TELEMEDICINE IN RUSSIA AS TECHNOLOGY AND SERVICE

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Since antiquity, providing medical services has been one of the traditional integral parts of economy. Nevertheless, the market of medical services has been always related to the intellectual sphere and therefore has been always receptive to new technologies. Today the market of medical services demonstrates high-growth potential and typical features of the new economy: sharing and direct use of professionals' knowledge and experience through the use of telecommunications technologies.

What is Telemedicine?

New technologies rapidly developing at the end of the XX century – computer and telecommunications technologies – have found wide application in different spheres of human life such as medicine and healthcare. One of such applications, that use digital data processing and digital methods for storing medical diagnostic data and special methods for secure data transfer through communication links, was called **telemedicine**.

But only since 1995, it has become possible to introduce telemedicine into medical practice due to joint efforts of governments of some Northern countries, Norway in particular, and oil and gas transnational companies, which allows doctors to provide medical services to people in remote or difficult-to-access regions, for example to oil workers at offshore oil rigs.

On the other hand, in the most complicated cases across the world, telemedicine is the most efficient means of providing medical care & consulting, independently of the physical location of people who need care.

*Thus, **telemedicine** is a set of organizational, technological and commercial measures to provide functioning of the consultative-diagnostic system when any patient or doctor can receive a distant consultation from a specialist through the use of specialized equipment and telecommunications.*

Some facts from the history and brief overview of telemedicine in Russia

The pioneers in using telemedicine technologies in the USSR were aviation and space doctors who handled and analysed telemetric information about the health state of pilots, then astronauts, during their flights.

It should be noted that telemedicine technologies were used in the USSR to liquidate disaster consequences. The first experience of using new technologies (in fact it was international experience) was during the Spitak earthquake in Armenia. Later telemedicine was used during the fire on a train suffered from a blow on gas pipeline near Ufa.

Telemedicine in Russia has been developing in several directions concurrently: at the governmental level and in the private sector, in regions and at the federal level.

Until recently, almost in each Ministry there was a committee on telemedicine. Today in order to better coordinate the work at the State level, a Coordinating Committee on Telemedicine was created, headed by L. Reiman (the RF Minister for Communications and Information) and Y. Shevchenko (the RF Minister for Health).

Russia is one of few countries across the globe (I dare say Russia is the only one) that has the State "Concept of development of telemedicine technologies in the RF" adopted. The concept was adopted by the RF Ministry of Health in 2001.

The adaptation of the State "Electronic Russia" program by the RF government in 2001 was a real breakthrough of telemedicine. According to this program, in 2003 there in Russia will

be created some areas where different types of telemedicine equipment and methods for providing functioning of telemedicine systems will be tried. These areas will be created in the Chuvash Republic, Belgorod and Lipetsk regions, at some nuclear power plants and disaster centres.

If successful, it is planned to launch a nationwide telemedicine network in 2004. All these projects will be financed by the State, regional governments and insurance companies on an equal footing.

All telemedicine projects can be divided into several categories. Mainly, in Russia there have been carried out consultations between doctors from large regional in-patient clinics and leading specialists from the State medical centres located in Moscow. In parallel, leading specialists carry out master-classes and training for their colleagues from regions.

Recently, there appeared new telemedicine projects based on using mobile systems and equipment.

A revolutionary new application of telemedicine in Russia has been using telemedicine equipment for creating a network of General Practitioners' Offices.

Creators of telemedicine systems in Russia have been facing a number of legal problems. Thus, in order to overcome these difficulties, the State Duma created a Working Group on Telemedicine to consolidate the experience gained and to prepare a law on telemedicine.

Currently Russia has a considerable number of telemedicine projects under way, each implemented to some extent. These are projects by such RF medical centres as the Medicine Centre of Affairs of the RF President, the Research Centre for Cardiovascular surgery named after Bakhuleva, Moscow Scientific Research Institute of Paediatrics and Child Surgery, Moscow Medical Academy's National Research Centre of Surgery, Research Neurosurgery Centre named after Burdenko, State Medicine Centre.

A number of telemedicine networks are currently being built at different levels: departmental (i.e., the most developed project is a project for the RF Ministry of Transport and Communications), corporate (i.e., the Russian UKOS Oil Company) and specialized (i.e., within the framework of the program to fight tuberculosis)

Telemedicine technologies are being actively introduced into the medicine practice in some regions across Russia.

What facilities can Telemedicine offer?

The market of medical services may be divided into three segments according to potential demand:

- Emergent medical care delivered to the patient (injured) in dangerous to life or health situations that must be dealt with immediately; personal medical monitoring for the health condition of the elderly or disables people;
- Primary Health Care aimed at satisfying primary medical needs of people;
- Specialized and highly specialized high-quality consultative-diagnostic and health management care including surgical medical aid.

