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First Results of the Implementation of Telemedical Service in The Odessa Region

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Results on the implementation of technical system purposed for telemedical consultations in Odessa Region of Ukraine are presented. Such a system permitted to perform telemedical consultations in the form of videoconferences with parallel transmission of medical images, and ECG records. First (half year) experience of performing consultative activity was in favour of identification of urgent indications for surgery in some patients, and proved to be preventive with regard to some complications in patients with acute heart and vessel diseases as well as in patients with traumas. The main conclusion on high effectiveness of proposed telemedical technical configuration, and especially in terms of heightening standards of regional medical care was made.

Key words: telemedical consultations, technical telemedical system, health care system.

Introduction

Telemedical care is regarded as a method of providing the most urgent medical care of a specialized type to patients [2, 5, 7, 9, 11]. This is of greatest significance in the case of acute heart failures, strokes, traumas etc. [7, 9, 10]. The advantage of telemedicine may be of importance in all health care systems in the former Soviet Union countries, and it is especially attractive for such regions as Odessa (Ukraine), where the incidence of heart

and vessel pathology occupies the first place (about 61.2%) among other causal factors of mortality in young age [3, 5, 6]. Traumas occupy the third place, while the second one belongs to tumours, amounting to 12.5% and 11.2%, respectively [5].

Despite such a situation, when telemedical service promises to be effective in saving patients' lives, the process of its implementation is very slow and telemedical consultations do not become routine. There are several reasons behind this. Among other things, what should be mentioned first is the lack of adequate insurance law. The relatively poor infrastructure (especially sparse communication lines), inadequate computer techniques, as well as a poor market of telemedical instrumentation should also be mentioned.

Nevertheless, the Odessa Region became the first in Ukraine where a government programme for the development of telemedicine was adopted by the local government (in mid-November 2006). It was a logical result of the earlier development of telemedicine in the region, when optical lines were used for distant telemedical consultations carried out by Odessa Clinical Regional Hospital and Izmail District Hospital, the most remote places in the Odessa Region located at Danube delta [5, 6].

Therefore the aim of the present work was confined to expert analysis of the results of systematically performed telemedical consultations arranged between Odessa Regional Hospital and District Izmail Hospital. Both the effectiveness of medical service and economic effectiveness were studied.

Material and Methods

Telemedical consultations of patients at Izmail District Hospital by specialists from Odessa Regional Hospital have been arranged to run since January, 2006. Both planned and urgent forms of consultations have been regularly held.

Generally, during remote medical consultations real time ultrasound investigations along with ECGs (12 leads) were usually transmitted. Besides, X-ray images were also transferred in some cases, especially in preliminary case histories. Additionally, results of some diagnostic procedures, if necessary, were later sent to consultants. Consultations lasted from 5.5 to 35.0 minutes (14.5 ± 4.2 min on average). Planned and urgent consultations took 17.4 ± 5.0 min and 7.3 ± 2.7 min, respectively. Altogether during the first half of 2006 planned consultations were arranged for 87 patients, while urgent consultations were held for 50 patients.

Expert evaluation of the efficacy of telemedical consultations was carried out by assessing the following indicators:

- 1) determination of the period of time necessary for delivering medical care of a specialized type (from the moment of the development of an urgent case) in absence of telemedical service;
- 2) determination of the number of patients in whom correct diagnosis was correctly made via telemedical facilities (planned consultations);
- 3) determination of the number of patients that could obtain a more effective care via telemedical consultations. This indicator was identified from a retrospective analysis of case histories of 20-55-year old patients, who were treated at Odessa Regional Hospital in the period 2004-2006.

In addition, a subjective evaluation of telemedical service by patients and medical workers was determined on the basis of answers to anonymous questionnaires.

Results

Telemedical consultations of patients in the rural zone of Odessa Region made it possible to provide correct diagnoses for most patients for the first time (Table 1). No less than 20% of patients required urgent surgery, which was subsequently successfully performed.

Therefore, satisfactory results were seen in patients who had been examined not earlier than one month from the time of telemedical consultation and surgery. Telemedical consultations were found to be very popular and attractive to patients, which fact was reflected in an increased number of planned medical consultations (Table 1). Thus, the number of patients who wanted to be consulted via telemedical facilities in May exceeded that in January by a factor of 2.7.

It is interesting to make an analysis of cases which were successfully diagnosed and later underwent surgery. Congenital defects made up the biggest part of such cases. For example, spinal hernia in newborns (2 cases), and an open Botalli ducts were diagnosed in 3 newborns, and in one newborn a foramen in the heart intraventricular septum was identified (0.6 cm^2). In two other cases oesophageal atresia along with the fistula between the bronchial tree and the oesophagus associated with pneumonia were diagnosed. Pylorostenosis was found in the course of telemedical consultations in three

Table 1. Non-urgent cases of telemedical consultations of patients from Izmail subregion (Rayon) of Odessa Region in the first half of 2006.

