telemedicine, remote consultations,
health records standardisation

Rafal STEGIERSKI[1], Pawel MIKOLAJCZAK[1],
Karol KUCZYNSKI[1], Waldemar SUSZYNSKI[1], Maciej SICZEK[2]

THE STRATEGY FOR TELEMEDICINE IN LUBLIN PROVINCE

Main role of this article is presentation, in a very short way, most important results of over two years of work board of experts from two universities, two clinical hospitals, city hall and also medical software and hardware suppliers. As a main purpose of strategy improvement of health care level in region was set. This aim will be achieved by telemedical infrastructure development, creation and implementation of procedures and instant training of staff. Strategy is focused on three main aspects. First one groups medical projects, second infrastructure project and third one is regional centre of coordination. In medical area proposed changes are mainly focused on telemedical support for emergency services, remote medical consultations and complex home monitoring of patients. Main solution for infrastructure assumes creation of integrated information system for hospitals and emergency units. I this part of the strategy selection of the proper standards for data storing and exchange. Probably one of the best choices is OpenEHR. Last part is centre of cooperation which consists of coordination centre of telemedical services, telemedical projects management unit, and training facility.

1. INTRODUCTION

Lublin Telemedical network has a chance to be a modern system of cooperation of patients, medical staff and administration departments of hospitals and medical centres which could break as geographical as social limits in access to modern medical services. This state could be obtained via simplification of medical information flow and standardisation of data storage and exchange in medical information systems.

Expected effects are, in most of the cases, quite new possibilities for regional healthcare services. As in many other projects of this kind, main aspects are focused on shifting bias of observation symptoms from not medically educated patient to proper medical services. It is more important in groups of high risk patients which tend to underestimation of their illness. Other aspect is automatic monitoring of patient in remote places, where, general practitioner, physician, or nurse being isn't possible as in many cases in emergency units where members have only general medical education. Remote consultations and interventions by specialists in regions with low density of population or placed in large distance from specialized hospitals or clinics is next aim. We should observe quicker propagation of information between medical centres, patients, administration, its collection and as a result possibility to analyse and use in medical and science studies as a side effect. All this new methods of communication and cooperation helps to build and evolve work groups of medical crew.

2. TELEMEDICINE IN THE WORLD

We understand telemedicine as remote medicine and healthcare. Probably it will be one of the few most important scopes of science in near future. Citizens of wealth part of the World are averagely older year by year. As a result it develops problems with proper examinations and treatments. Telemedicine helps to take care of patients and faster analyse of symptoms and more precisely set diagnosis by as local as remote medicals and specialists. In many, mostly rich, countries, such as USA, Canada or Japan, telemedical services are easy accessible nowadays. Similar programs to strategy presented here are inspired and financed by country or state government. As we have observed last few years one of the main purpose of telemedicine is reduction of the flow of patients when it is not necessary. What is more, all this actions have to be done without limitation of access to proper care and diagnosis. For example in

[1] Maria Curie Sklodowska University in Lublin, rafal.stegierski@gmail.com
[2] Hospital of Ministry of Interior and Administration

Texas in United States of America, country where telemedical systems are probably most spread at this days, about 38% reduction in transfer from one hospital emergency another and 45% reduction in unnecessary or redundant tests was observed few last years as a result of the integrated telemedical system and procedures implementation. Annual net savings in this case was about 4.28 billion dollars [6]. In many cases home telemedical system which could monitor all main physiological measurements of the patient like blood pressure, temperature, heart rate, helps in proper diagnosis because of possibility of monitoring time aspect of chronic diseases [5].

3. LUBLIN TELEMEDICAL SYSTEMS

In Lublin province second stage of the implementation of telemedical network which connect all hospitals, laboratories and emergency services is under way. Specialists in radiology, cardiology, emergency and similar areas work at preparation and tuning of procedures and protocols in vital cooperation with system integrators. As a result platform of cooperation will be built. Presented here strategies report is one of the next step to integrated telemedical system for the region.

Some new telemedical projects are in progress despite the lack of law regulations. For example in 2007 hospitals in Radzyn Podlaski and Bilgoraj had been connected to Laboratories of Radiology of Medical University in Lublin with leased lines. The Result is possibility to set up remote radiological consultations by prof. Andrzej Drop team. In John Paul II hospital in Zamosc patients with heart stroke could be additionally diagnosed remotely by cardiologist during transportation in ambulance. Some hospitals obtain ambulances with data transmission equipment such as EDGE modems which are integrated to health monitors. At this moment the most important problem is lack of emergency units coordination, data collection and redistribution centre in Lublin than equipment per se.