The listed-above segments greatly benefit from using the most important telemedicine technologies, namely:

«Clinical Telemedicine» lets doctors receive on-the-fly consultative-diagnostic help from the leading Medical Centers of Russia and other countries in order to provide medical care to patients wherever they live.

«Personal» and *«Home»* telemedicine utilize modern means of establishing individual communications such as mobile and/or connecting to the Internet in order to obtain specific personified recommendations: a qualified analysis of information about the patient's health condition (electrocardiogram, pulsometer data, etc.) can be sent from the Consultant to the Doctor in charge of the case through the use of telemedicine technologies.

«Medical Depository» uses modern means of communications in order to store the patient's medical data (e-medical history, including medical images) in a separate file, which both the patient and his doctor can access from any geographic point.

Where and how can Telemedicine help?

1. **Improving the quality of medical care; making high-quality medical care a uniform standard nationwide.** The use of telemedicine technologies helps solve such socially sound problems of the Health Care system as providing affordable, uniform standard medical services from any medical center independently of its physical and hierarchical location. This can be achieved by giving doctors and patients the possibility to receive professional consultations on a particular disease from leading specialists in a particular field.
2. **Providing medical services to people staying or living in remote or difficult-to-access regions.** In such regions medicine centres have small staff (one or two GPs or medical attendants) who call emergency in all complicated cases or ask to take the patient to a major medicine centre if they are unable to provide the appropriate care. Equipping such centres with special telemedicine-aided diagnostic facilities will enable local medical staff to receive telemedicine consultations from specialists without the need to transport patients to hospital.
3. **Providing medical care in cases of emergencies.** As a rule, a lot of specialists, medical specialists inclusive, are sent to the places of natural cataclysms, technogenic catastrophes, etc. where their help is indispensable. But in the most complicated cases (that happen very often), highly specialized help is needed while the specialist who can deliver the appropriate help can be hundreds kilometres away from the place of tragedy.
4. **Consultations provided from the leading medicine centres across the world.** The typical feature of the Former Republics of the USSR was concentration of leading medical professionals in Moscow and other capitals of the Union Republics in spite of the great total number of medical institutions scattered across the country. As a consequence, patients from different regions were heading to the capitals to receive high-quality medical care. After the USSR disintegrated and the cost of long distance trips raised, most people found themselves incapable of getting medical care from the leading specialists. Telemedicine can successfully solve this problem. Any patient can receive the necessary consultation from the best specialist in the field from any diagnostic centre across the globe (no matter where exactly the doctor works or lives), without the need to go to another hospital. In special cases the patient can be transported to a particular medical institution where highly specialized care can be provided according to a thoroughly prepared plan.
5. **Getting medical treatment abroad.** Certain groups of population can afford quality medical treatment. But the cost of such treatment abroad is much higher than in their native country. Therefore the selection of a medical institution abroad done on the basis of the results of a telemedicine consultation can be more reasonable, which can reduce the amount and total cost of treatment.
6. **Providing postoperative monitoring and support to the patients.** During the period of recovery after serious operations such as neurosurgical, cardiosurgical, etc., patients need continuous or periodical monitoring and support from the doctor who operated upon the patient. As a rule, such operations are performed in large medicine centres located in large cities, whereto non-resident patients may find it difficult to come – the time and cost of trips can be considerable. The problem can be solved through the use of telemedicine.
7. **Continuous training and re-training of medical staff.** New technologies reshaping our world and fast progress necessitate more training, making the task of distant training

– that is training in places where medical staff work – really crucial. Part of this problem is giving the specialists access to the most up-to-date medical information and news. Besides, doctors receiving consultations from highly qualified specialists gain experience and practical skills indispensable in their work.

8. **Creation of a database to store medical information.** To provide affordable and uniform-standard medical care, it is necessary to intelligently collect and store medical and medicine-related information in a database so that doctors and Health Officials could access it whenever needed. This will guarantee that all persons responsible for providing high-quality health care use actual data and are well informed about the current public health state (i.e., sickness rate across regions, the case history of a particular patient, etc.). Clever usage of distributed DBMSs in combination with telemedicine can satisfy many vital needs.

How are telemedicine consultations carried out?

In the context of «Clinical Telemedicine» the purpose of carrying out telemedicine consultations is four-fold:

- Verification of the results of a separate diagnostic examination;
- Diagnosis verification;
- Verification of medical tactics;
- Determining the medical grounds for getting medical treatment in Russia or abroad.