Period of time	Number of patients under examination	Diagnosis was correctly made in the course of TM consultation	Type of second opinion			Positive postponed results
			Urgent surgeries	Additional observation (examination of patients)	Therapeutic treatment	
January-February	15	7	3	4	9	14
March-April	32	21	9	10	18	29
May-June	43	27	14	12	26	39

other newborns on their 2nd and 3rd week of life, and indications for surgery were also identified. All cases were later successfully treated surgically.

Remote telemedical consultations helped to verify and modify ultrasound examinations, and in five women pelvioperitonitis was successfully diagnosed. Punctures were effectively used for fluid evacuation from the small pelvium along with miniinvasive laparoscopy. Two out of 5 women required surgery for salpingophoritis. They were all followed up for one month from the time of investigation/ surgery and their condition was found to be satisfactory.

In 59.8% of patients in the course of telemedical consultations the protocol of conservative treatment was modified. For example, a new type of pharmacological treatment was recommended along with advice on the diet and healthy way of life. Thus, in 8 cases the new generation of angiotensine-inhibiting enzyme blockers was prescribed, and in all cases the patients' condition improved.

Also results of urgent medical consultations have been analyzed during this period of time (Table 2). This analysis revealed that telemedical consultations made it possible to make a correct diagnosis and prescribe proper treatment more quickly. What is more, correct diagnosis and successful treatment resulted in stabilizing patients' condition and in economising on material and technical resources. (Table 2). Expert evaluation of the number and cost of standard visits by car or air by medical specialists revealed that by arranging teleconsultations more than US\$ 20.000 were saved in the first half of 2006.

It may be interesting to analyse in more detail urgent or emergency cases successfully diagnosed. For example, acute retention of urine in a 59-year-old man was discussed and proper recommendation was successfully offered by teleconsultants. The diagnosis of a tumour of the prostate was made, and consequently urgent surgery was performed with a satisfactory outcome. Acute retention of urine was also found in a pregnant woman (27th week of pregnancy), and kidney calculosis was diagnosed followed by laparoscopic surgery. In another pregnant women (33rd week of pregnancy) the diagnosis of acute vein thrombosis of the left leg was made and filters on the venous blood were installed, which dramatically helped in subsequent delivery.

In a 36 year-old woman severe bleeding in the course of delivery was observed, and a disseminated blood coagulation syndrome was diagnosed. The specific drug “Novoseven” was administered, but failed to bring any effect. By teleconsultation it was clarified that “Novoseven” had been given to the woman along with heparin, which was probably the cause of low therapeutic effectiveness of the prescribed treatment.

Table 2. Urgent telemedical consultations of patients in Izmail Rayon in 2006 (first 6 months)

Type of pathology	Number of patients to whom TM consultations were given	Type of urgent recommendations		Economy in time [in hours]	Economy in ambulances and air- flights
		With in-patient observation and/or treatment	Out-patient type of procedures		
Trauma (all types)	17	4	13	2-3	11
Acute heart and vessel diseases	10	2	8	1-2	2
Pathology in the course of delivery	14	5	9	1-5	8
Poisoning	5	4	1	>3	3
Acute infectious diseases	4	3	1	>5	2

Table 3. Retrospective analysis of the possibility of prevention of deaths from diseases covered by telemedical consultation service.

Disease	Period of analysis (years)		
	2003	2004	2005
Acute heart and vessel diseases:			
– heart infarct	58/31 (53.4%)	63/27 (42.8%)	49/20 (40.8%)
– thromboembolia	32/14 (43.7%)	19/7 (36.8%)	24/10 (41.7%)
– stroke	16/6 (37.5%)	21/5 (23.8%)	16/4 (25.0%)
Total (heart and vessel diseases):	106/ 51 (48.1%)	103/ 39 (37.9%)	89/ 34 (38.2%)
Trauma (brain trauma, polytrauma)	55/ 38 (69.1%)	64/ 40 (62.5%)	57/ 35 (61.4%)

Notes: the nominator represents the general number of cases resulting in death; the denominator represents the number of cases when TM consultation may have prevented death (in accordance with expert opinion).

Repeated administration of “Novoseven” without heparin immediately stopped bleeding.

Telemedical consultations on polytrauma, which required the presence of different specialists, deserve special attention. In all such cases (17 patients) a proper course of treatment was developed as a result of consultations. The type of surgical intervention has been identified resulting from the discussion and consensus of opinion among various specialists such as orthopaedists and traumatologists, or surgeons specialising in vessel and thorax pathologies, as well as neurosurgeons. Hence, the final decision led to satisfactory results in 15 out of 17 traumatised patients (Table 2).

