Perspectives of Telemedicine Development in Ukraine

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INTRODUCTION.

The healthcare system in Ukraine has seen the creation of National Medical Networks and Registers (databases). There are two extensively developed medical networks operating within the framework of the computer network of the first generation 'HealthNet' .

The most ramified of these two is the National Register of the individuals who are suffering from consequences of the Chernobyl disaster. This Register monitors the health of more than 700,000 persons. A computer network has been created in order to maintain this Register, covering 25 districts and cities under direct central administration- Kiev and Sebastopol.

The second most ramified network is the net of the Sanitary and Epidemiological Service of the Ministry of Health of Ukraine which is implemented on the computer centres of the district Sanitary and Epidemiological Service (ca. 70 computer centres), which transmits operative information on the current sanitary, epidemiological and ecological situation to the Ministry of Health of Ukraine. These nets are integrated in a common net called 'HealthNet'.

A third medical network has been created for the monitoring of oncological patients in Ukraine. This network links the regional Oncological Dispensaries (19 regions) with the Institute of Oncology in Kiev, on the basis of which the Oncological Register functions.

Since 1997, Ukraine is a member of the international "EuroTransplant" organization. This medical computer network has united regional Centres with the National Informational - Coordination Centre on Transplantation of Organs, Cells and Tissues, which is located in Kiev.

In connection with the increase in sexually transmitted diseases, including AIDS, regional databases (registers) have been developed in collaboration with the Regional dermatological-venereological Dispensaries, which provide links between the regional dispensaries and which allow to analyse and to predict the tendencies of development of such infections in region and to produce effective measures on their prophilaxis.

In the Kharkiv region, Healthcare information technology (IT) is particularly well developed. The clinical base of the Department of Clinical Informatics and IT in Healthcare Management of the Kharkiv Medical Academy of Postgraduate Education, which is in 5 Central clinical hospitals of Ukrzalisnica in Kharkiv, was the first in Ukraine to create a Telemedical Cardiological Centre, in which the technology of trans-telephone electrocardiography (ECG) has been introduced. All equipment for this technology, including portable ECG amplifiers and modems has been developed and created in Ukraine. Since 1998, the

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teleconsulting medical Centre for the analysis MRI images has functioned at Institute of Neurosurgery of Academy of Medical Sciences in Kiev. At the Kiev National Medical University, the telemedical consulting centre "Patholog" has been organized, in which competent oncologists-cytologists carry out consultations on morphological preparations. The Centre has the possibility to solicit a "second opinion " from experts of the military hospital in the USA. In 1996, the Ukrainian Association of Computer Medicine (UACM) created a WWW-server in 3 languages: Ukrainian, Russian and English (**http://www.uacm.cit-ua.net**). The UACM members are 81 scientific research institutes, universities, scientific societies, enterprises and hospitals. Over 1500 scientists who are individual members of the UACM have the possibility to use data bases and scientific information on world-wide and Europe-wide medical informatics in Ukrainian and Russian (WWW-servers of EFMI, IMIA, WHO, EHTO European Observatory on Telemedicine), UNESCO and different WWW-servers of IMIA/EFMI (Working and Specialist Groups). The UACM has received an offer and has created affiliate Web- EHTO-UKRAINE server of European Commission on Telemedicine in Ukraine in the national language (**http://www.ehto-ukr.cit-ua.net**). In 1996, the United Commission on Telemedicine of the Ministry of Healthcare and the Academy of Medical Sciences was created. The Commission co-operates with the UN International Telecommunication Union (ITU) and European Commission on Telemedecine (DGXIII). In July 1998 and September 1999, the UACM specialists took part in the Conference "Telemedecine International Medical Care Networks" in Visby (Sweden) on co-operation and efficient use of resources by building networks within the Baltic Region. In 1998, a Ukrainian-American project on the monitoring of birth defects in Ukraine has been initiated under the initiative of UACM (Read the detailed description of the project at **http://www.uacm.cit-ua.net**).

