

ОРИГІНАЛЬНІ ДОСЛІДЖЕННЯ

Cogitare hominis est!

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Information computer technologies for distant medical collaboration in the Ukraine Swiss Perinatal Health Project

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РЕЗЮМЕ, ABSTRACT

The Ukraine Swiss Perinatal Health Project aims to contribute to health system development by improving access to information and fostering professional networks for Ukrainian health professionals. Methods: An internet based telemedicine platform was chosen enabling distant collaboration. Users were equipped with necessary infrastructure, basic PC, digital camera and internet access. Results: 80 users from Ukraine and abroad registered to the network. 124 cases were presented in the network, 81 with a distinct clinical question, among them 68 received comments. Interaction took place between Ukrainian (case presentations) and international (providing comments) health professionals. Discussion: It is shown, that ICT in health foster communication among professionals and contribute to continuous education over distance (Ukr. z. telemed. med. telemat.-2006.-Vol.4,№1.-P.21-29).

Keywords: Information & Communication Technology, Telemedicine, distant collaboration, knowledge sharing, health system development

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ІНФОРМАЦІЙНІ КОМП'ЮТЕРНІ ТЕХНОЛОГІЇ ДЛЯ ДИСТАНЦІЙНОГО МЕДИЧНОГО СПІВРОБІТНИЦТВА В УКРАЇНО-ШВЕЙЦАРСЬКОМУ ПРОЕКТІ ПЕРИНАТАЛЬНОГО ЗДОРОВ'Я
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Україно-Швейцарський проект перинатального здоров'я прагне вносити свій внесок у розвиток системи здоров'я, поліпшуючи доступ до інформації і сприяючи професійним зв'язкам для українських працівників охорони здоров'я. Методи: телемедична платформа на основі Інтернету була обрана для дистанційного співробітництва. Користувачі одержали необхідну інфраструктуру, базові персональні комп'ютери, цифрові камери і підключення до Інтернету. Результати: 80 користувачів з України і зарубіжжя зареєструвалися в мережі. Були представлені 124 випадки, 81 з клінічними питаннями, на які було отримано 68 відповідей. Взаємодія була представлена українськими (презентація випадків) і іноземними (коментування) медичними працівниками. Дискусія: показано, що інформаційні комп'ютерні технології в охороні здоров'я сприяють професійному спілкуванню і вносять свій внесок у неперервну освіту на відстані (Укр.ж.телемед. мед.телемат.-2006.-Т.4,№1.-С. 21-29).

Ключові слова: інформаційні комп'ютерні технології, телемедицина, дистанційне співробітництво, поширення знань, розвиток системи охорони здоров'я

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ИНФОРМАЦИОННЫЕ КОМПЬЮТЕРНЫЕ ТЕХНОЛОГИИ ДЛЯ ДИСТАНЦИОННОГО МЕДИЦИНСКОГО СОТРУДНИЧЕСТВА В УКРАИНСКО-ШВЕЙЦАРСКОМ ПРОЕКТЕ ПЕРИНАТАЛЬНОГО ЗДОРОВЬЯ

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Украинско-Швейцарский проект перинатального здоровья стремится вносить свой вклад в развитие системы здоровья, улучшая доступ к информации и способствуя профессиональным связям для украинских работников здравоохранения. Методы: телемедицинская платформа на основе Интернета была избрана для дистанционного сотрудничества. Пользователи получили необходимую инфраструктуру, базовые персональные компьютеры, цифровые камеры и подключение к Интернету. Результаты: 80 пользователей из Украины и зарубежья зарегистрировались в сети. 124 случая были представлены, 81 с клиническими вопросами, на которые было получено 68 ответов. Взаимодействие было представлено украинскими (презентация случаев) и иностранными (комментирование) медицинскими работниками. Дискуссия: показано, что информационные компьютерные технологии в здравоохранении способствуют профессиональному общению и вносят свой вклад в непрерывное образование на расстоянии (Укр.ж.телемед.мед.телемат.-2006.-Т.4,№1.-С. 21-29).

