a successful transition from pilot deployment to the broader integrated delivery of care. Budget estimates must be co-developed and discussed within the first year. To allow for the allocation of funds, planning for inclusion of the program's continued costs should begin prior to the second year. The costs of maintaining the Thyroid Network will be focused around the Case Managers and Administrative positions, as these individuals are crucial to ensuring timely response to consultation and referral requests, and ensuring all aspects of the systems are utilized as trained. Technical continuing support costs are generally quite low, with possible hardware upgrades to the server and server software within five years, and annual maintenance fee to receive upgrades and service support the only forecasted requirements.

The true key to sustainability will be dependent upon the successful implementation of the Thyroid Network, where primary care clinicians receive timely and accurate responses to their requests, and specialists are able to better screen and prepare for the most appropriate referrals. This success will occur with the inclusion of the Ministry of Health leadership, the hospital leadership, and the consulting clinicians, in all aspects of the program, to ensure the focus is retained on the improvement of the health of the Serbian people.

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PRIMENA INFORMACIONE TEHNOLOGIJE U POBOLJŠANJU SISTEMA UPUĆIVANJA PACIJENATA IZ PRIMARNE ZDRAVSTVENE ZAŠTITE U SEKUNDARNU I TERCIJARNU ZDRAVSTVENU ZAŠTITU U SRBIJI : "THYRONET"- ELEKTRONSKA MREŽA KONSULTACIJA O TIROIDEJI

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Procenjuje se da je 80% korisnika tercijarne zdravstvene zaštite za bolesti tiroideje u Srbiji nepotrebno upućeno od strane lekara specijalista čime se oduzima i vreme i napor potreban za tretman korisnika kojima je ona zaista potrebna. Dokumentacija o tretmanu pacijenta retko biva poslata specijalizovanom zdravstvenom centru od strane primarne zaštite što zahteva ponovno izvođenje skupih laboratorijskih i radioloških testova. Dokumentacija iz specijalizovanog zdravstvenog centra se često ne vraća centru za primarnu zaštitu što otežava dalje praćenje i lečenje pacijenata. Za prevazilaženje prethodno navedenih problema predlaže se primena konsultativnog sistema putem elektronske mreže. U pilot projektu će biti data odgovarajuća organizaciona rešenja kako bi se prevazišao početni otpor i vršio monitoring primene ovakvog sistema. Korišćenje elektronskog sistema će optimalizovati vreme koje jedan lekar provede sa pacijentima kojima je tercijarna zaštita zaista potrebna. Savremena baza podataka omogućava detaljnu analizu kliničkih podataka i efikasno lečenje pacijenata.

Ključne reči: *elektronski konsultativni sistem, organizaciona promena, telemedicina, bolest tiroideje*