These medical networks are standalone networks, they are not interconnected. They function with the help of modem communication and inter-city phone lines. It is obvious that technologies, which were used in various medical networks in Ukraine in the last 5-10 years now require significant updating to a modern level.

THE PROJECT GOALS OF 'UkrMedNet'

At present a national Open Direct Access Medical Network is being created on the basis of the existing HealthNet and some other autonomous medical networks. This project also envisages the integration of all existing separate medical nets, medical universities and medical R&D institutes of Ukraine into one 'UkrMedNet', as well as the creation of a common informational space and its integration into the European one.

The 'UkrMedNet' project is being developed according to the guidelines provided by the Concept of the State Policy on the Health Care IT policy in Ukraine (adopted in June, 1995), by the Order of the President of Ukraine No. 186/93, dated 31 May 1993 "On the State Policy on IT in Ukraine", and on the decision of the Cabinet of Ministers of Ukraine No. 605 from 31 July 1994 on "IT Problems".

Presently, preparations are in full swing for a radical reform of the entire health care system in Ukraine. It should be underlined that this health care reform takes place in a country that suffered from an

ecological disaster of a global scale - the Chernobyl disaster. It has affected, and still affects the health of hundreds of thousands of people. It should also be noted that Ukraine occupies 607,7 thousands of sq. kilometres and that it has a population of about 52 million. Under these conditions, state-of-the-art IT offers realistic opportunities to solve all the problems which were mentioned above quickly, effectively and inexpensively.

The basis of the comprehensive medical IT infrastructure is the creation of the national Direct Access Computer Network 'UkrMedNet'. The goal of 'UkrMedNet' is to supply an operational infrastructure for all existing and future medical networks and telemedical consulting centres, and to set up a system for medical and ecological information exchange in and outside Ukraine, based on state-of-the-art communication technologies. The main purposes and problems for the near future are:

- To update the national medical computer network to a state-of-the-art level using advanced computer technologies, communication lines and telemetry technologies, and to integrate it with the Internet.
- To integrate the medical universities and R&D institutes of Ukraine into 'UkrMedNet'.
- To continue the creation, development and maintenance of WWW servers which support the Ukrainian, Russian and English languages, and to provide references to these servers. To integrate the Chernobyl Register net into 'UkrMedNet' and to create a WWW server containing the Chernobyl Register information. To provide access to the 'UkrMedNet' users to the created WWW servers, and provide this access to all countries (in Europe, both Americas, Asia and Africa).
- To set up Hospital Information Systems (HIS) at various levels (district hospital, regional hospital, specialised institute), equipped with up-to-date telecommunication facilities for transmitting bio-medical signals ((EEG, ECG etc) and medical images (Ro-grammes, MRI, etc.), texts, graphics, audio and visual information, according to telemedecine concepts. To integrate these systems into 'UkrMedNet' and provide an access to the Internet from 'UkrMedNet'.
- To continue the creation, development and maintenance of data banks on patients requiring organ transplantation and to unite them with the existing cell and tissue data banks within the information-and-co-ordination nucleus of the 'Ukrtransplant' system. To connect the State information system of organ, tissue and cell transplantation in Ukraine with the similar European 'EuroTransplant' system via the Internet.
- To continue training medical specialists to work with telematics applications, and to advocate the utilisation of up-to-date communication technologies in health care. To set up a State or International Training Centre, based at the Department of Clinical Informatics and IT in Health Care Management of the Kharkiv Medical Academy of Postgraduate Education.

- To continue the creation, development and maintenance of servers with information on the following sections:

  - Strategically important information on radiological, epidemiological and toxicological monitoring;

  - Quick access data bases containing information and instructions on urgent measures in emergency situations;

  - Information on the branches of medicine;

  - Medical information for the general public, including: diabetes, epilepsy, pregnancy, cardiovascular diseases, healthy way of life and rational nutrition, toxicology and pharmacology, data on prohibited food products, current pharmacological advises, and other relevant information for general public.