It should be noted that it is possible to provide both *off-line* and *on-line* telemedicine consultations through the use of special technologies.

The *off-line* mode of carrying out a telemedicine consultation suggests that all the necessary medical data is provided prior to consultation so that the Consultant can analyse it off-line, prepare a medical certificate or get prepared for an on-line consultation. In most cases it is enough to carry out an off-line telemedicine consultation.

In complicated cases when audio/visual contact between the Consultant and patient is needed, it is required to carry out *on-line* consultations. During an on-line consultation both parties can discuss the problem in real time, can see each other and the necessary medical information displayed on their screens.

The kind of telemedicine equipment needed for carrying out telemedicine consultations greatly depends on the expected number of telemedicine consultations. However, from the functional viewpoint telemedicine centres must be equipped with special facilities to process such data as results of X-ray diagnostics (i.e., X-raying, tomography, ultrasonic examination, etc.), cytological and histological examination, endomorphism and functional diagnostics.

Small telemedicine offices can be equipped with one workstation capable of performing the functions of a telemedicine terminal, a workstation for preparing the necessary medical documents and a server.

Telemedicine centres located in large medical institutions are usually equipped with:

- Telemedicine terminal;
- Videoconference-terminal (a station for carrying out group videoconferences);
- Specialized stations for teleconsulting;
- DB and Communications Server;
- Auxiliary equipment.

Examples of such telemedicine workshop's configuration and possible arrangement of equipment in a room are shown in Fig. 1 and 2.

What is Telemedicine in Russia?

Active interaction between those involved in the process of developing telemedicine in Russia resulted in a clearly defined business model for the market of telemedicine services, the participants of which are as follows:

- Specialized medicine centres acting as providers of medical consultative-diagnostic services;
- Preventive health care centres of different sizes and on different levels, offices and networks of the GP offices, insurance companies and private persons that buy medical services;
- Providers of telemedicine services – operators of medical air responsible for providing telemedicine services.

The key problem in developing telemedicine in Russia is a problem of expanding customer database, which requires building more telemedicine centres and offices across all regions.

What are the economic grounds for telemedicine?

It is well known that in the tsar's Russia, then in the USSR, now again in Russia, patients go to the capital to be treated by a Moscow professor. It is not just a matter of tradition, it is a real life situation: it is perfectly possible to equip any hospital in any remote area with the most up-to-date facilities but equipment is nothing without a good specialist.

According to statistics, late in the 80s Moscow accommodated up to 12-15 million patients seeking treatment from leading specialists annually. Russia's political and economic crisises followed by rising travelling costs lowered this figure to 1 million patients per year. As a result, almost 10 million patients find it impossible to receive affordable high quality medical care. Followed-up social and financial losses cannot be estimated precisely, but a rough estimate is many billions of rubles. These losses can be caused by different factors such as mal treatment resulting in total disability or the low-load of federal medicine centres that is inefficient usage of medicine resources.

Telemedicine technologies let us considerably reduce the cost of medical care by providing high quality health care services quickly that is reducing time, by reducing transport expenses, by shortening the recovery periods that is reducing social security disability insurance benefits.

Taking into account the large sizes of Russia, the total cost of a patient's coming/travelling to central clinics, his/her examination and followed treatment is about $700-1000 (US). This cost does not include losses related to the wasted working days, sick payments, second visit to the doctor, etc. The average cost of telemedicine consultation is about $100-150 (US). The mentioned about figures clearly show the economic effectiveness of telemedicine technologies as regards both the consumer of medical services and local budgets. As regards the annual financing of federal social programs, the cost of equipping telemedicine consultative-diagnostic centres in regions is less than the amount of money currently allocated for such programs.

The statistics across the world shows 25% annual growth in the market of telemedicine services. Only in the USA in 1997 that was the first year of wide application of telemedicine technologies by insurance companies, the amount of telemedicine consultations totalled 6 billion USD. According to international experts, the volume of the market of telemedicine services targeting only the elderly people across the wealthy countries with strong economy will amount 1 trillion USD by 2025. The capacity of the Russian telemedicine market can grow up to 0.65-1 billion UDS by 2007.

What is the specialization of "TANA" and "VITANET"?

The "TANA" companies group is the developer and provider of telemedicine equipment and appropriate software, as well as an independent provider of telemedicine services. Besides, the "TANA" companies group actively participates in the formation of the Russian and international markets of telemedicine services, targeting such important market segments as:

- Providing telemedicine consultative-diagnostic services in complicated medical cases;

- Creating networks of Family Doctor offices in large cities, equipping the offices with the necessary facilities;
- Improving the quality of medical care provided to people staying/living in remote or difficult-to-access regions;
- Using mobile telemedicine workstations in the field and during disasters;
- Distant personal monitoring of the health state of disabled and elderly people, in people's homes inclusive;
- Medical staff in-service training, raising the level of their professional skills by presenting new methods of diagnostics and treatment.

