Model for the implementation of Telemedicine for Consultation Services within the Ukrainian Perinatal Health System

Ukraine Swiss Perinatal Health Project

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Disclaimer

The views and ideas expressed herein are those of the author(s) and do not necessarily imply or reflect the opinion of the Agency.
### Abbreviations

<table>
<thead>
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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>CIS</td>
<td>Countries of Independent States</td>
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<tr>
<td>SCIH</td>
<td>Swiss Centre for International Health</td>
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<td>STI</td>
<td>Swiss Tropical Institute</td>
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Executive Summary

Background
Traditionally the Ukraine health system is highly specialized and centralized with emphasis on hospital based curative services. Whereas health care in general is easily accessible through a large network of facilities, their effectiveness and quality remains low due to amongst others limited resources, outdated clinical procedures and a lack of national and international networking. Missing customer orientation and a traditional course based continuous medical education system leads to the provision of unneeded services. An inefficient health care financing system and the over-extended health infrastructure are setting the wrong incentives towards institutional quality improvement.

The Ukraine Swiss Perinatology and Maternal and Child Health Promotion Projects supported the Health Sector Reform efforts of the Ukrainian Ministry of Health through a variety of key interventions targeting the increase in efficiency of services, increased human capacity in the health sector and promoting a client oriented approach to care and an intersectoral view on health. The present project phase focused on the rayon level health system with a support for a de-hospitalised, decentralised and family medicine oriented care but involving the entire referral structure involving all relevant stakeholders. Key interventions were:

- improvement of perinatal care through modern equipment, the rehabilitation and reorganisation of medical infrastructure, capacity building (obstetrics, neonatology, family medicine, management), the development of modern Clinical Practice Guidelines (CPG), the definition of services for each level of care through the Service Package and the introduction of a resource management tool promoted by WHO- the IHTP
- Introduction of Information and Communication Technology (ICT) in Health for professional exchange at the national and international levels, e-learning and exchange of referral information
- Introduction of Health Technology Management for sustainable and effective use of modern medical equipment
- The promotion of an interdisciplinary approach to health through client oriented health services, intersectoral collaboration for health and the promotion of a healthy lifestyle at rayon level (through the MCH promotion project)

The four models above are the key outcomes of the two projects, which were coordinated under an SDC umbrella. The following documentation will highlight the first three models one by one. However, the total impact of the two projects is considerably more than the sum of the effects of each model and it is the function of all models together, which make the difference.

Analysis and Objectives
A comprehensive situation analysis at the beginning of the project phase identified the lack of communication means and access to up-to-date evidence based information as one of the factors hampering the development and modernisation of the Ukraine health system. Structural factors contribute to the disparity between
the urban centres and the remote health facilities of the primary and secondary level in the rayons. Specialised knowledge is accumulated in the national reference centres and is not easily accessible for the health professionals working in the periphery of the Ukraine. The large distances and the slow transport system further prevent health professionals from regular access to continuous medical education.

Historically the professional exchange with international organisations and institutions was not fostered by the previous political system of the CIS. This lack of scientific exchange stimulating the appraisal of new external and the critical reflection of own current knowledge prevented the personal and institutional scientific advancement and consequently led the health system and clinical practice fall behind the current international standards.

The use of Information and Communication Technologies has emerged as a key tool to overcome the knowledge gap and to drive the efficiency and effectiveness of health systems. Telemedicine is one means to reduce professional isolation and enable the access to global expertise and information. The objective of the project was to establish an internet based network providing health professionals with an efficient tool for communication enabling them to exchange and share experience; and to obtain second opinion for their clinical cases from national and international colleagues. The growing information and knowledge generated on the platform serves as a resource for the continuous medical education of all health professional participating in the network.

**Model**

A “one fits all” model approach can hardly satisfy a highly complex country health system like the one in the Ukraine. The model that has been developed and tested with two pilot oblast and four pilot rayons suits this specific environment and might be used as a basis for further up scaling; however adaptations to the local context and requirements will always be required when transferring the model into other clinical specialities or to other geographic regions of the Ukraine.

The model consists of four main elements defining the application of Telemedicine in the clinical practice - the implementation process, the organisational setup, the operational setup and the infrastructure requirements.

The **implementation process** defines the various steps required to introduce Telemedicine as a new tool into the existing clinical environment. The main tasks are to raise awareness, catch interest and gain acceptance for this new tool from the main stakeholders; e.g. the oblast health administration, the oblast head clinicians, the hospital directors and the heads of the clinical services in the hospital. The oblast health administration must include Telemedicine into its health policy and make it a strategic objective. The oblast health clinicians will have to define and organise the collaboration and communication between oblast and rayon hospitals. The hospital directors must support the clinician in the introduction and implementation of Telemedicine activities within the hospital. The head of the clinical service needs to encourage and motivate his/her collaborators to get trained and apply the new tool in the daily clinical practice.

The **organisational setup** describes the environment in which Telemedicine shall be introduced and under which rules the involved partners are going to interact with each other. The Telemedicine network consists of individual clinicians working in institutions like oblast children hospitals, oblast perinatal centres, rayon hospitals and other national and international health institutions. The network allows the
registered participants to communicate and exchange information in a structured format in separate groups, e.g. present clinical cases for discussion, present clinical cases for consultation or provide information of general interest related to a certain clinical field. Participants may switch between different roles according to their current needs or interest. The three main roles are “case presenter”, “expert” and “case reader”. The roles are not exclusive and a case presenter may become an expert or an expert may become a reader for the next case.

The network needs to be moderated by a committed person – preferably a senior clinician - observing the activities, organising the network, stimulating discussions and intervening in case of problems and violation of the working rules. He/she is a resource person for all existing and new participants supporting them in case of questions related to the functioning of the network, etc. Furthermore he/she is responsible to maintain the relationship with the expert group and the technical administrator of the platform.

In order to use the network for consultation services (second opinion) it is most important to integrate the activity of presenting a clinical case and requesting external expertise into the existing clinical process. Telemedicine must be part of the clinical process and can not be applied as a stand alone tool. This is vital for consultations as there must be a formal agreement between the case presenter and the expert group defining the modus operandi between these two groups. Otherwise the response to clinical questions will always be unpredictable in terms of availability and time.

Telemedicine is based on modern technology which is not yet widespread in all hospitals today. The concepts of Telemedicine and computer literacy are not commonly known among all health professionals. It is vital to organise training courses for health professionals before implementing Telemedicine in their clinical environment preventing anxiety, overstrain and rejection.

The infrastructure requirements are relatively basic. The Telemedicine work place consists of a personal computer with display, printer and scanner. This PC needs to be connected to the internet using a fast digital access, e.g. ISDN or ADSL. For the acquisition of images in a digital format a digital camera with a standard resolution is used. Images from diagnostic modalities with digital output might be directly transferred to the Telemedicine work place, Nevertheless image file size needs to be adjusted to the speed of the internet connection. Otherwise case presentations and image up- and download will take too long.

The Telemedicine work place needs to be as close to the patient and the health professionals as possible. This enables access to the infrastructure for everybody at any time convenient for the health professionals.

