

PROBLEMS AND ACHIEVEMENTS OF INTRODUCTION OF TELEMEDICINE IN MEDICAL PRACTICE IN UKRAINE

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Last years in Ukraine are marked with the long-awaited beginning of processes of healthcare system reformation, the program and trends of which are stated in the foundational documents:

- Decree of the President of Ukraine No 186/93 from 31.05.1993 "On the state policy of informatization in Ukraine";
- Resolution of the Cabinet of Ministers No 605 from 31.07.1994 "Problems of informatization";
- Concept of state policy of healthcare informatization in Ukraine (approved in June 1995);
- Order of the Ministry of Health of Ukraine No 349 from 15.12.97 "On the top-priority measures on informatization in the field of healthcare";
- Law of Ukraine "On the concept of national program of informatization" No 75/98-Bp from 4.02.98;
- Resolution of the Cabinet of Ministers of Ukraine from 10.01.2002 No 14 "On approval of the intersectorial program "Health of Nation" for 2002-2011".

According to these documents a substantial role in the process of reforming the healthcare system is assigned to informatization and introduction of high technologies described by a unified term "telemedicine".

On the other hand, the program of development of family medicine is adopted, which envisages an U-turn of entire bulky machine of healthcare and its modernization in order to bring medicine closer to actual and urgent needs of the patient.

It is of interest to try to find the fields of crossing of these two volume reform programs in order to examine at their junction the possibilities of increasing the quality of medical aid.

In many developing countries, as well as in countries with transition economy, to which Ukraine can be referred, the level of medical aid in general is not high. There are thereat some clinics equipped with modern medical equipment and possessing a staff of highly qualified specialists. As a rule, such clinics are located in large cities and not evenly spread over the country's territory. Thus, a significant majority of the population is forced to use medical aid of insufficiently high quality, provided by local medical institutions, the manning level and equipment of which are often beneath criticism.

As a rule, diagnosis and treatment of ordinary diseases give no problem to local specialists; however, in the cases, when they have to face situations beyond their professional capabilities, an information vacuum appears, resulting in either wrong or incomplete diagnosis or wrong techniques of patient's treatment.

Thus, a serious problem of providing doctors of family dispensaries and remote aid posts with information and consultation. The most severe this problem becomes for rural regions. Right here the colleagues working in specialized medical institutions and possessing vast diagnostic and curative experience can and must give a hand to a family physician.

The only way to unite in the struggle for patient's health the efforts of a family physician and diagnostician, separated by a distance, is telemedicine. Creation of telemedicine network within the scope of the program of family medicine development enables beforehand trained staff of family dispensaries to obtain and transmit to a Remote Diagnostic Center (RDC), created on the basis of one of the leading regional medical institutions (as a rule, these are district cardiological dispensaries or diagnostic centers, in fewer cases – district clinical hospitals), digitized information. This information can be recordings of electrophysiological signals, for example, ECG or EEG, scanned X-ray images, electronic medical records, including case history, etc. Basing on obtained information, the highly qualified specialists of an RDC can:

- make a correct diagnosis;
- consult family physicians in questions connected with the technique and specific features of treatment of diagnosed disease;
- make a decision on the necessity of immediate admission of a patient to a corresponding medical center;

- provide remote consulting support of a patient after a diagnosis is made or a patient is discharged from a hospital.

The best developed of all areas of practical telemedicine in Ukraine, as well as in other countries, is remote transmission of ECG. It can be carried out in two ways. The first one supposes that a family physician possesses a 3/6/12 channel portable electrocardiograph, usually equipped with thermal printer and LCD screen and has a possibility of not only record, print out and process a patient's ECG, but also to transmit a data file via modem by means of digital communication protocols to an RDC's computer. An example of such device in Ukraine is electrocardiograph "UCARD-200" manufactured by "UTAS", Kiev.

The other approach supposes that the transmitting side has a pocket-size telemetric electrocardiograph-transmitter, which can combine recording of one or several electrocardiograms of a patient with immediate or postponed transmission of a signal over a telephone line to an RDC. In this case there is no necessity to have a modem at the transmitting side. All functions of digitizing, compression and transmission of EEG signal are performed by a microprocessor built in the electrocardiograph. This approach is implemented in Ukraine in 12-channel digital system "TELECARD" manufactured by " TREDEX Ltd", Kharkov.

This approach assumes the involvement in the telemedical network not only family physicians, but patients themselves, as the price and simplicity of usage of the peripheral device makes it affordable for the population. Thus, patients obtain a possibility to transmit their ECG to an RDC and immediately obtain a consultation from a specialist. In emergency cases a diagnostician can make a decision on immediate hospitalization and send to a patient a specialized ambulance car. In this case the system can perform continuous ECG monitoring and enable the ambulance car team to talk to doctors of RDC even during the patient transportation to a medical institution.