  - Information from other fields of knowledge necessary for health care (biology, physics, chemistry, etc.);

This will make the vast amount of information, which has been accumulated by the leading R&D and other organisations in Ukraine, commonly accessible. This work forms a part of the National Program for the development of telecommunication means in Ukraine.

The development of the architecture of UkrMrdNet is co-ordinated by the Ukraine Institute of Community Health, which operates under the guidance of the Ukrainian Association Of Computer Medicine (UACM), an organisation whose members work in areas related to the development and utilisation of informational technologies in health care. The UACM has a Scientific Council consisting of 68 leading scientific experts in the fields of medical informatics, medicine, and radioelectronics from Ukraine, N.I.S., USA, Japan, Great Britain, France and Poland. The association with UACM is the best guarantee that the goals and objectives of the project are realised, and that the efforts of the project participants are well co-ordinated.

'UKRMEDNET' ARCHITECTURE.

'UkrMedNet' will use the Internet (ISDN) and "Frame Relay technology". "Frame Relay technology" offers great advantages to telemedicine, which will allow data link data transfer (texts, graphics, images, voice and video) using uniform equipment.

'UkrMedNet' has a three-level structure .

The first level of the Net consists of a National and four/five Interregional nodes. All the nodes of this level have a similar structure and they service 5 or 6 districts (district nodes). These will be connected to the National node, which is based in Kiev. The Ukrainian National node also performs the functions of the interregional node for Kiev and adjacent districts. All Interregional nodes are directly connected to:

a) the national node ; b) one of interregional ones; c) one of Internet nodes which is not a part of the net of the Ministry of Health of Ukraine. This connection layout ensures doubling of the connections of the first level nodes, i.e. ensures virtually 100%-proof data transmission. This enables us to consider the proposed architecture to be highly reliable.

The National and Interregional nodes ensure the connection with the second-level nodes network, as well as direct links with large scientific and medical centres, organisations and universities. The second level of the net includes the regional health care departments. The second-level nodes are connected to the nearest inter-regional node. They ensure connection to the net of medical organisations located in the region.

The third level are district nodes and end users. They are connected to the nodes of the district health care departments. Within the scope of the project, this level is built on the basis of organisations - members of UACM, as well as all health-care organisations willing to join the project at their own expense or at the expense of the Ministry of Health of Ukraine (within the scope of the programme of development of telecommunications in Ukraine).

SUMMARY

The development of the Ukrainian National Medical Network provides possibilities for the exchange medical, ecological and scientific information. Physicians, scientists in R&D institutes and universities will obtain access to the necessary information, receive electronic copies of scientific journals and articles, and are able to run programmes unavailable on their equipment.

The Ukrainian national systems on transplantation of organs, tissues and cells, connected at present with 'Eurotransplant' will be incorporated in the unified European computer system of organ transplantation, thus giving Ukraine a real opportunity to join the progress in this field. The IT will be adapted to the national conditions in order to support organ, tissue and cell transplantation operations on the national and regional levels.

Based on international experience, a technical project will be created with standardised protocols for data bases and solutions, as well as standard programme modules with standard input and output files to be used in central and regional information and analytical systems in order to ensure the functioning of all data bases of a higher level.

Due to the network development the EU countries obtain the possibility to carry out many joint projects together with medical specialists in Ukraine. Thus, the R&D potential will be stabilised.

For a country occupying a vast territory, which finds itself in a dramatic economical situation, it is very important to create consultative telemedical centres. This will make it possible to provide qualified consultative and diagnostic medical aid for the population, primarily for those living in remote rural regions, at a low cost. Therefore, 'UkrMedNet' has a tremendous medical and social significance for Ukraine and will accelerate the integration of the country into the informational space of the world.

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