The communication platform used to create the network is the open source software iPath. iPath has been translated into Ukrainian language and is installed on the server of the Mohyla Academy School of Public Health. Access is free for registered users and new groups will be allocated on the platform on request.

Conclusions
The framework for innovation in the Ukraine health system is quite rigid. The health system is strongly regulated by administrative orders and highly hierarchical organised, both conditions which do not support the easy introduction of new tools or processes and which do not encourage innovative and interested health

1 http://ipath.ukma.kiev.ua/
professionals to voluntarily engage in such activities like Telemedicine. One of the preconditions before starting the implementation of the model is to obtain the management attention on all levels of the health system through work shops to raise the awareness of stakeholders and receive their documented commitment that Telemedicine has to be integrated as an official element of the health service delivery system.

One important component in the model is the potential user and it must be realized that not all potential user will use the Telemedicine application and not all of them will use it in the same way and to the same extent. The adaptation of a new technology takes time and must be supported from different angles. Telemedicine fosters an open and transparent communication culture between national and international professional colleagues and between hospitals of different levels. The presentation of medical cases, related questions and problems to the colleagues participating in the network requires openness to professional critics, trust and self-confidence. The attitude to admit the need for external consultation in strongly hierarchical system like the one in the Ukraine needs to be developed first. Therefore it is important to identify some open minded, progressive health professional who are spearheading the development of the network. Furthermore it has to be recognized that a larger part of the potential user are confronted with the concept of Telemedicine for the first time, most of them not familiar with the use of a personal computer and minimal English language skills. This is a considerable barrier for the usage of the Telemedicine tool and considerable efforts have to be made for the training of the health professionals.

The network will not work smoothly without some rules and guidelines on how to integrate Telemedicine into the clinical practice. Therefore all participating hospitals need to complement their clinical process with the application of Telemedicine within the routine daily work. Setting up a professional network with the aim of providing second opinion consulting services raises expectations among the committed users. The network must assure that these expectations can be met and professional expertise is provided within reasonable time otherwise it will lead to frustrations and the most innovative participants will stop using the network.

The model is based on very basic technical infrastructure. A standard personal computer and access to digital internet can be provided quite easily in any hospital of the Ukraine and technical constraints can be overcome. The critical issue is the sustainability of the long term operation. Hospitals must to be aware of the running cost for the internet subscription and they need to allocate the appropriate budget already from the beginning.

The model is a valuable basis for the introduction of Telemedicine into a clinical environment. Nevertheless it requires a thorough planning process and implementation and adaptation will take at least one to two years until the network is operating smoothly and sustainable.
1 Introduction

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.

1.1 Definition of Telemedicine

Telemedicine is composed of the Greek word τελε (tele) meaning 'far', and medicine. It is therefore the delivery of medicine at a distance. A more extensive definition is that it is the use of modern telecommunication and information technologies for the provision of clinical care to individuals located at a distance and to the transmission of information to provide that care (Wikipedia).

Defined by the U.S. Food and Drug Administration as the delivery and provision of healthcare and consultative services to individual patients and the transmission of information related to care, over distance, using telecommunications technologies. Telemedicine incorporates direct clinical, preventive, diagnostic, and therapeutic services and treatment; consultative and follow-up services; remote monitoring of patients; rehabilitative services; and patient education (FDA).

The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities (WHO).

1.2 Project background

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.

1.3 **Expected Benefits**

Benefits of Telemedicine are expected for patients and health professionals throughout the whole process of health care delivery and on all levels of health care provision. The additional access to health information and the possibility to exchange expertise with national and international colleagues through the network supports the decision making process in diagnostic, treatment and referral of patients.

1.3.1 **Benefits on regional Health care Level**

**Quality of Care:** Access to evidence based information and exchange with experts on national and international level enhance the knowledge and skills of health professionals contributing to a higher quality of health care.

**Recognition:** Improved quality of care increases the recognition and reputation of the institution and the health professionals among the population and increases the trust between the health professionals and the patients.

**Cost savings:** The appropriate type of care helps to reduce waste of scarce resources for unnecessary examinations, treatments, medications.

1.3.2 **Benefits on District Health Care Level**

**Quality of Care:** Access to evidence based information and exchange with experts on national referral and international level enhance the knowledge and skills of health professionals contributing to a higher quality of health care.

**Referral System:** Improved communication systems enable the exchange of relevant additional patient information with the higher level of
health care and support the efficient functioning of the referral system.

Recognition: Improved quality of care increases the recognition and reputation of the institution and the health professionals among the population and increases the trust between the health professionals and the patients.

Cost savings: The appropriate type of care helps to reduce waste of scarce resources for unnecessary examinations, treatments, medications.

1.3.3 Benefits for Health Professionals
The benefits for the health professionals result from the improved access to information and expertise and the possibility to continuously increase their knowledge and skills.

1.3.4 Benefits for Patients
The benefits for the Patients result from the improved access to information and expertise of their treating doctors and the general increase of knowledge and skills of the health staff.

Diagnostic Quality: The diagnostic decision in case of uncertainty or rare cases can be assured using second opinion from the referral institution avoiding unnecessary or harmful further examinations.

Treatment: The treatment decision in case of uncertainty or rare cases can be assured using second opinion from the referral institution initiating immediate or avoiding unnecessary or harmful treatments.

Referral: Improved diagnostic capacity can help to initiate critical referrals timely and help to avoid unnecessary complications. Improved diagnostic capacity can help to avoid unnecessary and strenuous referrals to distant hospitals. Family members can stay with their relatives and care for them close to their home.

Health expenditures: The appropriate type of care helps to reduce costs for unnecessary examinations, treatments, medications and referrals for the patient.
2 Organization

2.1 Organizational Set-up

2.1.1 Referral System
The health care system in the Ukraine has three levels of health care. The national level consists of the national referral institutions located in Kiev. The national level together with regional (oblast) health institutions form the third level of the health system. The district (rayon) health institutions form the second level 2 of the health system and refer their patients to the regional level. The primary health care level would refer its patients to the regional level but in the field of perinatal care they play only a minor role.

The referral system is broadly bypassed by the patients who do not follow this system seeking health services directly in the institutions of their choice.

![Diagram of health care referral system](image)

Figure 1: This figure represents the typical health care referral system. Oblast health care institutions refer their patients to the national health care institutions in Kiev. At the same time the Oblast health care institutions are responsible for the institutions on the first health care level from which they receive referred patients.

2.1.2 Clinical Setting
Health care delivery in an ambulatory or a hospital follows a defined process, using given resources and fulfils certain documentation requirements. The patient is the mobile part in the system moving from the patient administration to the examinations, continuing to the diagnostic interventions, and receiving treatment until he/she is discharged or referred to the next higher or lower level of health care. The organisation mainly focuses on internal processes and functions as a closed system. The implementation of Telemedicine in a clinical setting enables the health care delivery system to open and interact with other systems. Patient information is not bound to organisations, institutions or geographic
locations and instead of the patient the patient information becomes the moving part within the health care delivery system. But this requires that existing organisational processes are adapted in order to allow the efficient use of Telemedicine within the health care delivery system. The availability of Telemedicine and its application must be foreseen and described for each step in the health care delivery process.

