INTEGRATED TELEMEDICAL NETWORK IN LUBLIN PROVINCE – CURRENT STATUS AND FUTURE PLANS

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Abstract

A general strategy for telemedicine development in Lublin region is being prepared. It is going to include all major telemedicine areas: medical consultations on-line and off-line (routine and emergency), image and text data transmission for all medical specialities, educational and scientific services. An integrated network and a regional telemedical centre are intended to provide information flow between health care services of all levels: from a patient’s home up to highly specialized hospitals. The project is financed by the EU Structural Funds.

KEYWORDS: telemedicine, teleradiology, e-health

INTRODUCTION

In 1999 there were only about 5 telemedial projects in Poland. One of them was the low-cost PACS (Picture Archiving and Communication System) implemented in the Diagnostic Radiology Department of the Provincial Hospital in Lublin – Poland (Foord, 2001, Jeziorska et al., 2000). An Internet connection for radiological image transmission between hospitals was also established (Figure 1). Thousands of examinations have been acquisitioned, processed, transmitted between cooperating health service centres, and archived on CDs since then. This system is still in use. However, modern telemedical systems are expected to meet much more requirements than a few years ago. Besides, the need for telemedicine is widely realized by both doctors (new possibilities) and authorities (reduced hospitalization costs).
CURRENT STATE

Lublin is an academic city (many high schools, including the Medical University). However the Lublin region (Figure 2), inhabited by 2.2 million people, is mainly agricultural and poorly urbanized. Average hospitalization time is one of the longest in Poland due to low availability of modern medical equipment (for example, only two multislice CT scanners and two MRI scanners). Installation of new hardware in the rural area does not solve the problem of absence of highly specialized medical staff (radiologists). A problem of medical data (especially digital image data) archiving also arises.

These difficulties can be at least partially solved by application of telemedical techniques. It is possible to reduce the treatment time (and cost) and improve its quality.

When the first PACS in Lublin was created, network communication infrastructure was the weakest part of it. It was difficult to provide more widespread services. The situation has noticeably changed since then. In most cases the required network infrastructure is already available and it is not necessary to build new dedicated networks. High-bandwidth leased fibre links are offered in all major towns of the region. GSM (Global System for Mobile Communications) networks serviced by three operators and 2 Mbit/s Internet (DSL technologies) offered by the Polish Telecom are available almost everywhere.
THE TELEMEDICINE DEVELOPMENT PROJECT

There are a few telemedical projects being prepared by various teams. The examples are:
- teleradiological network for image transmission (CT, MRI, PET, etc.) coordinated by a teleradiology centre,
- GIS (Geographic Information System) and GPS (Global Positioning System)-based solutions for first-aid services,
- telemedical systems for ambulance services,
- telemetric electrocardiography transmission and cardioligic teleconsultation,
- videoterminals network for hospitals' admission rooms and emergency units,
- application of telemedical techniques for breast cancer detection.

These projects were initially developed independently. Some of them have been already partly implemented.

The GIS/GPS-based project (Figure 3) is probably the most innovative. Its purpose is to improve quality of first-aid services. Such systems work in most of EU countries. However, this one is very versatile and proposes an exceptional combination of technologies:
- GPS,
- RTK-DGPS (Real Time Kinematic Differential Global Positioning System) based on EUPOS (European Position Determination System) collocated stations,
- GIS,
- video monitoring,
- data transmission (WiFi, GPRS).

Several projects turned out to be complementary. A big part of technical infrastructure can be shared between them. Telemedical systems are also expected to be interoperable and compatible with each other, to provide the desired information flow (Figure 4).
In order to meet these needs and to coordinate all the programs, a regional telemedicine centre is going to be established. It should perform the following main tasks:

- provide efficient and reliable technical infrastructure – a cluster of application, database and web servers or a mainframe with virtual servers, storage and archiving systems, VPN (Virtual Private Network) concentrators (discussed later), hardware firewalls,
- coordinate various telemedical projects,
- build a multilayer, integrated telemedical portal, providing appropriate services (teleconsultation, teleconferencing, telemonitoring, patient record, image processing, e-learning, various expert systems) to privileged users, with advanced authentication procedures,
- build a central patient-oriented medical database,
- build a database of medical resources (localization of hospitals and emergency units, equipment availability, staff, etc.),
- act as a central point of the GIS/GPS-based telemedical system,
- initiate and organize regional and international cooperation, including neighbourhood programs (Poland – Belarus – Ukraine),
- build an e-learning environment for doctors and students,
- organize cooperation between medical and scientific centres, promote interdisciplinary research and innovative technologies.

Various projects have diverse network requirements. Only some of them are mission-critical and need redundant, dedicated links. Throughput requirements are also very different. For electrocardiography transmission, 56kbit/s could be enough. Teleradiological applications may need more than 10Mbit/s.

In many cases VPN tunnels through the public Internet seem to be the optimal, cost-effective choice (Frost & Sullivan, 2005). A hyper-growth in European IP VPN market is observable. VPN was successfully implemented in Lublin PACS in 1999 (Laszewski et al., 2003). Nowadays this technology is significantly more stable, secure and efficient. Enterprises’ migration to IP VPN is triggered not only by cost reduction, but also:

- support of mobile users,
- voice over IP (VOIP), video and multimedia applications,
- growing popularity of wireless LANs (WiFi),
- WEB-based interfaces to business applications.
CONCLUSIONS

Telemedical projects are successful in many European countries, for example:
- Norway – The Norwegian Centre for Telemedicine (NST),
- Great Britain - National Health Service (NHS),
- European MobiHelath project for remote patient monitoring through GPRS/UMTS (the Netherlands, Germany, Spain and other countries).

The Lublin low-cost PACS that has been working unfailingly for eight years was also a success. New, advanced, telemedical projects are being developed at the moment. However comprehensive, integrated solutions for the whole province (and beyond it) seem to be missing. The planned regional telemedicine centre presented here is expected to perform this function.

References


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