

**Ministry of Health Service of Ukraine  
Donetsk State Medical University named after M.Gorky**

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**Association for Ukrainian Telemedicine and eHealth  
Development**

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**EQUIPMENT FOR TELEMEDICINE  
PRACTICE IN MEDICAL  
ESTABLISHMENTS**

**Methodological recommendations (guidelines)**

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## 1. Background

Usage of a telemedicine as powerful tool for optimization of the organization of public health services, increase of care quality and improvements of medical education is noted in a number of scientific and legal documents. Telemedicine is the main part of the eHealth system which is regulated by the resolution of the World Health Organization (WHO) A58/21: “eHealth should have an impact on health systems by making health services more efficient and improving access to care, especially in remote areas, for people with disabilities and for the elderly. It should benefit health-care providers, professionals, and final users through higher quality of care and health promotion. It should also affect the cost of care by reducing redundancy and duplication of examinations and making possible economies of scale”.

Telemedicine – part of the health care system which uses computer information technologies and telecommunications for providing medical care when distance between medical staff and patient is a critical factor.

Standard sets of equipment (which consist of computers, peripheral facilities, devices for digitalization of medical information, digital diagnostic devices, communication terminals) are necessary for telemedicine usage in daily clinical practice.

The Association for Ukrainian Telemedicine and eHealth Development and its colleagues have positive experience of telemedicine usage in clinical practice and medical education [1,4,5,7,9-12,14,16-18,21]. In these guidelines we present our recommendations for the gathering of different telemedicine sets. Recommendations are based on WHO documents, good practice models of the International Society for Telemedicine and eHealth, a few articles and own practical experience [2-4,6,8-11,13,15-17,19,20-25].

## 2. Basic types of sets of telemedicine equipment

**Telemedicine work station** – set of devices and software, multitask workplace for medical information processing and conduct of telemedicine procedures.

**Telemedicine office** – telemedicine work station with advanced sets of digital diagnostic devices and equipment for large-format videoconferences.

**Telemedicine point** – simple set of devices for telescreening (gathering, digitalization and sending of primary diagnostic information in special medical centre for revealing of risk groups and the subsequent active treatment.

**Mobile telemedicine set** – movable telemedicine work station for outdoor telemedicine practice.

**Telehospice** – telemedicine equipment for clinical, information and psychological support of patients and staff of palliative care centres. Include sets of home telemedicine.

**Centre of home telemedicine** – sets of equipment for distant medical care of out-patients (telemonitoring, management, support, teleconsultations etc). Consists of call-centre and any quantity of home monitors.

### **3. Standard sets of telemedicine equipment**

In this chapter the standardized sets of telemedical equipment for use in various areas of public health services are described.

#### **3.1.1. General telemedicine work station**

Medical area: general medicine, any.

This specific adaptation consists of :

- personal computer/notebook (TFT-display 17” minimal, CD/DVD, audio and video input-output, USB, Bluetooth, IrDA interfaces, speakers, microphone, network adapter);
- digital photo camera (5 megapixel minimal, digital and optical zoom, video recording support);
- web-camera (640x480 pixels minimal);
- scanner;
- printer;
- modem/communication terminal.

Options:

- digital diagnostic equipment;

- special systems for videoconferences (protocol H.323) - broadband link required.

Usage of this adaptation :

- digitalization of medical information (text, x-rays, tomograms, locus morbi), usage of electronic medical records, creation of telemedicine case records;
- synchronous and asynchronous teleconsultations by IP-protocol;
- distant consiliums and daily meetings;
- distant (also with IP-phone) and continuous medical education.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- text editor;
- graphical editor (for bitmapped graphics);
- DICOM editor/viewer;
- video-codec;
- Internet browser;
- Internet messenger/IP-phone;
- e-mail software;
- antiviruses and antispam.

Options: special software for telemedicine, computer work places, PACS, hospital/medical information systems, electronic medical records, knowledge-based systems etc.

Communications:

- Internet (leased, dial-up, mobile, ADSL, xDSL etc);
- local, regional, national medical network;
- IP-channel;
  - ISDN.