2.2 Telemedicine Network

The Telemedicine network is a network of individuals rather than a network of institutions. Success or failure is very much depending on the motivation and commitment of the participating health professionals.

The contributions of the institutions are to encourage and support their collaborators to participate in the network and to foster the clinical discussions of medical cases using Telemedicine. Support means providing access to the telemedicine workplace, train collaborators in using the infrastructure, create a climate of openness where communication and exchange with colleagues outside the own institution is desired and hierarchical barriers are diminished.

2.2.1 Involved Institutions

The network consists of institutions working in the field of Perinatology namely Maternities and Children Hospitals on national, oblast and rayon level. Institutions are the back-bone of the network which must promote Telemedicine and organise its integration into the clinical work of the hospital.

In a first step two Ukrainian and one international institution were involved in the pilot network. The national referral Institute of Paediatrics, Obstetrics and Gynaecology in Kiev (POG) and the Oblast Children Hospital in Ivano-Frankivsk were selected to start a discussion group with the representative from the University Children Hospital in Zurich.

In a second step all the project partner hospitals from the Oblasts level in Ivano-Frankivsk, Volyn, Rivne and Donetsk were included in the discussion group. Two pilot rayon hospitals from each of the two oblasts in Ivano-Frankivsk and Volyn have been included into the discussion group in the third step.

The national referral level is represented also through the National Medical Academy for Postgraduate Education and the Children Hospital in Kiev (OCHMADET).

2.2.2 Individual Group Members

Real activity is initiated and driven by the individual group members. Their motivation and commitment is the motor which keeps the whole group

Most of the international participants are contributing out of personal interest and not representing the institution they are working for. These participants have been identified and invited through personal contacts. They volunteer to put their expertise at the disposal of the network in order to stimulate discussions or answer questions related to difficult clinical cases.

There are as well some Ukrainian participants who are not employees of the partner institutions of the project but who learned from colleagues about the Telemedicine network and decided to involve themselves out of their own interest and initiative.
2.2.3 Telemedicine Setting

Telemedicine enables people to communicate and collaborate independent from the time and the place where they are located. One of the main opportunities of Telemedicine is the networking character bringing people together independent from their nationality, the organisational and hierarchical structures in which they are integrated, the clinical field they are specialised in etc. The prerequisite to make Telemedicine beneficial for its user is that people working in Telemedicine are open and understand the advantages of these conditions.

Figure 2: This figure represents the organisation of Telemedicine for the consultation of clinical cases. Individuals from selected institutions are forming the Expert Group which is consulting the clinical cases presented by the members of the Discussion Group. Notice that participants can be members of both groups functioning in two different roles.

The model which is described in this paper developed from an unstructured forum type of discussion group to a structured consultation discussion group. This required the group members to define and attribute different roles to participants with dedicated tasks and responsibilities. The two main roles that participants can take are the one of the case presenter who has a clinical question he/she is raising in the discussion group and the expert group who is trying to answer the question. It is well possible that the same participant takes the role of a presenter for his own cases but figures as an expert for cases presented by other participants.

2.3 Participants and their Roles

2.3.1 Case Presenter

This is the key person in the telemedicine process. Any physician taking care for the patients may be a case presenter. In the institutions where telemedicine is an officially used technology all case presenters must follow an appropriate institutional protocol (see chapter 2.4.3).

The main objectives of case presentation are to get the second opinion about the patient, discuss diagnostic and treatment options or to share experience connected to the specific clinical case with colleagues.
The existing general rules of clinical case presentation at the Telemedicine server must be followed by any case presenter. The main task of the presenting person is to make a professional description of the case including only relevant and clinically significant information, grouping/separating the data (history, physical assessment, investigations, treatment done etc.), providing illustrative materials (images, video etc. if applicable) and asking concrete questions (see chapter 2.7 and 3.2). In order to foster standardisation increasing completeness and readability and improve overall quality of case presentations, the case presenter shall make use of the forms (see Annex 8) for his/her case presentation. Closure of the cases, answers to raised questions, and providing intermediate and final feedbacks is also a responsibility of case presenters.

In order to obtain expertise from the international experts the description must be done in English. Responsible physicians (case presenter) may need technical support in creating appropriate digital images and presenting them at the server.

The case is presented in iPath directly by the responsible physician (case author or owner) or passed to the technical person who is supposed to facilitate the task on request.

2.3.2 Experts

Expert team or group should be created to provide ongoing scheduled (optional) time framed consultant service for the group participants presenting clinical cases. The expert group should include qualified and experienced professionals from national and foreign medical institutions (mostly from tertiary level centres) who are committed to participate and dedicate sufficient time to provide their expertise. The organization of such a group is a formal responsibility of the main Telemedicine group moderator. The organisation of the expert group requires a formal time plan indicating the persons in charge for a specified time period, the time frames for a first reply and the time frame until the final response. The organisation also defines the role and responsibilities of the expert group members who are consultants to the expert in charge. The position of an expert in charge is rotating among all expert group members.

Objectives

- to provide ongoing scheduled (optional) time limited consultant service for the main Telemedicine group participants presenting clinical cases

Function

- persons identified by the group moderator according to predetermined criteria are invited to become the members of the expert group;
- those persons must be registered participants of the main Telemedicine discussion Group;
- organise the Expert discussion group on the Telemedicine platform;
- any case which needs involvement of Expert group members on discretion of a case owner or a group moderator is referred to the Expert group by the group moderator; to be referred to the Expert group the case must be presented in English;
- there are 2 possible ways to organize Expert group activity
with the first scenario an expert on duty should be available on a
everyday basis according the schedule developed by the
moderator
within the second model there is no expert on duty and the case
could be responded by any expert of the group as all of them are
receiving e-mail alerts.

- according to the model of Expert group operation in place the case must
  be responded by the expert on duty or could be responded by any expert
  of the group within defined time limit;
- if an expert on duty has any problem responding in time he or she must
  consult with the other experts in the expert group in order to determine the
  appropriate response;
- the expert comments must be presented within the original case in the
  main discussion group.

Roles and Tasks
An expert on duty or expert team member should

- be familiar with iPath server operation;
- be a registered member of the main Telemedicine discussion group;
- have activated e-mail alerts within the Expert group;
- inform Group moderator about his or her availability for the upcoming
  period if the first model is used; know the time period(s) of duty(ies);
  respond to any request as soon as possible during the duty period and
  immediately inform the Group moderator if any problems have occurred
  with timely response;
- respond to any request as soon as possible if the second model is used

Responsibilities
An expert team member is responsible for qualified and timely response to any
clinical case presented in the Expert group in agreement with the used model of
group operation.
Expert’s commitment is essential to perform all expert tasks.
Availability of the expert should be taken into account by the group moderator
when duty schedule is developed.