Ключевые слова: информационные компьютерные технологии, телемедицина, дистанционное сотрудничество, распространение знаний, развитие системы здравоохранения

http://www.telemed.org.ua/UJTMNT/N1_06/article4.html

Access to up-to-date information is one pre-requisite to make informed decisions in all aspects of life. Information and communication technologies offer great potential to improve health services and systems [1]. Healthcare is about knowledge management, the right knowledge available at the right time in the right place directly influences the right outcomes. In transitional countries access to information is still compromised for various reasons. The direct personal exchange of knowledge and expertise among colleagues on a larger scale is hampered by long distances and slow public transport systems. Paper based media like medical literature and scientific papers are scarce due to limited financial resources and lacking distribution systems. Libraries provide a restricted choice of medical books not representing the full range of current and international recognised knowledge. Latest developments in medical science discussed in international journals, influencing clinical practice and leading to the modification of the clinical practice guidelines do not reach the attention of the medical community, especially not to those health professionals working outside the urban centres.

The United Nations World Summit on the Information Society (WSIS) 2003 in Geneva emphasised that access to Information and Communication Technology (ICT) is one of the main elements for the development of societies. For most of the industrialised countries the use of Information

and Communication Technology (ICT) has emerged as a key to drive efficiency and effectiveness of their health systems.

The objective of the Ukraine Swiss Perinatal Health Project is to contribute to the health system development and to improve offer, quality and access to preventive and curative perinatal public health services in selected Ukrainian regions. The ICT component of the project aims to contribute to the overall objective by improving access to information for health professionals in Ukraine, fostering professional networks and establishing a Telemedicine platform through which information can be exchanged. It was expected that participants share their experience from daily clinical practice and provide expertise to answer medical questions of their colleagues, however there were no rules defined on how the network shall be used. Therefore participants applied the network very individually. This reflects also in the results section, where the activities are analysed from a general perspective and from the perspective of one district hospital. The involved health professionals are Obstetricians, Gynaecologists and Neonatologists from Ukraine and international colleagues. The technical infrastructure applied consists of personal computers, internet access, and a server application called iPath [2,3]. iPath has been chosen because of its intuitive user interface, its moderate computer and communication infrastructure requirements and because it is developed in open

source. Open source software is interesting for applications in low resource environments, where the costs for software and licences compromise the scarce health budget. Additionally, the open source model allows technology transfer and active participation by the Ukrainian partners also on

the technical level. The technical infrastructure enables the participants to collaborate in a closed user group and to communicate, using a common platform and disposing of a structured format with functions to exchange data and information.

Materials and Methods

The project started in April 2003 with two partner hospitals recruited from the Ukraine Swiss Perinatal Health Project (USPHP). The Institute for Paediatrics, Obstetrics and Gynaecology in Kiev and the Regional Children Hospital of Ivano-Frankivsk appointed each a doctor to coordinate the activities within the hospital. The coordinators received training for the application of iPath and the digital camera. They have been taught how to enter medical cases into the database and add digital files, how to open existing medical cases and how to provide comments. Interested doctors from these hospitals can refer to the coordinators to get information and trained in order to participate in the network. The department of Obstetrics and Gynaecology of the University Hospital of Zurich is the international counterpart within the network.

To facilitate tele-consultations as well as sharing and discussion of clinical information, the project selected the iPath telemedicine platform for implementing the Ukraine-Swiss perinatal telemedicine network. iPath is a web-based, open source telemedicine platform developed at the University of Basel since 2001 [2-5]. The iPath platform combines communication with content management features and its main function is the "medical discussion group" in which a defined group of users can present and discuss clinical cases.

iPath provides the user with a structured format to present the cases (cf. fig.1). The first section contains the main information about the presented case e.g. patient information, anamneses and diagnosis in plain text. The sender explains the reason for presenting the case and formulates question he/she wants to discuss. To the gallery the users can add images and any

other documents. The annotation section lists the comments provided by the users. Comments are entered directly from the web or can be sent by email. Comments via email are automatically integrated into the case.