During the period of May-June, 2006 effective telemedical consultations were arranged in urgent cases. Eleven successful consultations in newborns were made in 9 women who had problems with the reproductive system, and in 7 women who suffered from polytrauma.

The retrospective analysis of the prospective effectiveness of telemedical care covered the period between 2003 and 2005 (Table 3). Expert evaluation included description of the severity of the patient's condition, from the onset of the disease until the time of providing medical care and type of treatment initially prescribed. All this helped to estimate the possible benefits of telemedical consultations. Hence, expert

analysis revealed that had telemedical consultations been available at the proper time and consultations arranged, more than two-thirds of patients with acute heart and vessel diseases would have obtained proper medical service. In other forms of pathology, e.g. traumatic diseases, even more than two-thirds of patients would have benefited from telemedical care (Table 3).

When the subjective estimation of telemedical consultations was analysed all respondents (patients and medical staff alike) were found to appreciate this type of service. What they appreciated most was the fact that they had been spared the burden and cost of travelling to Odessa Hospital. Nevertheless, 13.5% of anonymous responders pointed out that the above advantages of telemedical technology may be of lesser value when the remote medical hospitals and/or centres become equipped with modern equipment, especially ultrasound diagnostic devices of high resolution. On the other hand, 8.2% of responders (medical workers) noted that telemedical technology may be valuable in improving the standards of hospital staff. Involvement of medical workers in distance learning may have a greater impact on increasing the diagnostic potential of remote medical centres than short-time interactive sessions and courses aimed at resolving difficult diagnostic situations. However, 7.5% of responders claim that, for various reasons, communication in the course of telemedical sessions is not very effective.

Discussion

The data obtained revealed that telemedical consultations were to a certain extent effective in establishing precise diagnosis and urgent medical procedures. Planned consultations showed high effectiveness in the diagnosis of pathology in newborns and in women with diseases of the reproductive system. Neonatology and gynaecology or obstetrician are among the branches of medicine that can benefit most from the new telemedical service [1, 5, 6, 7]. It could then be concluded that this system may put health care in Odessa region on a higher level. This is most desirable in view of the prospective acceptance by the Ukrainian Ministry of Health of European pregnancy/delivery standards (22 instead of 28 weeks). Telemedical consultations are also of benefit in unsatisfactory gynaecological and obstetric or neonatological services in remote places in the Odessa region.

We have revealed a comparatively high effectiveness of telemedical consultations when compared with the data from other authors [8, 9, 10]. This situation may be explained by the difference of the present-day health care system in Ukraine compared with that in other countries. The Ukrainian health care system is undergoing reforms in the absence of a modern medical insurance scheme accepted by the population at large. Those who have had experience with telemedical consultations may in future appreciate the advantages of medical insurance [7].

The data obtained from the retrospective analysis show that telemedical services are highly effective in patients in critical condition resulting from heart and vessel disturbances and traumatic damage. It should also be stressed that we have focused our attention on the type of diseases which lead to the high mortality of young people in the Odessa region.

It should be noted that the above mentioned analysis revealed a tendency (on an annual basis) towards a lower number people who received inadequate, usually belated urgent medical care. All this indicates that the existing telemedical system should be improved.

Our results from an anonymous questionnaire indicated that in the Odessa region and in Ukraine as a whole awareness of the importance of telemedical service is not satisfactory. This is true for both potential patients and medical workers, and in this respect the Ukrainian system differs from that in the EU countries.

Taking into consideration the relatively inadequate material and technical facilities available in local hospitals, the development of telemedical service in Odessa region must be continued in parallel with the development of all telecommunication systems in the region. That is why it seems that what is more appropriate and can be more easily implemented is the idea of a “telemedical network” provided with standard “telemedical terminals” and proper telemedical diagnostic instrumentation. Further improvement of telemedical care is expected to be based on active participation of remotely localised hospitals and the transformation of “telemedical terminals” into “telemedical centres” with a growing spectrum of telemedical diagnostic devices to reach the present-day European standards.

Conclusions

1. Planned telemedical consultations in the form of videoconferences with parallel transmission of medical images, ECG records, etc. represent a highly effective diagnostic tool which makes it possible to identify urgent cases for subsequent treatment.
2. Urgent telemedical consultations also ensure higher effectiveness of treatment of acute heart and vessel diseases as well as the consequences of traumatic damage.
3. Distribution of knowledge on telemedicine helps to increase the interest among the population to have access to this type of medical service.
4. Telemedical consultations, backed by the informed consent of patients, can lead to some sort of recommendations or “second opinions” generated by “telemedical consultants”, and, consequently, can bring about fewer medical mistakes or other conflicting situations during telemedical sessions.

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