Qualification
Members of the Expert group should

- be recognized authorities in the fields of Obstetrics, Gynaecology or
  Neonatology/ Paediatrics;
- preferably work at the tertiary level centres or University hospitals;
- be able to read, write and communicate in English (optional)
- be familiar with the context of the local Ukrainian health system

2.3.3 Group Moderator
Group moderator is a person responsible for overall telemedicine activity in the
group making it organized, effective and useful. Any new telemedicine discussion
group shall be opened in iPath only after the group moderator is defined and
agreed to play this role.
The moderator is a group organizer who technically allows any new person to get
an access to and become a member of the Group. From the other standpoint the
moderator is a kind of group supervisor who follows all cases and comments, reacts to difficulties users may have and corrects or puts attention to erroneous case presentations etc. if needed. He/she also analyses Group activity (case/comment presentations and content) and monitors overall work quality on a regular basis.

With iPath server the moderator will get a special opportunity to obtain information about new registrants and statistical data representing dynamics of case presentations and members' activity with time which could be useful for group work optimisation and quality improvement.

Responsibilities:

- Ensure quality of work and possibility of telemedicine integration into clinical practice.

Qualification:

- Experienced Medical Doctor in the field of Perinatology
- Working in a hospital of National or Oblast referral level
- Working experience in a Western health institution
- Fluency in English
- Contacts to health professionals in Perinatology working abroad

Tasks:

- Triage
  - Naming convention respected
  - Minimal set and appropriate quality of necessary information provided
  - Delete unwanted entries
  - Referral case
- Follow up
  - Assure reaction of expert team
  - Assure replies to questions from expert team
  - Response to group members comments containing inappropriate or wrong information/recommendations
  - Assure feedback from case presenter
  - Assure the case is closed
- Manage Group Members
  - Explain to new applicants the purpose of the group and clarify with them the expectation of the group and the contribution they are able/willing to make
  - Grant access to the group for new applicants
  - Instruct new participants about working rules and conventions
  - Communication with and suggestions for case presenters
  - Keep contact with system administration and inform about problems and wishes of the group members
- Manage Expert Group Activity
  - Keep contact with and recruit new experts
  - Assure reaction of expert team
  - Develop the schedule of experts' duties
- Every day the moderator should:
  - Review all new cases and comments using e-mail alerts and/or direct entrance into the system, evaluate content, respond to any
problem found, refer the case to the Expert group if needed, provide follow up;
  o respond to any e-mail requests from newly registered persons or to any other e-mails connected to Group activity.
• Every 1 or 2 weeks the moderator should:
  o review new registered participants on the server and new Group members.
• Every 1 or 2 months the moderator should:
  o summarize every day monitoring data and make conclusions about existing problems and quality improvement;
  o obtain and analyse statistical data (registered Group members, descriptive case/ participant statistics and quality monitoring form data) with submission of a formal report posted in the Group; the report should contain the list of identified current problems and suggestions what parts of the activity could be done better;
  o develop an expert duty schedule (if applicable)

Activity indicators used by Group moderator
• changing in Group membership with time, ratio of active/non-active users
• number of new system entries/ cases that have been reviewed
• number of new cases presented/ per one active user
• number of the comments provided per one active user
• number of images or other supplements provided per one new case
• number of cases presented in English/ number of cases required International expertise/ total number of cases

Quality indicators used by Group moderator
• total number of new comments provided/number of the comments provided in time (within 24, 48 and 72 hours after case presentation, average delay for the first comment)
• results from quality monitoring forms (significance for clinical practice)

2.4 Integration of Telemedicine into Clinical Practice
• Identification of disciplines and clinical problems to be solved via Telemedicine
• Description of the clinical process
• Required information to be communicated
• Appointing responsibilities for the process within the hospital

2.4.1 Routine Clinical process
In a routine clinical process an attending physician is primarily and legally responsible for patient's care. Depending on the type of institution and local circumstances this physician usually uses consultations (or asks for participation in the treatment process, especially in surgical specialties) of department head, deputy hospital head, professor (associate professor) or other physicians (including those of other specialties and/or from different and/or higher level institutions) on a regular basis (according to the hospital rules) or in cases when diagnosis and/or treatment options are unknown, unclear or doubtful.

Suggestions of the mentioned consultants should be filed into the patient's medical record and must be considered by attending physician in subsequent patient care.
Such consultations could be obtained instantly locally (if the consultant works in the same hospital face to face or by phone) or with some delay on distance (if a consultant works in a different hospital or in another city) which influences the type of consultation used.

The possible results of this consultation process are confirmation or changes in diagnostic and treatment plans and/or patient transfer to the higher level or just different hospital.

This practice covers both emergency and non-emergency clinical cases. The follow up includes repeated consultations and/or phone communications.

Use of timely and properly done consultations usually leads to improvement of clinical process and overall results of patients’ care.

However, the described routine clinical process has several weak points:

- In general, resulting quality and effectiveness of provided consultations depends on the level of institution – the higher the level of institution, the more different consultants are readily and timely available. Timely availability and distance to consultants really make difference in terms of clinical outcomes.
- The delay in consultations and proper interventions as well as improper actions are typical problems of primary care hospitals (where potential consultants usually do not work at all; any important clinical problem must be timely recognised and presented to appropriate consultant who usually works in different institution and often quite far from the primary care hospital).
- Quality of information exchange is not optimal or even insufficient since it is based just on descriptions via phone communications; sometimes making the transfer of the patient to the consultant necessary.
- Level and amount of expertise provided is usually limited with local (regional) consultants and resources and depend on their knowledge and experience.

The mentioned problems make it necessary to look for additional strategies to improve effectiveness of the routine clinical process, especially in non-tertiary level hospitals. One of such strategies is a use of telemedicine technologies in standard clinical practice. Telemedicine enables the transfer of the clinically important information to the consultant while allowing the patient to stay in his familiar environment provided no immediate signs for referral are present.

2.4.2 Consultation process

Consultation is a generic process which is used in routine clinical practice to improve quality and effectiveness of medical care. This process is usually initiated by the reasons mentioned above - if patient’s diagnosis and/or treatment options are unknown, unclear or doubtful according to knowledge and experience of attending physician and the other responsible medical personal working at the department (Figure 3).
2.4.3 Telemedicine process

The telemedicine process is the generic process of consultation based on telemedicine technologies. The telemedicine process could be activated and incorporated into routine clinical process at the stage of consultation request.

An appropriate decision could be made by the attending physician in or without agreement with department head or any other administrative person responsible for telemedicine use (see section 2.4.1).

Case selection could be made based on:
- practical needs of a physician having problems with patient care or willing to improve existing medical practice; or
- according to the criteria predefined by appropriate unit or hospital protocol

As soon as clinical decision is made to initiate telemedicine process the attending physician should manage the process of clinical data preparation for the new case presentation on the telemedicine server. Descriptive information about the patient should be prepared in digital format and diagnostic images should be obtained promptly (see chapter 3.1/3.2). After completion of case presentation in iPath the person in charge or the attending physician has to follow up the case and make sure that the attending physician is aware about the answers to her or his
questions. It is the responsibility of the attending physician to value and take into account the given suggestions or not, but she/he must provide a follow up information about the patient outcome on the server as well as finally close the case after patient final hospital discharge, referral or death (after presentation of autopsy data).