The range of equipment manufactured and supplied by the "TANA" company includes a number of hardware devices and systems different in functionality and performance to be specially used in telemedicine centres and offices.

The "TANA telemedicine systems" as provider of telemedicine services, organizes telemedicine consultations of any type – scheduled, urgent or emergent – on a wide range of diseases and medical cases under the three main tariff plans: "Diagnostician", "Consultant" and "Conference of specialist doctors"

Activities of "TANA" and "VITANET" abroad

Apart from participation in large international forums and exhibitions ("Telecom'97, 99", Geneva; "Africa Telecom'98, Johannesburg; "ACEAN'98 Summit", Kuala Lumpur; forum "Eurasia", Brussels, 2001; "InfoCom-2001" and "InfoCom-2002", Moscow, the first Telemedicine and Telecare International Trade Fair, Luxemburg, 2002), the "TANA" Companies Group has been actively interacting with Russian and international public and intergovernmental organizations such as the International Telecommunications Union, the Russian Red Cross, the World Health Organization, the representative office of the UN Development program in Russia and a number of medicine centers in Russia and abroad for the purpose of implementing different telemedicine pilot projects that help form the market of telemedicine services.

We can distinguish three main directions within this activity:

- Bilateral and multilateral cooperation in the field of providing telemedicine services, the purpose of which is not only buying medical consultations abroad for the Russian customers, but selling consultations from Russian medicine centres to the world market;
- The development of projects utilizing telemedicine technologies aimed at the Health care systems of different countries, including former Soviet Republics and African countries. In 2001-2002 the "TANA" Companies Group and "VITANET" public company in cooperation with international experts prepared a number of projects to fight Tuberculosis, AIDS and MALARIA through the use of the mobile telemedicine laboratories and centres in Ethiopia (2001) and Kenya (2002), the relevant project-proposals were submitted to the Global Fund created in 2001 by G-8 to fight Tuberculosis, AIDS and MALARIA in the least developed countries.
- Bilateral Working Groups created under intergovernmental agreements between Russia on the one hand and Germany, Norway, Canada and Israel on the other hand, have become an important lever in cooperation on Telemedicine between the countries. The format of bilateral Working Groups lets both parties successfully share the experience and implement mutual projects.

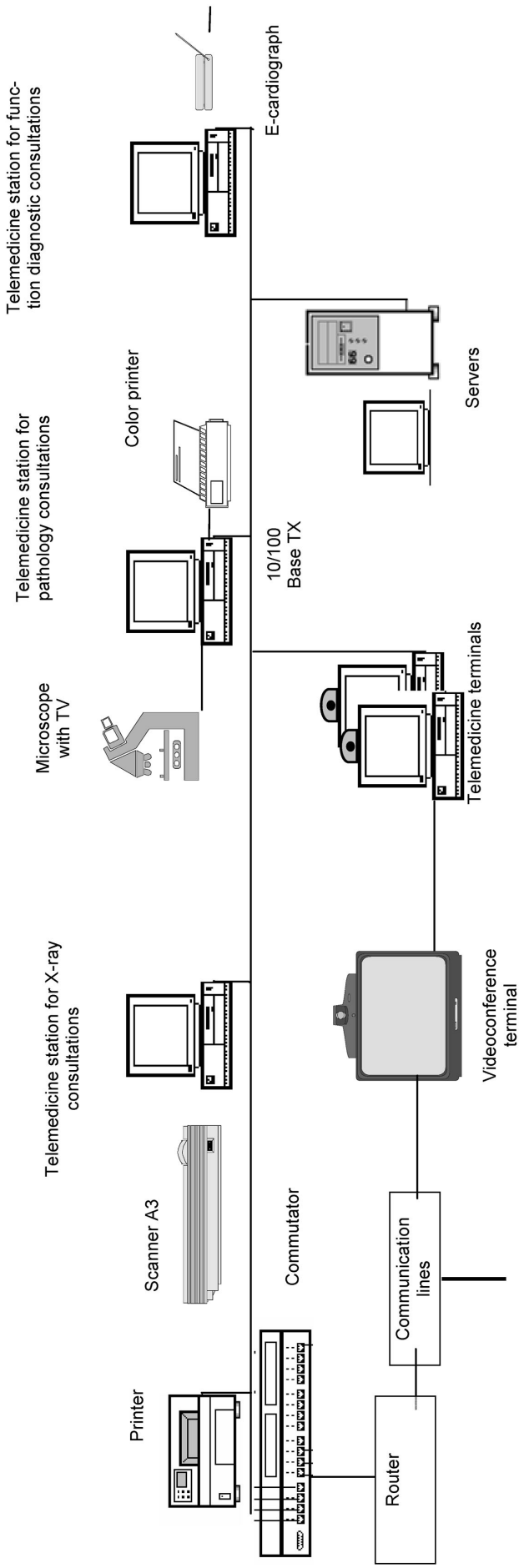

Fig. 1. Configuration and possible arrangement of equipment of telemedicine consulting centre