### **3.1.2. Adaptation for traumatology and orthopaedics**

Medical area: traumatology, orthopaedics, bone and joint oncology, neuro- and maxillofacial trauma.

This adaptation consists of :

- personal computer/notebook (TFT-display 17" minimal, CD/DVD, audio and video input-output, USB, Bluetooth, IrDA interfaces, speakers, microphone, network adapter);
- digital photo camera (5 megapixel minimal, digital and optical zoom, video recording support);
- scanner;

- printer;
- negatoscope;
- modem/communication terminal.

Options:

- web-camera (640x480 pixels minimal);
- cellular phone (digital camera, WAP/GPRS, MMS)/communicator;
- digital ultrasound system.

Usage of this adaptation :

- digitalization of medical information (text, x-rays, tomograms, locus morbi), usage of electronic medical records, creation of telemedicine case records;
- synchronous and asynchronous teleconsultations by IP-protocol;
- telerehabilitation, distant support and supervision of out-hospital patients;
- distant consiliums and daily meetings;
- distant (also with IP-phone) and continuous medical education.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- text editor;
- graphical editor (for bitmapped graphics);
- DICOM editor/viewer;
- video-codec;
- Internet browser;
- Internet messenger/IP-phone;
- e-mail software;
- antiviruses and antispam.

Options: special software for telemedicine, computer work places, PACS, hospital/medical/radiological information systems, electronic medical records, knowledge-based systems etc.

Communications:

- Internet (leased, dial-up, mobile, ADSL, xDSL etc);
- local, regional, national medical network;
- IP-channel;
- ISDN.

### **3.1.3. Adaptation for dermatology and venerology**

Medical area: dermatology, venerology, plastic surgery, cosmetology.

This adaptation consists of :

- personal computer/notebook (TFT-display 19" minimal, CD/DVD, audio and video input-output, USB, Bluetooth, IrDA interfaces, speakers, microphone, network adapter);
- digital photo camera (7 megapixel minimal, digital and optical zoom, video recording support, replaceable objectives, manual settings);
- dermascope (digital dermascopic system or portable dermascope with adapter for photcamera);
- scanner;
- printer;
- modem/communication terminal.

Options:

- microscope with C-adapter or robotic digital microscope.

Usage of this modification:

- digitalization of medical information (text, locus morbi, results of examinations, cytological images), usage of electronic medical records, creation of telemedicine case records;
- synchronous and asynchronous teleconsultations by IP-protocol;
- distant consiliums and daily meetings;
- distant (also with IP-phone) and continuous medical education.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- text editor;
- graphical editor (for bitmapped graphics);
- software for digital dermascope;
- Internet browser;
- Internet messenger/IP-phone;
- e-mail software;
- antiviruses and antispam.

Options: special software for telemedicine, computer work places, PACS, hospital/medical information systems, electronic medical records, knowledge-based systems etc.

Communications:

- Internet (leased, dial-up, mobile, ADSL, xDSL etc);
- local, regional, national medical network;
- IP-channel;
- ISDN.



### **3.1.4. Adaptation for maxillofacial surgery and dentistry**

Medical area: maxillofacial surgery (inflammation, oncological pathology, congenital abnormalities, defects and deformations) and traumatology, reconstructive surgery, dental implantation, dentistry, orthodontia.

This adaptation consists of :

- personal computer/notebook (SVGA display, CD/DVD, audio and video input-output, USB, Bluetooth, IrDA interfaces, speakers, microphone, network adapter);
- digital photo camera (5 megapixel minimal, digital and optical zoom (3,0 minimum), video recording support);
- intraoral digital video camera;
- scanner;
- printer;
- negatoscope;
- modem/communication terminal.

Options:

- digital radiovisiograph;
- web-camera (640x480 pixels minimal);
- cellular phone (digital camera, WAP/GPRS, MMS)/communicator.