Suggested outline for the institutionalisation of a teleconsultation protocol

<table>
<thead>
<tr>
<th>Control question</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| Are criteria for case selection developed?                                      | • Deputy head physician/ Clinical person responsible for telemedicine implementation in the hospital  
  • Head of the department                                                        |
| Who selects and how to select the cases for teleconsultation?                    | • Attending physicians  
  • Head of the department  
  • Daily, based on the existent criteria, defining the need of translation into English |
| Who manages and how to manage the process?                                      | • Deputy head physician/ Clinical person responsible for telemedicine implementation in the hospital/ Head of the department  
  • Daily control of selection criteria use in the routine clinical process  
  • Ongoing control of effectiveness and clinical outcomes  
  • Weekly (or every 2 weeks) control based on real information obtained from iPath – physicians’ activity, case quality to be presented and discussed in a staff meeting |
| Who prepares clinical information and uploads it to iPath?                      | • Attending physicians  
  • Technical assistant could help to obtain and present visual information |
| Who controls the response?                                                      | • Attending physicians or technical assistant  
  • Technical assistant immediately informs attending physician about the response  
  • The mechanism is developed for timely response to additional expert’s request about the patient |
| Who and how reviews requested information and makes clinical decisions about patient care? | • Attending physicians  
  • Head of the department and deputy head physician if necessary |
| Who is responsible for the case closure?                                        | • Attending physicians  
  • Clinical person responsible for telemedicine implementation in the hospital controls case closure on a regular basis |

Suggested criteria for case selection
- Unknown, unclear or doubtful diagnosis or management options in the absence of emergency
- In emergency teleconsultation could be used only as a complementary option
- Identified high-risk clinical situations even despite the established diagnosis and known treatment options. Analysis of problematic aspects of medical care in the institution is needed to develop the list of concrete high-risk clinical situations
  - Review the all cases of death (including the cases which have happened in the level II-III hospitals after patient transfer)
  - Review the all cases of urgent consultations and/or transfers
  - Review the specific causes of morbidity and mortality including the all serious complications developed after transfer to the other hospitals
- Patient transfer to the higher level hospital in the pilot regions
- Description of rare, interesting or illustrative cases useful for continuous medical education

Figure 4: Generic process and protocol of teleconsultation (hospital component)
Figure 5: Case management in the telemedicine process

The part of the process described above is a hospital component of the telemedicine process but it also includes the second component – case management (Fig. 3) with involvement of Group moderator, Expert Group members and registered users (see sections 2.4.2 and 2.4.3).

2.4.4 Telemedicine workplace

The Telemedicine workplace is described in its technical details in chapter 4.2 and consists of the main elements of information and communication technology. A computer with internet access allows the participants to connect to the iPath platform and to read and post clinical cases. Originally the participating institutions had the idea that the Telemedicine Working Place has to be a special separate room. One person was nominated to be the official Telemedicine Coordinator responsible for the Telemedicine activities of the hospital. This arrangement lead to various difficulties which became actually important obstacles preventing health professionals from using the Telemedicine Working Place and being actively involved in Telemedicine.

Problems of Access:
- The Telemedicine Working Place is locked during the absence of the Telemedicine Coordinator
- The Telemedicine Working Place is locked before and after the usual working hours, when clinicians had time to use it.
- The Telemedicine Working Place is monopolized by the Coordinator and used as a personal working instrument.

The suggested location of the Telemedicine Workplace is the clinical working area e.g. on the ward, not necessarily in a separate and especially reserved room. Doctors’ office is the acceptable place to organize such a workstation.

Access to the Telemedicine Workplace
Any physician who works at the hospital should have the right and access to use the Telemedicine Workplace if there is any need for that:

- such a physician must have necessary skills to use a computer, Internet and iPath (see chapter 2.4);
- the identified technical person may help physician to post a case at the server and /or to get information from there (see sections 2.4.1 & 2.4.3);
- using of Telemedicine Workplace should not interfere with a routine clinical process (if the station located in the doctor’s office)

The access is to be allowed and provided 24 hours a day but should be optimised with officially announced working hours.

The working process at the Telemedicine Workplace should be organized (responsible persons to be defined daily/weekly, written registration for the station use to be implemented, activity monitoring and security to be provided, etc).

Possibilities and regulations to use the computer workplace for other purposes should be identified and provided (e.g. internet search, email, professional forums, etc.). Of course a policy need to be put in place in order to stimulate positive the use of computers and avoid the abuse of it (illegal music and video downloads, surfing pornographic and racist sites etc.).

2.5 Information and communication

2.5.1 Hospital internal information

There are two levels within the hospital to communicate to when introducing new policies, procedures or working tools namely to the management level and to the staff level.

The application of Telemedicine in a hospital is a management decision and has to be understood, accepted and followed by the staff. The head of the hospital together with the head of the clinical services need to communicate their commitment for the introduction of Telemedicine and their expectations related to it very clearly. They need to explain the objectives and benefits for the hospital, the personal and the patients to the heads of the clinical departments and assure them with their support for the practical implementation.

The heads of the clinical departments have to inform their staff about the decision taken by the hospital management to integrate Telemedicine within the clinical practice and explain the objectives and tasks related to it. As the heads of departments and their staff will be affected mostly by the decision it is important to address questions and concerns in a transparent manner. Staff might be concerned about being exposed to new technology and not able to cope with it, being replaced by the new working tool, having a higher work load to cope with, being exposed to and controlled in their work by others, etc. These fears need to be discussed and answered openly in the team in order to ensure the commitment of the staff and to ensure the attainment of the expected benefits for everybody.

The development of a plan for the practical implementation of Telemedicine within the department is best done together in a team of senior and junior health professionals. Make sure that information about progress from the implementation team is provided to all staff members regularly e.g. during weekly meetings. Information shall reach all staff members including residents and nurses.
2.6 Training

An essential task in order to implement Telemedicine successfully is the training of the staff that is going to use iPath. Many of the health professionals of the hospital are confronted with the different aspects Telemedicine comprises for the first time. In order to deal with the manifold concerns they might have towards modern technology and new methods it is important to introduce them with training courses targeting different issues.

2.6.1 Methodological understanding of Telemedicine

Telemedicine is a concept which has various definitions and different notions. It is important that the future user of iPath understand the concept of Telemedicine in the context of their hospital and the objectives that are pursued with it.

- The users have to be clear about their own role and the role of the other participants within the Telemedicine network.
- The users need to understand the processes and rules defining the collaboration of the participants within the Telemedicine network.
- The users have to familiarize with the terminology used and should be able to explain the underlying physical structure of the Telemedicine network.
- The user must understand the concept of iPath and the pre-conditions for its successful application
- The user will learn about good communication practice on iPath and quality aspects of working with Telemedicine

The methodological training can be provided in class rooms for larger groups (10 to 20 persons) without having access to iPath, even so it would be better to have iPath at hand in order to be able to demonstrate certain issues related to questions.