It must be noted that both considered systems can work via both conventional communication lines and on the basis of mobile phones of NMT, GSM-900 and GSM-1800 standards. However, for this either an external modem or a mobile telephone with built-in modem must be connected to the "UCARD-200" system.

It seems necessary to underline those practical results, which a wide implementation of telemedicine in medical practice implies:

- dramatic increase of the outpatient and inpatient medical care to patients in any region of the district;
- providing consultation assistance to medical workers working in central regional hospitals and family dispensaries arbitrarily remote from an RDC;
- shortening the duration of temporary invalidity and disability retirement due to timely emergency medical aid;
- reducing the number of primary and secondary myocardial infarctions in patients either provided with personal peripheral devices, or attended by a family physician possessing such device, and as a consequence, reduction of the number of unmotivated hospitalizations and visits to polyclinics;
- reducing the number of false calls of cardiological ambulance teams, which mounts up to 30 per cent of the total amount;
- remote control over the consumption of medication by patients;
- plummeting of the cost of qualified medical aid obtained by patients due to elimination of intercity travels.

In spite of the fact that, at first glance, telemedicine has bright prospects in Ukraine, in the course of introducing telemedical technologies in actual medical practice in Ukraine, one regularly encounters two kinds of delusion: "telemedicine – it is too complex" and "telemedicine - it is too expensive". Besides, there is a certain scepticism of doctors regarding the usefulness of the aid from a doctor dozens and hundreds kilometers away.

The desire to gain an understanding of these delusions has become one of the incentives to write the present article.

The first thesis: "telemedicine technologies are too complex and distant from practice". It is difficult not to agree with this thesis by imagining the reaction of a rural doctor offered to install a computer, connect peripheral equipment for videoconferencing (video camera plus image processing

board), use a modem for connecting to the Internet and so on. Note, all this without abandoning actual medical practice and patients, who need aid right here and now. It is worth to specially underline that one-time or even spaced out for a couple of years provisioning with all or at least a major part of rural outpatient medical rooms with a complete set of above mentioned equipment looks like an utopia requiring no proves.

The second thesis: “telemedical technologies are too expensive even to think about”. Properly, it follows from thesis one, as the estimated cost of the “necessary”, as they usually claim, set of equipment is more than ten thousand grivnas. One must add to this the cost of a dedicated communication channel, without which a doctor can only exchange email messages, and even this with great difficulty, as the quality of rural telephone networks leaves much to be desired. The Ukrtelecom prices for a dedicated line are 800 grivnas for connection and about twenty grivnas – monthly subscription fee. Besides, it is necessary to pay a provider company, which provides the access to the Internet over a dedicated line. Minimum prices are in the order of 140 grivnas monthly, including up to 100 Mb of prepaid traffic. All that is above – at rates of 70-80 kopeks/Mb. To this we add that 100 Mb - it is approximately 15-20 minutes of compressed color video. How many videoconferences one can hold for this money?

So, the reasons for scepticism of a rural doctor become more than understandable. And further, if we take into account that, as a rule, he has at his disposal **no** diagnostic device, which can provide the input of digital information into a computer, the situation seems simply desperate. However, active advocates of **such** telemedicine can propose, for example, to print out an ECG on a one-channel electrocardiograph of ‘Malysh’ type, glue strips to a sheet of paper, scan the image and safely send it by electronic mail to a remote diagnostic center...Perhaps, it is easy to imagine, what a dispensary doctor will think about such kind of consultative aid. However, of no better opinion on telemedicine in such implementation will be a diagnostician, who has used to work with a decent quality electrocardiograms, as a rule, multichannel, recorded on a more or less modern equipment.

So, there is no way out? All that is left is to day-dream and wait, when Ukraine will become so rich that it can find budget means to purchase telemedical working places for each family dispensary and each rural medical aid post, that in one beautiful moment the access to the Internet will become cheaper and all rural telephone lines will become digital?

No, far from true, but to understand this it is necessary to discard stereotypes, imposed by dilettantes from telemedicine, who have chosen from all diversity of this trend only that, which makes it possible to number themselves with advanced users of the most complex modern technologies. It did not go without bureaucrats from telecommunication authorities, who have seen in word “telemedicine” the known suffix “tele-“, but totally lost the medical contents. However, they can be forgiven for that due to peculiarities of exceptionally technical education and posts held. And all this ‘feast of progress’ has been picked up by mass media, greedy for sensations and vivid presentations. As a result, the notion of “telemedicine” first of all is associated in Ukraine with video conferences and telebridges, with the possibility not only to hear, but also to see a conversation partner hundreds of kilometers away.