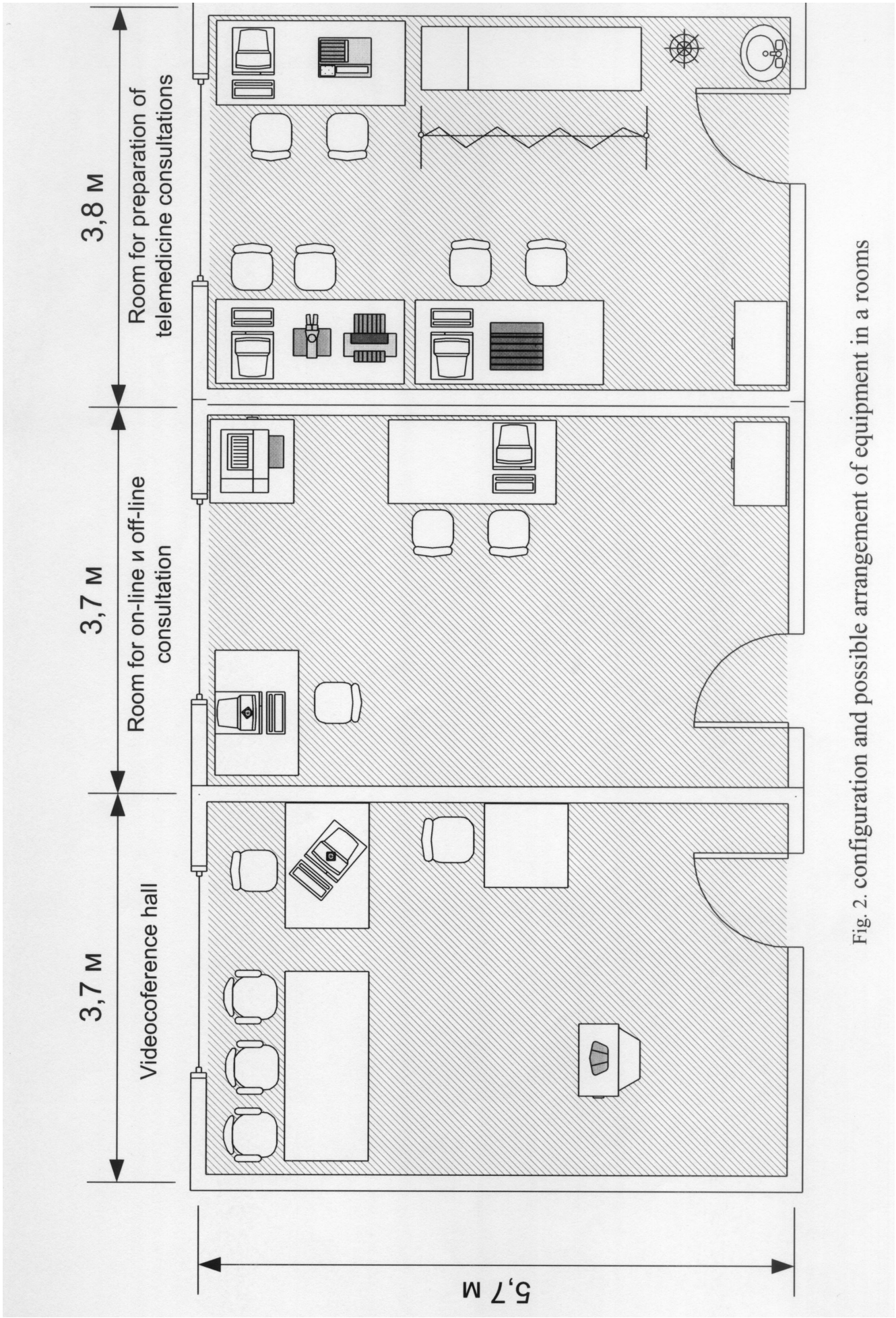

Fig. 2. configuration and possible arrangement of equipment in a rooms