2.6.2 Computer Skills

- Some of the health professionals will work with modern Information and Communication Technologies like computers, printer, internet and digital cameras for the first time. This is a physical but also mental barrier which needs to be overcome in order to enable all staff members to participate in the Telemedicine network. Therefore courses need to be provided enabling the user to perform the following activities:
  - Use a digital camera to acquire good quality images
    - Patients
    - x-ray images
    - Ultrasound images
  - Use the computer to write and edit plain text (typewriter function)
  - Use the computer to surf the internet and “google” for specific topics
  - Use the computer to store images taken with the digital camera

The computer training needs to be done in computer classes with the respective technical infrastructure in order to be as practical as possible and to provide the students with real hands on training. As students need much more attention in this type of courses classes should not be bigger than four to six persons.

2.6.3 iPath skills

One does not need extensive knowledge to make use of iPath and Telemedicine. iPath is quite intuitive and everybody who is familiar with Window and has already used the Internet Explorer before will find this platform quite self explaining.
Nevertheless every user needs to receive a thorough introduction in iPath and should be able to carry out and to explain their colleagues on how to perform the following tasks.

- Find the main site of iPath in the Internet
- Register as a new user and obtain username and password
- Get an overview of existing groups and its moderator
- Apply to a group moderator in order to become member of an existing group
- Read existing case presentations and make annotations to it
- Create new cases following the existing conventions on case presentations (structured format) applicable in the respective group
- Attach objects e.g. images, documents, forms to cases
- Manage own cases in order to ensure quality e.g. respond to questions from the audience, provide a final feed-back on outcome and close the case, fill in the case evaluation form in order to improve long term quality and outcome of case presentations

The iPath training needs to be done in computer classes with the respective technical infrastructure in order to be as practical as possible and to provide the students with hands on training. As students need much more attention in this type of courses classes should not be bigger than four to six persons with a collaborative learning approach.

2.6.4 Language skills

Despite the fact that iPath is translated into Ukrainian language many of the potential benefits that access to computers and internet provide are only attainable for those who can read and understand the English language. The internet provides a wealth of additional resources for free including scientific medical papers, clinical guidelines, anatomic atlases and more. It is recommended to all users to make personal efforts to learn English on private basis or ask their colleagues to support them when using the computer to get information from the sources available in the internet.

English courses might be taken on individual basis and corresponding to the time available. It will take a considerable amount of time to conclude a Basic English course and will not be provided in the frame of such a project. For some advanced computer users a "Crash Course" on Basic English will help them to explore the English internet sites.

2.7 Quality Assurance

The aspect of Quality Assurance receives increased attention in modern health care systems and is an important aspect in Telemedicine as well. All the measures taken to assure and continuously improve quality are targeting at the quality of service. For Telemedicine this translates into:

- Formal Quality of the Case Description
- Clinical Quality of the Case Description
- Good Communication Practice

2.7.1 Formal Quality of Case Description

The Formal Quality of a case description is related to the frame for the case presentation which is given by iPath itself and how this frame is filled in. For each field given clear instruction are required defining the possible entries and every user shall strictly adhere to this conventions (see chapter 3.2). Such conventions
enhance standardisation of case description and thus readability, classification of cases, reduction of erroneous entries and facilitate the retrieval of cases from the case list using the search function of iPath.

2.7.2 Clinical Quality of case Description
The Clinical Quality of a case description is related to the completeness and the language used. It is self-understanding that all available relevant information about the patient, the history of the case, the diagnostic performed etc. are provided in the case description in a structured comprehensive manner. Clinicians do not have time and the information shall be as concise as possible without omissions but also without long prosaic descriptions of irrelevant information. Abbreviations and terminology used shall be internationally recognised. In order to facilitate the structured case description iPath allows the creation of standard forms providing fields which can be filled in with the commonly used and expected clinical information of a medical case. An example of an Obstetrics/Gynaecology Form can be found in the Appendix 7.1.

The information contained in a case description can considerably be increased when adding additional documents (laboratory results), images illustrating diagnostic examinations (x-ray) or the specific pathology (morphology of the skin). Images attached to the cases shall be relevant for the specific problem described and the image frame shall be chosen appropriately to display the specific problem in the correct format e.g. giving a clear reverence about the size and spread of eczema.

Images have an added value only if the quality is high enough to recognize the specific information contained in it. Image quality is determined by sharpness, resolution and contrast. Find some good and some bad practice samples here below.

![Sample Images](image1.png)

i) ![Sample Images](image2.png)

ii) ![Sample Images](image3.png)

iii) ![Sample Images](image4.png)

iv)
Figure 6: Four images of different image quality – i) good quality, ii) insufficient sharpness, iii) insufficient contrast, iv) low resolution

Images are taken with a digital camera and therefore it is easy to make several shots which afterwards can be checked on the computer. Finally the most appropriate ones are selected and attached to the case description.

Images taken from persons always require the informed consent of the patient or its legal representative. The dignity of the person displayed has highest priority and needs to be respected in all circumstances. The identity shall be concealed in order that it can not be traced backed to the person according to existing policy or good clinical practice in Ukraine.

2.7.3 Good communication practice

Good Communication Practice is a question of communication culture that is lived within the discussion groups. The general rule is that communication is short and professional but still friendly and collegial. This means that case owners are aiming at describing their cases understandable and comprehensive in order to make it easy to be read by the members of the group.

On the other hand group members shall actively contribute to stimulate discussions while asking questions or request additional information to the case if it is lacking. Questions origin from other group members reading a new case shall be answered by the owner of the case within reasonable time in order to maintain the flow of discussion and to aggregate an added value during the discussion.

In order to allow all participants to continuously enhance their knowledge and also in order to use the network for continuous medical education purposes it is essential that case owners provide feedback about the presented case. This means that after a certain time the case shall be closed and the case owner writes a final comment explaining the obtained results or patient outcome, e.g. treatment results, referral etc.
3 Operation

3.1 Patient Administration
Patient information used for iPath presentation must correspond to several requirements:

- verbal informed consent of the patient or its legal representative must be obtained before case presentation on the server
- the identity shall be concealed in order that it can not be traced back to the person: name, exact date of birth, addresses and any other personal data must be omitted
- images displayed should not show patient’s face (eyes) and should not contain any personal information (name, date of birth etc)

Consultation obtained via iPath could be transferred (filled in) to the patient’s medical record and used in the routine clinical process.

3.2 Case Description
Case description should present clinically relevant and significant information which allows answering to the posted questions or providing any other appropriate response. Standard forms may be used to improve quality of information presented, e.g. Newborn’s case presentation outline (see Appendix 8.2) and good communication policy must be followed (see chapter 2.7).

To enhance standardisation of case description and thus readability, classification of cases, reduction of erroneous entries and facilitate the retrieval of cases from the case list using the search function of iPath the standard iPath fields must be filled in properly.

Title: The field “Title” is used to determine the pathological condition or disease which is presented in the case and refers to medical entity of the case.

Subtitle: The field “Subtitle” is used to identify the medical specialty which the presented case belongs to. It will help the other users to make a conclusion if this case will be interesting for them. This field additionally indicates to what database this case will be removed for storage in the future.