Usage of this modification:

- usage of intraoral digital camera and digital radiovisiograph allows to receive and send (without distortions) high-quality images of teeth, mouth cavity, x-rays etc;
- digitalization of medical information, usage of electronic medical records, creation of telemedicine case records;
- synchronous and asynchronous teleconsultations by IP-protocol;
- cellular phone/communicator (smartphone, cameraphone) allows to conduct synchronous teleconsultations by MMS and usage of mobile Internet;
- distant consiliums and daily meetings;
- distant (also with IP-phone) and continuous medical education.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- text editor;
- graphical editor (for bitmapped graphics);
- video-codec;
- Internet browser;

- Internet messenger/IP-phone;
- e-mail software;
- antiviruses and antispaam.

Options: computer work places, PACS, hospital/medical information systems, electronic medical records etc.

Communications:

- Internet (leased, dial-up, mobile, ADSL, xDSL etc);
- local, regional, national medical network;
- IP-channel.

### **3.1.5. Adaptation for pathology**

Medical area: pathology, cytology, pathological anatomy.

In telepathology the combination of two stations is usually used: sending (inquirer) and receiving (expert).

Sending adaptation consists of :

- personal computer/notebook (TFT-display 17" minimal, CD/DVD, audio and video input-output, USB, Bluetooth, IrDA interfaces, speakers, microphone, network adapter);
- digital photo camera (5 megapixel minimal, digital and optical zoom, video recording support);
- microscope with C-adapter or robotic digital microscope;
- printer;
- modem/communication terminal.

Receiving adaptation consists of :

- personal computer/notebook (TFT-display 17" minimal, CD/DVD, audio and video input-output, USB, Bluetooth, IrDA interfaces, speakers, microphone, network adapter);
- remote control for robotic microscope;
- modem/communication terminal.

Usage of this combination:

- digitalization of medical (cytological) information, usage of electronic medical records, creation of telemedicine case records;
- synchronous and asynchronous teleconsultations by IP-protocol;
- teliagnostic, teleassistance;
- distant and continuous medical education.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- software for telepathology;

- text editor;
- graphical editor (for bitmapped graphics);
- Internet browser;
- Internet messenger/IP-phone;
- e-mail software;
- antiviruses and antispam.

Options: special software for telemedicine, computer work places, PACS, hospital/medical information systems, electronic medical records etc.

Communications:

- Internet (leased, dial-up, mobile, ADSL, xDSL etc);
- local, regional, national medical network;
- IP-channel;
- ISDN.

### **3.1.6. Adaptation for family medicine**

In family medicine it is better to use the adaptation for general medicine (see 3.1.1) or telemedicine office (see 3.2). Home telecare systems is also better to use in the frame of family medicine. There are two sorts of such systems: “home monitor - call-centre” and “home nursing device - call-centre”.

First sort includes :

1). Home monitor:

- digital diagnostic devices for out-hospital usage by patients;
- monitor (device for gathering, integration and sending medical information to the call-centre, communication with medical staff). Notice – usage of personal computers as monitors are not efficient and up-to-date. Use is supposed for PDAs and smartphones.

2). Call-centre:

- personal computer(s);
- special software (data base of patients, examination results, prescriptions, analyses communication tools, etc);
- modem/communication terminal.

Communications:

- cable or cellular phone;
- Internet (arbitrary).

Second sort includes :

1). Devices for home nursing:

- notebook/PDA/communicator;
- digital photo(video)camera;
- digital diagnostic equipment.

2). Call-centre:

- personal computer(s);
- special software (data base of patients, examination results, prescriptions, analyses communication tools, etc);
- modem/communication terminal.

Communications:

- cable or cellular phone;
- Internet (arbitrary).

### **3.1.7. Adaptation for internal diseases, paediatrics and infection diseases**

Medical area: internal diseases of adults and children (cardiology, endocrinology, pulmonology, gastroenterology, urology, rheumatology etc).

This adaptation consists of :

- personal computer/notebook (TFT-display 19" minimal, CD/DVD, audio and video input-output, USB, Bluetooth, IrDA interfaces, speakers, microphone, network adapter);
- digital photo camera (5 megapixel minimal, digital and optical zoom, video recording support);
- telemedicine camera for general examination;
- digital stethoscope;
- digital ECG;
- digital spirometer;
- scanner;
- printer;
- negatoscope;
- modem/communication terminal.