Instead of operating its own server, the project started with utilizing the existing iPath server at University of Basel, operated by the Department of Pathology of the University of Basel (<http://telemed.ipath.ch>). This server is used worldwide by over 1000 users and is also hosting many telemedicine applications with developing countries [4]. Since April 2003 the network was growing continuously and new participants added to the network like the six partner hospitals from the Perinatal Health Project and individual doctors working in other hospitals. Up today 80 individual doctors (61 Ukrainian and 19 international) registered to iPath and are members of the network.

The USPHP is operating its own discussion group on iPath. User first register a user account on the iPath server and can then apply to become member of the Ukraine Swiss Perinatal Health Group. iPath is accessible from any personal computer with internet connection. The most important functions are also accessible through an email interface, which is particularly useful for participants with slow connectivity and for receiving automatic notifications about new cases and comments.

The technical pre-conditions in the partner hospitals were varying from no infrastructure available to fully equipped and operational computer work places. The Perinatal Health Project provided the needed infrastructure where necessary to the partner hospitals. Participants outside the partner hospitals use their professional or private technical infrastructure.

Newborn with lung pathology (4819) < | up | >

Home List Find Edit Add Delete print Chat Export image drop Slideshow Compare referral

Newborn with lung pathology **type:** Question **sender:** vodtmo 2004-04-06 14:44
subtitle: child from mother with hepatitis C Ukrainian Swiss Perinatal Health Programme

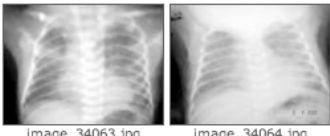
Child: boy. Birth date: 27.02.04. Anamnesis: 1-st pregnancy complicated by hemorrhage in stomach, resection of stomach, hepatitis C at the end of pregnancy. Delivery: C-Section at the gestation term of 31-32 weeks. Weight: 1770 g. Length: 43 cm. Apgar score: 5-6. After delivery the child was in grave condition. Artificial lung ventilation was conducted according to the following parameters: pin/pex 15/3, FIO₂: 0,4-0,35. VO₂: 5 l/min for 20 days and CPAP for 10 days. Immunisation against hepatitis B after delivery was performed.

At the moment the child has independent breathing without oxygen, SPO₂: 94-96%, crepitations in both lungs. Liver: +3,5 cm. Echocardiogram of heart: N. Neurosonography: N. General bilirubin: 71,7, direct bilirubin: 15, indirect: 56,1. ALT: 0,1. AST: 0,2. Protein: 59. ABHBCor-positive, ABHCV-negative, AB-HAV-IgM-negative.

Treatment: cefalosporini III and IV generation, immunoglobulini, digoxini.

Question: How can you explain the lungs changes? How the child should be treated born from mother with hepatitis C?

gallery:



Image_34063.jpg Image_34064.jpg

annotations » add comment

opitz [comment sent by email from syluc <SYLUC@wanadoo.fr>]:
 2004-04-09 15:40 Dear Colleagues

Your questions induce more questions...This is why medicine is so interesting...

1) Did the mother get contaminated by the hepatitis C virus (HCV) during

Figure 1. Typical case presentation on iPath. The header gives information about the type of case, submission date and the submitting user. This is followed by a textual description of the case which should include relevant clinical information and which should clearly formulate a question that should be discussed. Additionally the case can be illustrated with digital images or other documents. Cased details can only be modified by the owner of the case; however, other group members can add comments at the bottom of the case

The required equipment for a working place consists of a desktop computer (minimum Pentium III/1 GHz or better, 256MB, 60GB HDD), monitor (17" CRT with XGA resolution – 1024x768 pixels), flat bed scanner (1200dpi) and a digital camera. The cameras should have a resolution of 2 mega pixels or better, a 3x optical zoom lens with macro mode and the option to switch of the flash. For the project, Pentax Optio 33L cameras were chosen. The computer work places are connected to the internet through digital modem connections of minimum 64kB/s, either ISDN or

DSL. The analogue dial-up modem connections available in some partner hospitals were not sufficient in terms of speed, availability and reliability due to the bad physical quality of the telephone lines. Occasionally no separate physical line was available or it was connected through the hospital's telephone switch board disabling an internet connection. For those cases a separate physical line was installed between the hospital and the nearest point of presence of an internet service provider. Internet connectivity was established through various local internet service providers.