Indisputably, this is interesting, it makes it possible to hold useful meetings, train remote subscribers, exchange opinions, including on specific features of diagnosis and subsequent treatment of patients. But such telemedicine has no serious social basis, these are and will be for a long time one-time actions, enthusiastically described by mass media, but are not able to change the actual state of the matters in Ukrainian healthcare. One must be aware of that.

Leading central and regional medical centers can afford buying videoconferencing equipment, connection and regular usage of dedicated communication channels, telemedical consultations with foreign clinics on the basis of exchange of laboratory investigations, digital and video images, electronic medical records, etc. Even in spite of the fact that there is virtually no serious state approach to the development of telemedicine, a number of Ukrainian clinics already use these technologies in their practice, actively cooperate with foreign partners and even take part in the process of patient exchange.

Nevertheless, this is only the top of an iceberg. At the same time, in the country there are thousands of dispensaries and aid posts, which service millions of patients, and for them such telemedicine remains the technology from another world. Meanwhile, in Western countries long ago

has become an axiom the fact that telemedicine is intended just for remote, difficult to access places, deprived from quality diagnostic aid, at places, suffering from the lack of highly qualified medical staff. Just drive outside the girdle road of any Ukrainian district center, and you will find yourself in such places.

The main purpose of telemedicine – increasing the quality of diagnostic and consultation aid to the population with cardinal sparing of costs. This is just the main advantage of telemedicine. That is why all developed countries devote increased attention to the development of telemedicine technologies. Russia also went this way, and here the program of development of telemedicine has been already composed and begins to be implemented, telemedical centers are created everywhere, standards are introduced, fund “Telemedicine” and the Coordinating Council on telemedicine of the Ministry of Health. Serious steps are undertaken in implementing telemedicine at the lowest level of healthcare, the closest to a patient. At the state level the telemedicine is recognized as one of three main trends of social implementation of telecommunication technologies.

Unfortunately, the telemedicine in our country develops at the risk and peril of the most enterprising and progressive managers of medical institutions, as well as at the expense of initiative developments of domestic manufacturers of telemedical equipment. Nevertheless, there are some achievements, and the medical public at large must be made aware of them. However, before to proceed to the description of actual achievements in the field of telemedicine introduction in Ukraine, it is necessary to try to formulate the basic requirements to telemedical equipment in the most rigid wording:

1. Ensuring least cost when creating a consultation network.
2. Providing the highest level of diagnosis compared with any non-telemedical equipment.
3. Providing real practical consultative assistance to doctors in remote dispensaries.
4. Simplicity of usage and reliability of operation.

In the case when at least one of these requirements is not satisfied the prospects of implementation of telemedical systems seem rather limited due to extremely cautious attitude to this trend of the country's medical authorities and doctors.

The telemedical system of ECG transmission over telephone “Telecard” is widely used in Ukraine. In a number of districts the stations are installed in district cardiological dispensaries, diagnostic centers and district clinical hospitals. Most widely the system is used in Kherson and Sumy districts, where the “Telecard” peripheral devices are installed in all central regional hospitals.

The system has found an interesting implementation at Nizhnedneprovsky tube plant, city of Dnepropetrovsk, where a central station is installed in the factory's medical aid post, and the peripheral devices are located in the most remote places. During three years of operation several infarctions and considerable number of rhythm disturbances of various degree of severity have been registered there. Besides, the system is used at regular health survey of the plant's employees, which has made it possible to avoid queues in the medical aid post. ECGs of the employees are transmitted directly from the shops.

In the Kharkov Central Clinical Hospital No 5 the “Telecard” system operates for more than five years. Peripheral devices are installed in several departments of the hospital, in a number of railroad hospitals, at two cars of the city ambulance aid, as well as in the Interdistrict hospital of the Penalty Execution Administration. Several devices are used privately. The employees of the Remote Diagnostic Center analyze daily dozens of electrocardiograms, providing qualified diagnostic and consultation assistance to their colleagues and patients.

At the end of 2002 the Kharkov district clinical hospital joined the program of telemedicine implementation into medical practice. At present a central station is installed in the department of functional diagnostics (DFD), but it is planned to create in the nearest future a round-the-clock service. Three peripheral devices are installed in departments of the district clinical hospital, which has made it possible to reduce substantially the number of calls of DFD staff for ECG recordings in these departments. Operational efficiency of ECG recording has increased, together with the increase of diagnosis quality, because the "Telecard" system makes it possible to record and transmit 12-channel synchronous ECG with the duration of 15 seconds.