Options:

- set for telepathology (see 3.1.5);
- web-camera (640x480 pixels minimal);
- special systems for videoconferences (protocol H.323) - broadband link required;
- digital ultrasound system;

- digital systems of monitoring/telemonitoring (home, trans-phone etc – see 3.4).

Usage of this adaptation :

- digitalization of medical information, usage of electronic medical records, creation of telemedicine case records;
- synchronous and asynchronous teleconsultations;
- distant consiliums and daily meetings;
- telerehabilitation, distant support and supervision of out-hospital patients;
- distant and continuous medical education.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- text editor;
- graphical editor (for bitmapped graphics);
- DICOM editor/viewer;
- video-codec;
- Internet browser;
- Internet messenger/IP-phone;
- e-mail software;
- antiviruses and antispam.

Options: special software for telemedicine, computer work places, PACS, hospital/medical information systems, electronic medical records, knowledge-based systems, software for videoconferences (protocol H.323), etc.

Communications:

- Internet (leased, dial-up, mobile, ADSL, xDSL etc);
- local, regional, national medical network;
- IP-channel;
- ISDN.

### **3.1.8. Adaptation for surgery**

Medical area: general, abdominal, thoracic, vessels, burns surgery, urology, oncology.

This adaptation consists of :

- personal computer/notebook (TFT-display 19” minimal, CD/DVD, audio and video input-output, USB, Bluetooth, IrDA interfaces, speakers, microphone, network adapter);

- digital photo camera (5 mega pixel minimal, digital and optical zoom, video recording support);
- telemedicine camera for general examination;
- scanner;
- printer;
- negatoscope;
- C-adapters for endoscopes;
- modem/communication terminal.

Options:

- web-camera (640x480 pixels minimal);
- special systems for videoconferences (protocol H.323) - broadband link required;
- digital ultrasound system.

Usage of this adaptation :

- digitalization of medical information (text, x-rays, tomograms, locus morbi), usage of electronic medical records, creation of telemedicine case records;
- synchronous and asynchronous teleconsultations;
- distant consiliums and daily meetings;
- telerehabilitation, distant support and supervision of out-hospital patients;
- distant and continuous medical education.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- text editor;
- graphical editor (for bitmapped graphics);
- DICOM editor/viewer;
- video-codec;
- Internet browser;
- Internet messenger/IP-phone;
- e-mail software;
- antiviruses and antispam.

Options: special software for telemedicine, computer work places, PACS, hospital/medical information systems, electronic medical records, knowledge-based systems, software for videoconferences (protocol H.323), etc.

Communications:

- Internet (leased, dial-up, mobile, ADSL, xDSL etc);

- local, regional, national medical network;
- IP-channel;
- ISDN.

### **3.1.9. Adaptation for phthisiatry**

Medical area: phthisiatry, tuberculosis prevention.

This adaptation consists of :

- personal computer/notebook (TFT-display 17" minimal, CD/DVD, audio and video input-output, USB, Bluetooth, IrDA interfaces, speakers, microphone, network adapter);
- digital photo camera (5 megapixel minimal, digital and optical zoom, video recording support);
- web-camera (640x480 pixels minimal);
- digital stethoscope;
- digital spirometer;
- negatoscope;
- scanner;
- printer;
- modem/communication terminal.

Options:

- special systems for videoconferences (protocol H.323) - broadband link required;
- C-adapters.

Usage of this adaptation :

- digitalization of medical information and x-rays archives, usage of electronic medical records, creation of telemedicine case records;
- synchronous and asynchronous teleconsultations;
- distant consiliums and daily meetings;
- telescreening, teleprevention;
- telecare for prisons, special social establishments etc;
- distant and continuous medical education.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- text editor;
- graphical editor (for bitmapped graphics);
- DICOM editor/viewer;
- video-codec;
- Internet browser;

- Internet messenger/IP-phone;
- e-mail software;
- antiviruses and antispam.

Options: special software for telemedicine, computer work places, PACS, hospital/medical information systems, electronic medical records, knowledge-based systems, software for videoconferences (protocol H.323), etc.

Communications:

- Internet (leased, dial-up, mobile, ADSL, xDSL etc);
- local, regional, national medical network;
- IP-channel;
- ISDN.