Results and Discussion

The clinical cases entered into ipath between September 2003 and January 2006, were considered in the study. The study analysed the way Information and Communication Technologies (ICT) did enable the development of the projected professional network and how the technology was adopted by the user.

The following user and usage aspects have been analysed:

- Number of user and frequency of participation
- Characteristics of network participation
- Number and characteristics of cases presented in the network

- Level and Quality of Interaction within the network

User statistics

From the total number of 80 registrations 61 (76%) originate from Ukrainian and 19 (24%) from international health professionals. Health professionals summarises Obstetricians, Gynaecologists, Neonatologist and Paediatricians. 14 (17.5%) persons just completed registration but did never access the system - they are not considered to be users. 21 (32%) of the registered users logged into the network more than 25 times, whereas 45 (68%) registered users logged into the network less than 25 times. 11 users logged in more than 100 times.

26 (39%) registered users logged into the network at least once during the time period of the last three months (11/05 to 01/06). 40 (61%) of the registered users have not logged in for more than 3 months.

There are active and non-active (only reading) users. 22 (33%) registered users

opened at least one case for discussion and 29 (44%) registered users did provide one or more comments to presented cases. 18 (27%) users are providing both, cases and comments to the network. 34 (52%) users did never post a case or write any comment, 10 of these reading only users logged in more than 10 times into the system.

Case statistics

During the observation period 124 cases were opened. All the cases have been opened by Ukrainian users; international users did not open cases. The cases can be distinguished between pure clinical case presentations (n=43) and consultations, i.e. case presentations with distinct clinical questions (n=81). As table 1 illustrates, cases represented the fields of Obstetrics (52%), Gynaecology (10%), Neonatology (28%) and Paediatrics (10%).

Table 1. Distribution of cases

	Obstetrics	Gynaecology	Neonatology	Paediatrics	Total
Presentations	22 (11)	7 (0)	8 (5)	6 (2)	43 (18)
Consultations	43 (38)	5 (4)	27 (23)	6 (3)	81 (68)
Total	65	12	35	12	124

The numbers in brackets indicate the number of cases that received at least one comment. Out of the 124 case, 43 were case presentation and 81 were consultations. From the 43 case presentations only 18 received any comments (42%). From the 81 consultations 68 received at least one comment (84%)

36 (29%) of the cases contained text only and 88 (71%) contained images e.g. morphologic images of a body parts were contained in 42 cases, radiological images in 23 and ultrasound images in 48 cases. For the cases that were presented with images the number of images ranged from 1 to 25 with an average of 4.7 images per case.

Comment statistics

38 (31%) of the total of 124 cases did not receive any comment. 86 of the cases received one or more comments. From the 81 cases presented as consultations 13 (16%) did not receive any comment. From the total of 165 comments provided in the network 50 (30%) have been provided within three calendar days. 21 Ukrainian users have provided together 86 comments with an average of 4.1 comments per user; 7 international user together stand for 79

comments, on average 11.3 comments per user. Requests for clarifications or final outcome of the presented cases were issued 32 times, but only 13 times a reply was given.

To characterise the different usage of the system we set the activity (number of cases and number of comments) in relation with the number of sessions (login). A high ratio of cases per session indicates that a user is mainly interested in using the telemedicine platform for presenting or consulting own cases. A high ratio of comments per session illustrates that the user's main interest is answering clinical questions. Table 2 illustrates that these two groups are clearly different. The users with the highest case/session ratio are all clinicians from regional hospitals. On the other hand, among the 5 users with the highest comments/session ratio 4 are international par-

ticipants. Further it is interesting to know that none of the most active users with

more than 100 logins are among either of these two groups.