As a result of survey taken by strategy work group and information collected during works of authors as a members of the board of experts we know that level of computerisation in hospitals is still rather low for Lublin province. There are only 40% [4] of healthcare centres have permanent access to internet and in most of them use 2 Mbps or even slower connections. Only 18% [4] of centres in this volume transmit medical information. Special informatics units have only 37% of centres [4]. Diagnostic equipment compatible with medical data exchange standards with proper network interfaces are only 5% of all installed. Software which is in use very occasionally is integrated solution. In most cases it is some modules of KS Sodem, InfoMedica or Cilininet. Sometimes its local HIS (Hospital Information System), RIS (Radiology Information System) or rarely PACS (Picture Archiving and Communication System) build ad-hoc platform without standardised mechanism of exchange data with other centres.

As a result of the implementation of the telemedical strategy for Lublin province should be observable higher quality of illness prevention, better statistics of treatment, faster and better help in emergency situations and, of course, lower cost of medical services.

The most important targets which strategy should help to achieve are:
- Increase in ability to access specialists and advance diagnostic methods per patient.
- Better ratio of diagnose illness in early stages.
- Reduce occurrence of continuation of wrong treatment in case of wrong or late diagnosis.
- Decreasing the cost of transportation when remote consultation and analyse of collected results of examinations is enough.
- Reduction of unnecessary transportation of patient between centres via emergency services to access specialists.
- Higher ration of survived golden hour in case of critical patients [5].
- Faster access to administration services and easier - electronic way of registration for examination or consultation.
- Easy accessible information about medics duty times, results of examination which builds up better image in society.
- Faster developing medical and derivative science by possibility to access collected in centralised systems, statistical and quality information about patients, examinations and treatments.
- Faster exchange of information via standardised protocols and data storage formats.

- Limitation of redundant examinations follow a result of lack of information in patients documentation.
- Reduction of time needed to place proper diagnosis as a result of complete and ease accessible information about past examinations and treatments.
- Increasing ration of remote consultation with first contact medics [8].

4. OPENEHR

Usage of the standardised methods of collection, storage and exchange health records follows from the last four points. OpenEHR standard is quite natural choice because it is not only open, free, well documented [1], but also compatible with most of widely spread and known standards as ISO/CEN EN 13606 [2], HL7 or DICOM.

Medical records usually are stored in local databases within healthcare centre, hospital or clinic. Access to data collected this way from outside is complicated but in last few years we could observe instant progress in developing of methods and protocols which helps in it. Most times this kind of data distribution is necessary when consultation with specialists or continuation of treatment in other health centre is essential for patient. To allow quite free flow of information specialised set of standards such as Health Level 7 for health records or DICOM3 former ACR/NEMA 1 and 2 where set. Despite these attempts all current solutions are far from perfection mainly because of lack of the common way of describing used procedures, homogeneous specification of examinations and diagnosis, proposed treatment and evaluation of its results. ICD codes known for years are too lack and too limited, typical, often paper health records are restricted to few laconic sentences in most cases in local language. As an answer to demand for uniform way of communication and data distribution OpenEHR is developed. This is standard based on archetypes and formal terminology and helps to transfer in easy way information about state of the patient and its treatment[3].

Optimum is a system which allow to all medical information, results of examinations, prescriptions and treatments follow patient in way which provide easy access even by General Practitioner or emergency units. Such solution build around central database if we count volume of the information is impossible. Distributed system which aggregate databases in clinic, hospitals, medical centres and general practitioners is more real but transaction time for each query is far too long, so it could be used as recovery procedure to recreate lost data. Progress in informatics and electronics gives a possibility to create personal database incorporated in Electronic Insurance Card, which could store all medical records of owner. If information stored on this kind card will be in OpenEHR standard it could be readable and understandable around the World. It is also possible to build up free and system independent, written for e.g. in Java, reader installed side by side with database on such a card. Authors has attempted to develop such a software, create proper procedures and integrate results with the strategy.

5. CLASSIFICATION OF PROJECTS

Telemedical projects presented in strategy could be assigned to one of the following groups: domain oriented projects, infrastructure, coordination and additional projects.

Domain projects are mainly focused on direct support of healthcare services in areas of teleradiology, emergency and health monitoring.

Infrastructure projects are directly connected to domain one and are focused on help with selection, obtaining and integration of software and hardware and organization of courses for staff whenever it is necessary. Other aspect is implementation of telemedical oriented management systems with active cooperation with management departments of medical centres.

Last one group is coordination projects support. Main aim of this one is preparation and integration and coordination all activities of all other projects. In spot of this projects are also social campaigns, advertisement, educational events which increase knowledge of population.