Notice - usage of network of telemedicine points (see 3.6) for prevention, screening and early diagnosis of tuberculosis in special and social establishments, prisons, rural areas etc are very effective in phthisiatry practice.

### 3.1.10. Adaptation for oncology

For oncology it is better to use networks which consist of : telemedicine work station adaptations for surgery, pathology, telemedicine points and telehospices (see – 3.1.5., 3.1.8., 3.5, 3.6).

### 3.1.11. Other devices

*Table. Special telemedicine equipment*

Medical area	Digital diagnostic device
ENT diseases	ENT-scope
Eye diseases	Ophthalmoscope
Endoscopy, microscopy	C-adapter (for connection of digital camera to endoscope/microscope tubes)
Oncology, orthopaedics, surgery	Thermograph
Psychiatry	Videoconferences sets (IP, H.323)

It is possible to use communicators and smartphones (in-build digital camera, WAP/GPRS/EDGE, SMS/MMS, e-mail):



- for synchronous and asynchronous teleconsultations (MMS/e-mail/wap-sites with voice/SMS communication);
- as modems for connection of telemedicine work station to mobile Internet;
- as home monitor (in home telemedicine systems);
- as tool for active communication and information support (SMS-reminder, information dissemination etc).

### **3.2. Telemedicine Office**

Medical area: any.

This adaptation consists of :

- personal computer/notebook (TFT-display 19" minimal, CD/DVD, audio and video input-output, USB, Bluetooth, IrDA interfaces, speakers, microphone, network adapter);
- digital photo camera (5 megapixel minimal, digital and optical zoom, video recording support);
- system for videoconferences (protocol H.323) - broadband link required;
- telemedicine camera for general examination;
- document-camera;
- scanner;
- printer;
- negatoscope;
- digital stethoscope;
- digital ECG;
- digital ophthalmoscope;
- digital ENT-scope;
- digital spirometer;
- dermascope (digital dermascopic system or portable dermascope with adapter for photo camera);
- digital ultrasound system;
- digital systems of monitoring/telemonitoring (home, trans-phone etc – see 3.4);
- modem/communication terminal.

Usage of this adaptation :

- digitalization of any kind of medical information, usage of electronic medical records, creation of telemedicine case records;

- synchronous and asynchronous teleconsultations;
- distant consiliums and daily meetings;
- telescreening, teleprevention;
- telerehabilitation, distant support and supervision of out-hospital patients;
- distant and continuous medical education.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- text editor;
- graphical editor (for bitmapped graphics);
- DICOM editor/viewer;
- software for videoconferences (H.323);
- video-codec;
- Internet browser;
- Internet messenger/IP-phone;
- e-mail software;
- antiviruses and antispam.

Options: special software for telemedicine, computer work places, PACS, software for call-centre, hospital/medical information systems, electronic medical records, knowledge-based systems etc.

Communications:

- broadband Internet (leased, dial-up, mobile, ADSL, xDSL etc);
- local, regional, national medical network;
- IP-channel;
- ISDN;
- satellite link.

### **3.3. Mobile telemedicine set (work station)**

Medical area: any.

Adaptation 1:

- car/ transport;
- portable computer or a few computers in network;
- standard peripheral facilities;
- set of digital diagnostic equipment;
- videoconferences kit (protocol H.323) - broadband link required;
- communication terminal.

Modification 2:

- notebook/PDA/communicator;
- special digital diagnostic device (ultrasound system, digital photo-camera, ECG etc);
- communication terminal.

Modification 3:

- PDA/communicator/smartphone.

Usage:

1. All adaptations :

- connection and medical care for remote and rural areas, in close establishments (prisons, social etc);
- digitalization of medical information, usage of electronic medical records, creation of telemedicine case records;
- synchronous teleconsultations (especially in emergency situations);
- medical care in pestholes, centres of disasters;
- telemonitoring;
- examination of out-hospital patients, teleprevention.

2. Adaptation 1 – mainly used in disaster, military, transport, air-space medicine; also – for medical care and prevention in remote areas.