Clinical application

The Volyn Regional Children's Territorial Medical Centre used the platform mainly for distant medical consultation of their patients. The description of the patient history, the documentation of the clinical problem in writing and with images and the formulation of the clinical questions has been prepared in iPath. The team using iPath includes physicians of different specialities e.g. Neonatologists, Paediatricians, Surgeons, Obstetricians and Gynaecologists. Neonatologists used iPath more frequently.

There have been 16 cases uploaded since September 2003 (fig.2A/B). The objective of the clinical integration of iPath was to obtain additional information from colleagues outside of the own working environment in order to make informed decisions. ECG data, X-Ray images, ultrasound and computer tomography images as well as laboratory examinations were uploaded and discussed using iPath.

Diagnosis specification and therapeutic management selection were needed for the patients with skin disease, genetic disease (facomatosis, achondroplasia). Patients with intrauterine infection, sepsis, hyperplasia of endometrium, bronchopulmonary dysplasia and central nervous system lesion needed the specification of therapeutic management. Additionally, a rare case of a child with birth defect of the brain (holoprosencephaly) was described. The information concerning an appropriate choice of a Referral Centre was needed for a patient with mandibulofacial dysostosis (Franchescetti syndrome). The nosological structure of the uploaded cases was diverse as it can be seen in figure 2C.

The leading place is taken by congenital pathology as more hard and significant pathology for correction and treatment. After receiving comments a clinical meeting was organised, where all recommendations and suggestions were discussed among spe-

cialists and they decided the possibility to use them in this situation.

Most of the consultations were done instantly. This gave the possibility to make appropriate decisions e.g. to change antibacterial therapy, to correct artificial lung ventilation parameters, to provide differential diagnosis and additional examination of patients.

The time delay until the expected information is received is one important factor for the usefulness of this information. For 5 (34%) cases the information arrived within 24 hours, for 4 (24%) cases it arrived within 48 hours. For 3 (18%) cases no answer was provided within the network (fig.2D).

Partial or complete satisfaction was given in the cases when recommendations could be applied in the clinical process. The counselling is considered to be negative in case of no reply because each request for information had a professional interest and a clinical relevance. The most efficient consultations resulted for the following cases: provision of artificial lung ventilation, antibacterial therapy, assessment of immunological results (fig.2E). Satisfaction of the consultation for patient can be hardly estimated as it depends on the final result of the treatment and this is not always objectively measurable.

Discussion

When the Ukrainian Swiss Perinatal Health Project introduced a telemedicine component in April 2003 the main goal of this initiative was to foster communication between Ukrainian specialists and the involved medical partners in Switzerland and Western Europe. The initial interest was high and 80 users had registered. However, only 45 users logged in regularly and only 26 users logged in during the last 3 months. On first sight this might seem as a very low rate of participation it actually corresponds very well with the general picture of such a telemedicine platform.