<table>
<thead>
<tr>
<th>Medical Speciality</th>
<th>Acronym</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstetrics</td>
<td>OBS</td>
</tr>
<tr>
<td>(Prenatal Medicine)</td>
<td>(PrnM)</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>GYN</td>
</tr>
<tr>
<td>Neonatology</td>
<td>NEON</td>
</tr>
<tr>
<td>Paediatrics</td>
<td>PAED</td>
</tr>
</tbody>
</table>

Table: 1 Acronyms to be used for the identification of the case according to the medical speciality and to be filled into the field “Subtitle”

Type: The field “Type” is used to indicate the purpose of case presentation in iPath. This information will give an idea about the presenter’s contribution and his/her expectations.
<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRT</td>
<td>This type of case description is intended to emphasize some interesting or unusual features revealed in the patient. The users are asked to discuss the presented peculiarities.</td>
</tr>
<tr>
<td>SEO</td>
<td>This type of case description is intended to get the second opinion of other persons concerning the presented case. Questions and requests must be clearly formulated. This type of case description is intended to get the advices corresponding to the treatment or management of a concrete patient. Questions and requests must be clearly formulated.</td>
</tr>
<tr>
<td>CME</td>
<td>The case will contain information, information sources or recourses which could be useful for personal education or practice.</td>
</tr>
<tr>
<td>INF</td>
<td>The case will contain information which could be useful for the Group members.</td>
</tr>
</tbody>
</table>

Table: 2 Acronyms to be used for the identification of the case according to the purpose of the case presentation and to be filled into the field “Type”

Description: The field “Description” is the main section of case medical description. The following information about the patient must be presented there:

- Demographic data, e.g., age, gestational age, gender, birth weight, etc.;
- History data which correspond to the clinical situation
- Physical assessment data (with diagnostic images as appropriate)
- The results of instrumental and laboratory investigations (with diagnostic images provided as a supplement)
- Established diagnosis
- Treatment provided
- List of the questions and/or expectations

While describing the case it is very important not to forget to follow the section 3.1 requirements.

To elaborate the case presentations standardised, readable and useful the electronic form shown in the Annex 8.1 shall be used.

A case presenter may allow the other users to add images or other supplements to the original case (recommended). To activate this option it is necessary to select the appropriate box under the filed “Options”.

A case presenter is personally responsible for the closure of the case after the final information about the patient’s outcome has been presented. Each case shall be evaluated by its owner using the Case evaluation form (see Appendix 8.3) which can be activated in the comment section of the case.

Case status is indicated with a bullet in red or green colour located near the case type field. To close the case it is necessary to click on the bullet, select the status “case closed” in the appearing window and click on the “save” button.
3.3 Case Annotation

Telemedicine process operated via iPath platform implies using so-called discussion group which is usually limited to the specific medical field (in our situation this field is Perinatal Health). It means that every new case presented in the Group is going to be discussed with participation of the experts or any other Group members.

Every Group member will see (or will be informed via e-mail about) the new cases presented in the Group and can provide comment to the case, add additional visual information (if allowed by case presenter), answer to author’s questions and/or ask own questions about the details of patient’s condition or management.

The general requirements to the quality of comments and good communication policy are the same as were described for the case presentations (see chapters 2.7 & 3.2). The comments, answers and/or recommendations must be clear, concrete, simple and short. It is very important to provide references to the sources of information for the treatment and diagnostic recommendations if available.

In the telemedicine and case annotation process time delay is a specific and critical variable which tells us how potentially useful and practical teleconsultation service is. Taking into account the fact that telemedicine service is not dealing with urgent cases the overall goal is to provide the first comment to the clinical case within 24 hours after its presentation in iPath and not later than 72 hours after presentation.

3.4 Case Monitoring

After closure of every case its presenter should fill the evaluation form (see Appendix 8.3) to quickly evaluate the outcome of case presentations. It helps the moderator of the Group to understand the users’ expectations and the obtained benefits of iPath usage, and it helps to improve the organisation of the group and the structure of the telemedicine platform.
4 Technical Preconditions and Infrastructure

The Telemedicine model is based on two components. The communication platform allowing the participating hospitals to communicate and exchange information and the Telemedicine Work Place required in each participating hospital to access the web platform.

4.1 iPath Platform

To facilitate teleconsultations 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 core of iPath is the iPath-Server, based on PHP. To run iPath server a web server environment with preferably PHP5/Apache/MySQL is needed. The Mohyla School of Public Health as one of the project partner has provided their server and network infrastructure to allocate the Ukraine iPath platform (http://ipath.ukma.kiev.ua/) and are assuring the technical server and iPath administration with their staff.

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.

Figure 7: This figure represents a 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.

iPath provides the user with a structured format to present the cases (Figure 7). 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.

4.2 Telemedicine Work Place

4.2.1 Computer
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. 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 off the flash. For the project, Pentax Optio 33L cameras were chosen.

4.2.2 Internet
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.

4.2.3 Access to digital diagnostic images
Acquisition of digital images to illustrate the clinical case depends on the original source of the images. The digital image file size shall be sufficiently high to show the relevant information but still be small enough to allow an efficient up- and download of the images via a low bandwidth internet connection. If the file size exceeds 500kB/s the displaying of the images in iPath becomes slow. Digital image sources like modern ultrasound or x-ray scanners which allow transferring the images directly to the computer or to safe them on a disc are not frequently available in hospitals on Oblast and Rayon level. Image file sizes are
usually of several MB and must be reduced in size to a lower file size using an appropriate Software e.g. IrfanView (http://www.irfanview.com/).

Analogue images e.g. x-ray, ultrasound print out, etc. as well as images of the patients need to be digitized. This is done by the flat bed scanner or the digital camera which are part of the Telemedicine Workplace as specified here above. The images are afterwards transferred from the digital camera to the computer via USB connection and then uploaded again to iPath through email or the web interface.

5 Implementation Process

The implementation of the model into the existing environment requires different interventions on different levels of the health system.

5.1 Awareness creation among stakeholders

The main stakeholder are the regional and district health administration together with the regional head Obstetrician and head Neonatologist and the directors of the regional hospital. These persons need to be convinced about the potential benefits of Telemedicine and how it will support the improvement of the health system. The formal commitment of this group of stakeholders to support all activities undertaken to integrate Telemedicine into clinical practice is essential for the success of such a project.

5.2 Order by the regional health administration

The oblast health administration which is the legal body on regional level needs to issue an official order which is formally

- approving Telemedicine as an integral part of clinical activities
- requesting health institutions to integrate Telemedicine into clinical practice
- requesting health institutions to establish and formalise internal processes describing the practical implementation of Telemedicine in their facilities
- requesting health institutions to establish and formalise processes describing the collaboration and communication between the facilities, e.g. between oblast and rayon hospitals

5.3 Implementation of the Model

The implementation of the model into clinical practice requires the definition of internal and external process of collaboration and communication in order to organise and harmonise Telemedicine activities with existing clinical practice (see chapter 2.4). The elaboration of processes and the definition of tasks and responsibilities shall be done in a team involving the regional head Obstetrician and head Neonatologist as well as the responsible persons for clinical services in the regional and district hospitals.