6. CENTRE OF COORDINATION

Centre of coordination is needed to obtain synergy between strategy and individual projects created by experts. As far we know from experience in most of cases medical or technical experts have not enough knowledge to obtain founds, manage large projects, foresee all law and formal aspects and sell results of their work. In some cases different teams could propose similar or redundant projects requiring similar telemedical or telecommunication equipment. This is good opportunity to share human and technical resources.

Main tasks of the centre are of course coordination of telemedical projects in region via monitoring of the realization of strategy. It also includes future improvement of strategy to fulfil current technological, medical and law demands, analyse of the correspondence of new projects with strategy. Next one is support to current projects by information about possible sources of funds, law assistance, contact with possible partners, and, if it is necessary, project and funds management.

Telemedical network in Lublin province plans to cooperate with international centres of medical information exchange. In most cases it could be obtained much easier with department designed to take this role. Also all contacts with business partners it this case could be professionally organized and coordinated. In future centre could be extended by additional departments, when it is necessary, focused only on new roles followed needs of situation.

Centre should be supervised by group of specialists from clinics and hospitals, medical universities, medical organizations, local government, business representatives and other groups which want to participate in increasing of quality of healthcare services in region.

Possible drawbacks of proposed structure are excessive centralisation of the management and lack of flexibility in situations where quick reaction is required for example in short term projects. Avoidance of situations like this is possible when centre support and coordinate projects not supervise or control.

7. CENTRE OF SERVICES

Main products realized in incubation phase of strategy will be probably services tested in pilot implementations by teams ready to integrate this solutions as final form in wider environment. Next stage is integration with all local systems of healthcare centres. It is clear that in most of cases interference with current systems is unnecessary but sometimes proposed solution need deep integration with deep changes at all levels of as software as procedures.

Main task of the centre will be coordination of remote consultations and preparing of proper telecommunication services. At the beginning centre of services will be more logical and distributed than physical infrastructure with proper database with information about medics, its specialisation and experiences. It will be also group of law, management and financial procedures collected during its duty.

8. COMPETITION CENTRE

One of the most important aspects of implementation of strategy for Lublin province is increasing level of knowledge of medical and technical crew. Training facilities and centres could be located in Lublin Science and Technological Park or by side of local universities, especially at the beginning. Proper courses could be prepared by scientists and educators from local universities and science institutes.

9. CONCLUSIONS

When we looking at results of similar projects in other provinces of Poland, and other countries in the World [6] and, especially, Europe [9], we could see it is not easy, but it is possible to create modern telemedical infrastructure and integrated proper systems to make access to high qualified specialists easier. Such a system should be build with usage of spread around the World standards such as mentioned here OpenEHR. We also could observe better prejudice to healthcare service in society as a side effect of faster, more exact therapies which are a result of cooperation.

BIBLIOGRAPHY

[1] Introducing openEHR. The openEHR Foundation, 2003−2007.

[2] BEALE T., ISO 18308 Conformance Statement. The openEHR Foundation, 2002−2006.

[3] BEALE T., HEARD S., et al., openEHR Architecture, Architecture Overview. The openEHR Foundation, 2007.

[4] BOBYK A., KUCZYŃSKI K., et al., G. Report: The Evalution Strategy for Telemedicine in Lublin Province for Years 2008−2012 (In Polish).

[5] CLEMMENSEN P., SEJERSTEN M., SILLESEN M., et al., Diversion of ST–elevation myocardial infarction patients for primary angioplasty based on wireless prehospital 12–lead electrocardiographic, transmission directly to the cardiologist's handheld computer: a progress report, Journal of Electrocardiology, Vol. 38, Suppl 1, 2005.

[6] VO A. H., The Telehealth Promise. Better Health Care and Cost Savings for the 21st Century. AT&T Center for Telehealth Research and Policy, Electronic Health Network, University of Texas Medical Branch, Galveston, 2005.

[7] RODRIGUEZ A., VILLALAR J. L., ARREDONDO M. T., CABRERA M. F., DEL POZO F., Transmission trials with a support system for the treatment of cardiac arrest outside hospital. Telemed Telecare. 2001;7 Suppl 1, pp. 60−62.

[8] SCALVINI S., ZANELLI E., VOLTERRANI M., CASTORINA M., GIORDANO A., GLISENTI F., Potential cost reductions for the National Health Service through a telecardiology service dedicated to general practice physicians. Ital Heart J Suppl. 2(10), 2001, pp. 1091−1097.

[9] AUDEBERT H. J., SCHENKEL J., HEUSCHMANN P. U., BOGDAHN U., HABERL R. L., Effects of the implementation of a telemedical stroke network: the Telemedic Pilot Project for Integrative Stroke Care (TEMPiS) in Bavaria, Germany.