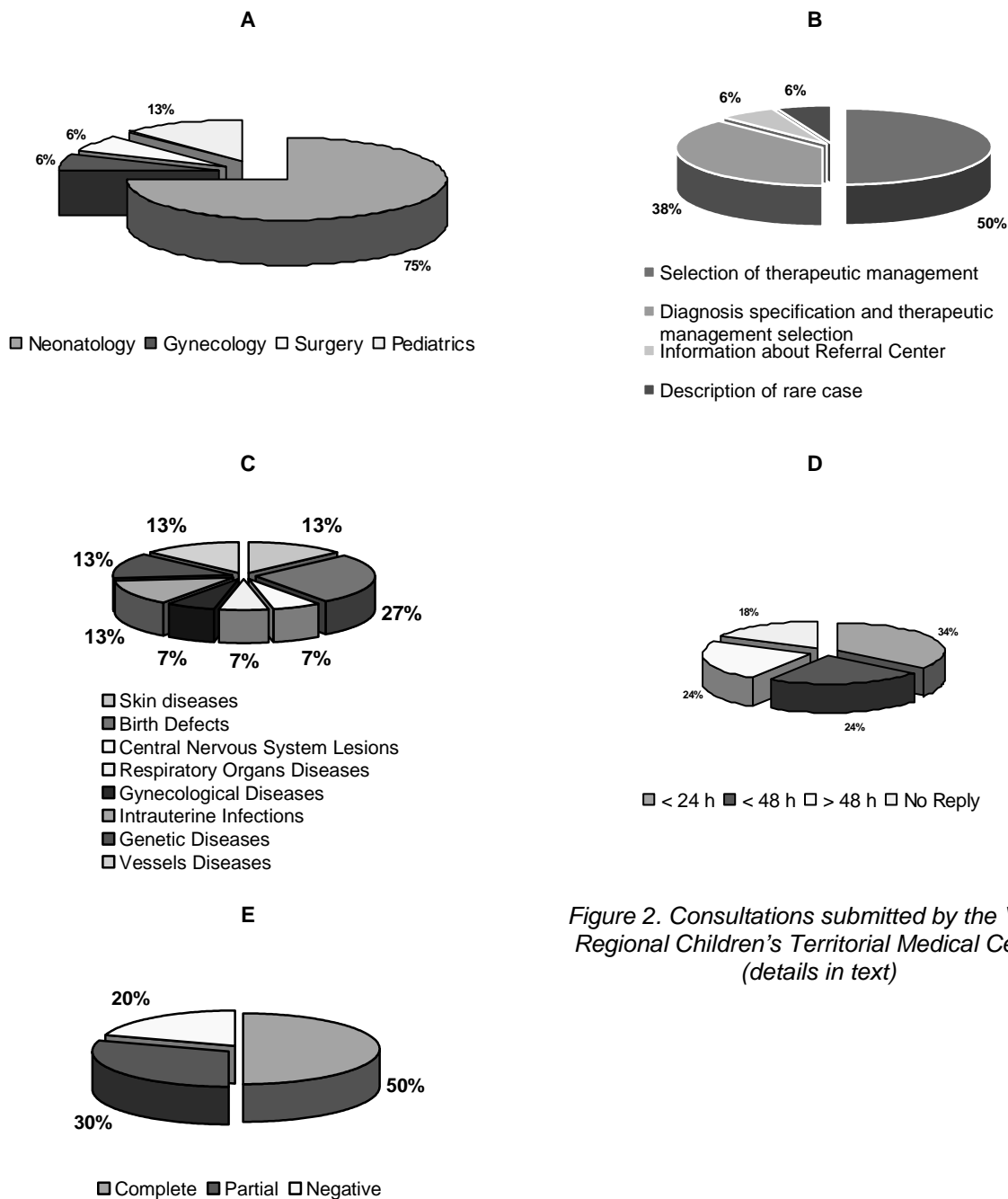


Figure 2. Consultations submitted by the Volyn Regional Children's Territorial Medical Centre (details in text)

Looking at the iPath telemedicine server of the University of Basel on which the project's application is hosted reveals a similar picture. Out of over 2100 registrations, only about 1000 users are actively using the server.

For the Ukrainian partners in this project, especially those working in regional hospitals, the telemedicine tool provided an opportunity to overcome professional isolation and to share clinical experiences and consult difficult cases with specialists from

different countries (Switzerland, Hungary, France, USA and Ukraine).

While the initial goal of the telemedicine component was focused on the sharing and mutual presentation of interesting medical cases, it has become obvious that there is also a very strong demand for consultation. Out of the 124 cases submitted to the telemedicine platform, only 43 were case presentations. 81 cases were submitted as clinical consultations.

As table 2 illustrates, there was a distinguished difference in the participation

pattern between the international and the Ukrainian participants in the network. Typically, the Ukrainian partners submitted consultations while the international partners are providing comments. Considering the

fact that one single doctor submitted 50% of the comments from Ukrainian users, the input provided by Ukrainian experts was relatively low.