3. Adaptation 2 – mainly used in home telemedicine, for out-patients services.

4. Adaptation 3 – mainly used for synchronous teleconsultations (especially in emergency situations); also – in home telemedicine and for out-patients services.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- software and drivers for communication terminal;
- text editor;
- graphical editor (for bitmapped graphics);
- DICOM editor/viewer;
- video-codec;
- Internet browser;
- Internet messenger/IP-phone;
- e-mail software;
- antiviruses and antispam.

Options: special software for telemedicine, computer work places, PACS, hospital/medical information systems, electronic

medical records, knowledge-based systems etc.

Communications:

- satellite link;
- Internet (mobile).

### **3.4. Set for telephonic transmission of diagnostic information (based on “Tredex”)**

Medical area: cardiology, cardioreanimation, rehabilitation, medical care for rural areas, family medicine, emergency medicine.

Set for telephonic transmission of diagnostic information (based on “Tredex”) consists of Call-centre station and all kinds of sending devices.

The Call-center station includes :

- personal computer/notebook (SVGA display, CD/DVD, audio and video input-output, USB, speakers, microphone, network adapter);
- printer (laser);
- basis receiving block;
- original software “Telecard”;
- set of cables;
- special power module.

Options:

- cable phone;
- modem (IP);
- UPS.

Sending devices include:

- transphone amplifier-transmitter of ECG;
- cable with ECG sensors.

Options:

- single-use ECG sensors;
- multi-use ECG sensors Ag-AgCl;
- cellular phone;
- radio phone;
- portable radio station.

Usage:

- urgent transmission of ECG in diagnostic call-centre from rural hospitals with cardiological teleconsultations;
- transmission of ECG from low level hospitals for screening, prevention and cardiological teleconsultations;

- distant education of medical staff in low level and rural hospitals (new methods of diagnostic and medications treatment in cardiology);
- archiving of medical information with ECG analyses in dynamics;
- usage of received ECGs for education process (as illustrations) and in decision-support systems.

Software (licensed, freeware, open code):

- original software “Telecard”;
- operation system of computer (with drivers of peripheral facilities);
- Internet browser;
- e-mail software;
- antiviruses and antispam.

Communications:

- analogous and digital cable phone lines;
- cellular phone lines;
- satellite links;
- high-quality radio links;
- Internet (leased, dial-up, mobile, ADSL, xDSL etc);
- local, regional, national medical network.

### **3.5. Set for telehospcie with home telemedicine systems**

This adaptation consists of :

- personal computer/notebook (TFT-display 19” minimal, CD/DVD, audio and video input-output, USB, Bluetooth, IrDA interfaces, speakers, microphone, network adapter);
- system for videoconferences (protocol H.323) - broadband link required;
- digital photo camera (5 megapixel minimal, digital and optical zoom, video recording support);
- telemedicine camera for general examination;
- scanner;
- printer;
- negatoscope;
- digital stethoscope;
- digital ECG;
- digital ultrasound system.
- modem/communication terminal.

Usage of this adaptation :

- digitalization of medical information, usage of electronic medical records, creation of telemedicine case records;
- distant rounds, supervision and support;
- distant care for palliative patients;
- synchronous and asynchronous teleconsultations;
- distant consiliums and daily meetings;
- distant information and psychological support and education for staff, patients, relatives;
- tele-visits of relatives.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- software for videoconferences (H.323);
- text editor;
- graphical editor (for bitmapped graphics);
- video-codec;
- Internet browser;
- Internet messenger/IP-phone;
- e-mail software;
- antiviruses and antispam.

Options: special software for telemedicine, computer work places, PACS, software for call-centre, hospital/medical information systems, electronic medical records, knowledge-based systems etc.

Communications:

- Internet (leased, dial-up, mobile, ADSL, xDSL etc);
- local, regional, national medical network;
- IP-channel;
- ISDN.

For home telemedicine (home telecare for palliative patients, support of caregivers) better to use system “home monitor - call-centre”:

1). Home monitor:

- digital diagnostic devices for out-hospital usage by patients;
- monitor (device for gathering, integration and sending medical information to the call-centre, communication with medical staff). Notice – usage of personal computers as monitors are not efficient and up-to-date. Use is supposed for PDAs and smartphones.