The used original know-how developed by the manufacturer of the system, company "TREDEX", ensures digital transmission of ECG over any telephone lines and even over mobile

communication channels of GSM standard without using additional modems. At the same time, when DFD staff is called for ECG recording, one-channel electrocardiographs are used, which are much inferior to "Telecard" in the quality of electrocardiogram displaying.

To the credit of employees of telecommunication administration of Ukraine, one of the most coherent and active supporters of telemedicine introduction in Kharkov district is the director of Kharkov directorship of "Ukrtelecom" open joint stock company S.I.Tatarchuk. With his support, the first in Ukraine experiment on equipping family dispensaries and rural aid posts with "Telecard" peripheral devices develops in the district. So, the equipment already works in Kharkov region – in Ponomarenky, Manchenky, Korotich, Liptzy and Merefa. More than one hundred electrocardiograms were received over a short period, a substantial part of which had pathologies. As many patients acknowledge, they never accounted on the possibility of obtaining consultation from the best specialists of Kharkov district without leaving the native village.

The results obtained in the course of first months of the "Telecard" system operation have strengthened the assurance of the developers, Chief Physician of the District Clinical Hospital N.I.Berezka and district medical authorities in the correctness of the made decisions. At present negotiations are in progress for installing "Telecard" devices in other family dispensaries and aid posts of Kharkov district as well.

It is of interest to analyze the system possibilities basing on the specified criteria of efficiency of telemedicine equipment.

1. Ensuring the lowest cost.

The cost of the "Telecard" central system is 13,500 Grn, each peripheral device costs 3,000 Grn. The cheapest one-channel electrocardiograph costs not less than 5,000 Grn.

Thus, when, for example, 20 medical aid posts the expenditures on "Telecard" will be 73,500 Grn. For purchasing one-channel electrocardiographs they will be 100,000 Grn, that is, the saving will be 26,500 Grn.

2. Ensuring the highest level of diagnosis compared with any other non-telemedical equipment.

In order to make a correct diagnosis and develop proper technique of patient's treatment, a doctor must be of high qualification, including the field of electrocardiography. Training of each doctor at the initial level, only to teach him or her to at least slightly understand ECG, will cost not less than 300 Grn. For 20 medical aid posts – 6,000 Grn.

But even after that the level of diagnostic skill of the leading specialists of the district, receiving ECG over telephone from regions, remains immeasurably higher than the level of qualification of local specialists. And this means that there is no alternative to telemedicine in the course of solving the task of increasing the level of medical aid to the population. No other non-telemedical equipment can ensure a quality diagnosis over 2-3 minutes.

3. Providing actual practical consultation assistance to doctors of remote dispensaries.

The experience, which the developers of the "Telecard" system possess, large number of favorable responses and continuously growing volume of transmitted ECGs have unambiguously shown that doctors in the field have apprehended with enthusiasm the prospects, which opened before them and try to use "Telecard" regularly in their work.

4. Simplicity of usage and reliability in operation.

During seven years, which have passed since the first version appeared, "Telecard" have passed through four modifications aimed at simplifying its operation and ensuring reliable operation over any communication lines, including very noisy ones. Over the last two years none at all warranty or post-warranty repair of the equipment took place, in spite of the fact that hundreds of devices work in the healthcare system of Ukraine.

As to the simplicity of usage, the device weights 130 gram, is pocket-sized and provided with a single button, which switches all modes of the device operation. The operating instructions occupy one sheet of paper of format A4. Average time of training to operate the peripheral device – 5 minutes. The most time-consuming is the training of medical staff in proper application of ten electrodes simultaneously, as, unfortunately, the overwhelming majority of specialists of dispensaries and medial aid posts never encountered 12-channel electrocardiographs in their work.

In addition to item 1 of this estimation, the calculations can be given made in the district cardiologic dispensary of Kherson district. One visit of an emergency team from Kherson to a district region at a distance beyond 200 km costs 700-800 Grn. Not less than 20-25 per cent of calls were false in the sense that a provisional diagnosis "myocardial infarction" or another diagnosis, which require immediate admittance to the district clinical dispensary, made by doctors in regions, was not confirmed. In these cases the patients can be treated in central regional hospitals.

Implementation of "Telecard" has made it possible to eliminate such unjustified calls virtually completely. Thus, with one peripheral device costing 3,000 Grn and with the given expenditures on one visit of the emergency team, "Telecard" pays off already after 4-5 cases of canceling such calls, that is, virtually, in one or two months.

The results given in the article must be considered as an invitation for a dialogue to the specialists, who determine the development of telemedicine in regions. As the calculations and work experience show, implementation of telemedicine in actual medical practice is not a tribute to fashion at all, but a way to increase the quality of medical aid with cost saving. There is no alternative to telemedicine from this point of view.