5.4 Training activities

The successful application of Telemedicine for the clinical practice requires specific skills from the individual clinicians. In order to acquire these skills the clinicians have to attend the following training modules (see chapter 2.6):

- Basic course module about the concept of Telemedicine
5.5 Provisioning of infrastructure
According to the strategy of the regional health administration and the availability of financial resources, the provision of the required infrastructure can be planned.

In a first step, all health facilities need to be assessed identifying the availability of existing computer hardware and software, and access to fast internet (4.2). According to the assessment result, a procurement list and a cost estimate need to be established before issuing a request for offers. The offer shall include the delivery, installation, and testing of the hardware together with the internet connection.

The regional health administration might have the possibility to negotiate with the local telecommunication provider special tariffs for the internet connection of their health facilities.

6 Critical Appraisal of the Model

7 Conclusions

The framework for innovation in the Ukraine health system is quite rigid. The health system is strongly regulated by administrative orders and highly hierarchical organised, both conditions which do not support the easy introduction of new tools or processes and which do not encourage innovative and interested health professionals to voluntarily engage in such activities like Telemedicine. One of the preconditions before starting the implementation of the model is to obtain the management attention on all levels of the health system through workshops to raise the awareness of stakeholders and receive their documented commitment that Telemedicine has to be integrated as an official element of the health service delivery system.

One important component in the model is the potential user and it must be realized that not all potential users will use the Telemedicine application and not all of them will use it in the same way and to the same extent. The adaptation of a new technology takes time and must be supported from different angles. Telemedicine fosters an open and transparent communication culture between national and international professional colleagues and between hospitals of different levels. The presentation of medical cases, related questions and problems to the colleagues participating in the network requires openness to professional critics, trust and self-confidence. The attitude to admit the need for external consultation in strongly hierarchical systems like the one in Ukraine needs to be developed first. Therefore, it is important to identify some open-minded, progressive health professionals who are spearheading the development of the network. Furthermore, it has to be recognized that a larger part of the potential users are confronted with the concept of Telemedicine for the first time, most of them not familiar with the use of a personal computer and minimal English language skills.
This is a considerable barrier for the usage of the Telemedicine tool and considerable efforts have to be made for the training of the health professionals.

The network will not work smoothly without some rules and guidelines on how to integrate Telemedicine into the clinical practice. Therefore all participating hospitals need to complement their clinical process with the application of Telemedicine within the routine daily work. Setting up a professional network with the aim of providing second opinion consulting services raises expectations among the committed users. The network must assure that these expectations can be met and professional expertise is provided within reasonable time otherwise it will lead to frustrations and the most innovative participants will stop using the network. The model is based on very basic technical infrastructure. A standard personal computer and access to digital internet can be provided quite easily in any hospital of the Ukraine and technical constraints can be overcome. The critical issue is the sustainability of the long term operation. Hospitals must to be aware of the running cost for the internet subscription and they need to allocate the appropriate budget already from the beginning.

The model is a valuable basis for the introduction of Telemedicine into a clinical environment. Nevertheless it requires a thorough planning process and implementation and adaptation will take at least one to two years until the network is operating smoothly and sustainable.
# Appendix

## 8.1 Obstetrics / Gynaecology Form

<table>
<thead>
<tr>
<th>Identification Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code / Patient Code:</td>
</tr>
<tr>
<td>Case No. / Case Nr.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient's Age:</td>
</tr>
<tr>
<td>Gestation:</td>
</tr>
<tr>
<td>Gender:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient History</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Obstetric and Gynecologic History</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Current Pregnancy Course</th>
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</table>

<table>
<thead>
<tr>
<th>Clinical Observations</th>
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</table>

<table>
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<th>Laboratory Examinations</th>
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<table>
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<tr>
<th>Clinical Imaging</th>
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<table>
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<tr>
<th>Treatment</th>
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<table>
<thead>
<tr>
<th>Questions</th>
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<thead>
<tr>
<th>Signature</th>
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</table>

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8.2 Neonatology Form

8.3 Case Evaluation Form

Forma oцінки випадку
Ця форма допомагає швидко оцінити результати представлення клінічного випадку в iPath. Вона надає можливість модератору групи зрозуміти сподівання і переваги використання iPath, а також сприяє поліпшенню організації роботи групи і структури платформи. Ми дуже просимо Вас проаналізувати представленний випадок і заповнити коротку форму. Дякуємо Вам за підтримку у поліпшенні телемедичної платформи.

Запитання 1: Що було метою створення цього випадку?

☑ Проста презентація клінічного випадку, щоб ознайомити з цікавими клінічними аспектами колег.
☐ Презентація клінічного випадку для обговорення пов’язаних з ним цікавих запитань.
☐ Консультативна з метою отримання іншої думки від колег.

Запитання 2: Яким був вплив представлення випадку в iPath на діагноз?

☐ Діагноз підтверджений
☐ Діагноз уточнений
☐ Діагноз змінений
☐ Рекомендації неприйнятні
☐ Запитання щодо діагнозу не ставилось у цьому клінічному випадку

Запитання 3: Яким був вплив представлення випадку в iPath на лікувальний процес?

☐ Лікування підтверджено
☐ Лікування уточнено
☐ Лікування змінено
☐ Рекомендації неприйнятні
☐ Запитання щодо лікування не ставилось у цьому клінічному випадку

Запитання 4: Яким був вплив представлення випадку в iPath на призначення медикаментів?

☐ Медикаменти підтвердженні
☐ Медикаменти уточнені
☐ Медикаменти змінені
☐ Рекомендації неприйнятні
☐ Запитання щодо використання медикаментів не ставилось у цьому клінічному випадку
Запитання 5: Яким був вплив представлення випадку в iPath на переведення пацієнта?
- [ ] Вдалося уникнути переведення
- [ ] Необхідність переведення підтверджена
- [ ] Можливим було своєчасне переведення
- [ ] Запитання щодо переведення не ставилось у цьому клінічному випадку

Запитання 6: Яким був вплив представлення випадку в iPath на транспортування пацієнта?
- [ ] Вдалося уникнути непотрібного транспортування
- [ ] Не вдалося уникнути непотрібного транспортування
- [ ] Запитання щодо транспортування не ставилось у цьому клінічному випадку

Запитання 7: Чи Ви отримали якесь нові знання внаслідок представлення цього клінічного випадку?
- [ ] так
- [ ] ні

Запитання 8: У межах якого проміжку часу Ви отримали коментар щодо випадку?
- [ ] Не отримали взагалі
- [ ] Так, протягом прийнятого проміжку часу
- [ ] Так, але надто пізно

Запитання 9: Чи Ви задоволені результатами представлення випадку в iPath?
- [ ] Повністю
- [ ] Частково
- [ ] Не задоволені

Comments:
Ми дуже зацікавлені отримати від Вас критичні зауваження і побажання. Будь ласка, напишіть Ваші коментарі нижче.
9 References