2). Call-centre:

- personal computer(s);

- special software (data base of patients, examination results, prescriptions, analyses communication tools, etc);
- modem/communication terminal.

Communications:

- cable or cellular phone;
- broadband Internet (arbitrary).

### **3.6. Telemedicine point**

Telemedicine point could be divided in two adaptations.

Adaptation 1:

- communicator/PDA/smartphone (in-build digital camera (1,3 megapixels minimum), mobile Internet (WAP/GPRS/EDGE/CDMA/3G), messages (SMS/MMS), e-mail).

Modification 2:

- notebook (USB);
- digital photo camera (5 megapixel minimal, digital and optical zoom, video recording support);
- modem/communication terminal.

Usage:

- digitalization of medical information (first of all – visual) during screening and prevention examinations;
- sending of digital medical information into special medical centre;
- detection of risk groups.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- e-mail software;
- antiviruses and antispam.

Options: graphical editor, special software for telemedicine.

Communications:

- cellular phone line;
- cellular services (MMS);
- Internet (first of all – mobile; leased, dial-up etc).

### **3.7. Sets for distant education**

#### **3.7.1. Set for distant education based on IP-phone**

Set consists of two main points: lecturer's point, auditorium's point.

Lecturer's point includes:

- computer (bluetooth interface, sound card, microphone, speakers);
- modem;
- cellular phone (bluetooth interface).

Auditorium's point includes:

- computer (bluetooth interface, sound card, microphone, speakers);
- wide format devices for presentation of audio/video information;
- cellular phone (bluetooth interface).

Usage:

- distant lectures, presentations;
- main scenario of usage: preliminary adjustment of organizational questions; creation and email to auditorium of multimedia presentation by lecturer; connection of lecturer's and auditorium's points at lecture's fixed time via IP-telephony; demonstration of presentation to auditorium accompanied by distance lecture.

Software (licensed, freeware, open code):

- operation system of computer (with drivers of peripheral facilities);
- IP-phone;
- software for multimedia presentations creation and demonstration;
- e-mail software;
- antiviruses and antispam.

Communications:

- Internet (leased, dial-up, mobile, ADSL, xDSL etc).

### **3.7.2. Set for distant education based on videoconferences**

Set for distant education based on wide-format videoconferences (protocol H.323) is similar to video studio (see. Chapter 3.8).

### **3.8. Set for telemedicine videoconferences (video studio)**

This set consists of :

- videoconference system;
- multiplexer;
- videoswitcher;
- document-camera;
- additional video camera;
- videomixer;
- device VGA-PAL;
- personal computer;
- printer;



- scanner;
- microscope;
- digital photo-, video camera;
- videotape recorder (2 items);
- audiomixer;
- microphone;
- wireless microphone;
- multimedia projector;
- projecting screen;
- panel/TV set (diagonal from 29") – 2 items.;
- special room (see below).

Optional:

- videosever.

Room:

- for distant education and teleconsultations – for 20-25 people, representation at panel (TV);
- for distant scientific and methodological activity – for 50-100 people, representation by multimedia projector at wide projecting screen;
- should be good acoustics, sound protection, light and walls colouring.

Usage of this set:

- distant education (special telelectures, postgraduate courses, translations of surgeries and manipulations, telementoring, schools etc);
- teleconsultations (synchronous, clinical rounds, teleconsiliums etc);
- distant scientific and methodological activity (scientific teleconferences, managers meetings etc).

Software (licensed, freeware, open code):

- video-codec (software for videoconferences (H.323));
- operation system of computer (with drivers of peripheral facilities);
- text editor;
- graphic editor;
- DICOM-viewer;
- Internet browser;
- Internet messenger;
- IP-phone;
- software for multimedia presentations creation and demonstration;
- multimedia player;

- e-mail software;
- antiviruses and antispam.

Communications:

- separate phone line (cable, cellular);
- broadband Internet (leased, dial-up, mobile, ADSL, xDSL, 3G etc)/IP/e-mail;
- ISDN.

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### Methodological recommendations (guidelines)

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