Table 2. Characteristics of user activity by estimating the ratio of cases and comments per session

Users with most cases/session

Rank	Sessions	Cases	Cases/Session	Origin
1.	8	2	0,25	Ukraine
2.	10	2	0,20	Ukraine
3.	5	1	0,20	Ukraine
4.	75	14	0,19	Ukraine
5.	6	1	0,17	Ukraine

Users with most comments/session

Rank	Sessions	Comments	Comments/Session	Origin
1.	20	11	0,55	Internat.
2.	10	5	0,50	Ukraine
3.	96	35	0,36	Internat.
4.	17	5	0,29	Internat.
5.	69	15	0,22	Internat.

The table shows the top 5 user who posted most cases/session and who posted most comments/session. Interestingly, the activity is very asymmetric. While the most active users posting cases are all clinicians from regional hospitals in Ukraine, the user most actively posting comments are mainly international participants. Interestingly, none of the very active users (100+ logins) is in either top 5 list

From the technical side, establishing communication links was not so much a problem. The initial technical problems with connectivity through modem connections could be relatively easily resolved by upgrading the telephone lines from the main hospital telephone system to a new telephone line installed by the internet service providers. However, technical connectivity alone is not sufficient for successful telemedicine consultations. 31% of the presented cases did not receive any answer and only 30% of the comments were submitted within 3 days from the presentation of the case. Out of the 32 cases in which further clinical details were requested, these were provided only for 13 cases. However, this seemingly low activity also reflects the fact that the application was from the beginning designed as a tool for information sharing rather than direct clinical consultations.

Additionally, some of the international consultants had been unwilling or unable to comment directly inside the platform. They accepted consultations by personal e-mail, but then only the one person sending the email would be able to read their comments and the large part of the group who was in-

terested in this forum as a source of constant professional training would be deprived of this input. As a way out, some users started to post comments, which they received by personal email, into the platform to share these comments with their colleagues.

Some participants perceived the use of English for case discussions as a barrier for wider acceptance of the telemedicine platform among Ukrainian health professionals. As a consequence, some of the users from the Donetsk region founded an additional regional forum using Ukrainian language. In this group 25 cases have been presented and discussed in Ukrainian. Additionally, they also translated the user interface of iPath into Ukrainian language.

Based on the experiences summarised in this paper, the USPHP has come to the conclusion that the telemedicine component should be continued, but that a new way of organising the workflow is necessary. In order to find an appropriate form of organisation and to plan the expansion of the telemedicine component a "telemedicine working group" has been formed in Ukraine and this group is now taking the leading role in defining the future of the telemedicine com-

ponent within the USPHP. The working group is currently planning the following steps:

1. To set up its own telemedicine server in Ukraine, using the open source iPath software. This server will then be available for all medical disciplines such as dermatology, pathology or radiology [4].
2. Organisation of a consultation service for clinical problems in the perinatal medicine. This service shall be organised in the form of a Virtual Institute such as the iPath project is already using e.g. in the telepathology projects [5].
3. To enhance the quality of the case descriptions and the communication the working group is preparing several consultation forms. These forms will allow the users to submit the description of their problem in a more structured and complete way. This should also have a positive impact on the number of consultants' responses. As the medical problems presented within this

network are very diverse, a single case description form will not suffice.

The Ukraine partners are also interested in expanding the network to the district level and to organise interregional consultation groups. The integration of this consultancy services into the daily clinical process will require an organisational structure to ensure timely and relevant replies to clinical consultations. For such a structure, the involvement of additional local experts who are willing to provide their expertise is required. Additionally the group's activity has to be moderated from a health professional ensuring that presented cases are according to the standards set by the telemedicine working group and to ensure that cases are forwarded to the consultants.

Finally, a second goal of the telemedicine working group is to build up an organisation that will be able to continue independently the telemedicine server in Ukraine after termination of the USPHP project itself.

Conclusion

It has been shown that ICT is a valuable instrument to enable access to information and to foster the exchange of experience among national and international health professionals. It is contributing to the continuous professional education and may even increase the capacity of a health sys-

tem. On the other hand it became obvious that technology alone, without the appropriate structures behind which organise the network, the benefits are not fully realised. The positive experiences made so far encourage the project to further develop the network.

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