

Informative and communicative technologies as a basis for personalized therapies

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Summary

Review of literature is devoted to issues of importance in informative and communicative technologies as part of modern health care development. Some of the important areas of informative and communicative technologies application are presented in practical public health: remote monitoring of key vital functions of the organism, telemedicine consultation, control and security of home rehabilitation, primary and secondary disease prevention and early disease diagnostics support, preventive telemedicine monitoring, the support system of medical decisions. Convincing data on higher "clinical efficiency" and effectiveness of the service, effective protection of public health in young and elderly patients, social and economic benefits, improved life quality, reducing number of hospitalizations and complications, adverse outcomes due to using informative and communicative technologies in medicine, is presented. Significant increase of therapy compliance, increase of public awareness in the present pathology for the purpose of active disease management, as well as patients' satisfaction in quality of health care through personalized communications with doctors are justified.

Key words

Informative and communicative technologies (ICT), patients' deciding, compliance, therapeutic training.

Introduction

There is no doubt that informative and communicative technologies (ICT) in medicine are a useful tool for improving the quality and efficiency of health care, both at the global and local levels. Not being an alternative to traditional forms of treatment and rehabilitation, information telemedicine systems are ICT, enhancing the effectiveness of conventional treatment.

The use of ICT in daily practice requires training of medical personnel, literacy of doctors and patients in the field of some service, organization of the health care structure and its management. Some researchers suggest, that “clinical productivity” of services and performance are achieved not by the introduction of the telemedicine technologies, but by an adequate interpretation of the results of their use and acceptance of medical and organizational solutions for achieving the main objectives of health care [1–8].

In the implementation of tasks using ICT, one of the fundamental roles is taken by active participation, awareness and literacy of patients in self-management of health, joint decision-making responsibility of the patient and the doctor for chronic diseases [2]. A number of scientific studies shown, that low literacy in health issues associated with inequitable access to health care, which results in an increase in the frequency of hospitalization, mortality, deterioration in quality of life (Figure 1) [2].

There is strong evidence of a more effective protection of public health in the application of additional opportunities in the form of ICT [2–5], with an emphasis on active participation of the patient in accomplishing the task. The positive experience of the clinical use of ICT worldwide put the medicine to a new level, successfully helping to reduce the number

of hospitalizations, complications, adverse outcomes, as well as socio-economic benefits, improving the quality of life [4]. It is proved that increase in the efficiency of preventive, curative and rehabilitative measures is achieved through dynamic monitoring of patients in a real-time, control and emergency correction of the key parameters of vital functions of the human body, preventive measures to ensure the safety of home rehabilitation. The account of features of the disease can improve significantly the efficiency and safety of the decisions [2, 4, 9–12]. It is noteworthy that the increase in the availability of medical care for patients with disabilities, as well as overcoming the spatial and temporal barriers between health workers and people living in remote regions lead to clinical and socio-economic benefits for patients [1–6, 13].

A number of large clinical trials [4, 6, 9, 13, 14] shown the data on the effectiveness of clinical use in all medicine branches of such ICT as the remote monitoring of key vital signs (blood pressure, heart rate, blood glucose, etc.), telemedicine consultations, monitoring of the home rehabilitation, a support system of medical solutions. Thus, various aspects of the individual approach to patients developed increasingly, which should be based more on the study of regularities rather than intuition or experience of the doctor. Approach to remote telemonitoring has unlimited possibilities and is often implemented in implantable devices — pacemakers and implantable cardioverter defibrillator, providing data on the functioning of the implanted system, as well as extensive information on the patient’s state [1, 10, 15, 16].

Statistics show that by 2020, senior citizens will make up 25% of the world’s population [17], i.e. it pays attention to the issue of “aging”. As soon as

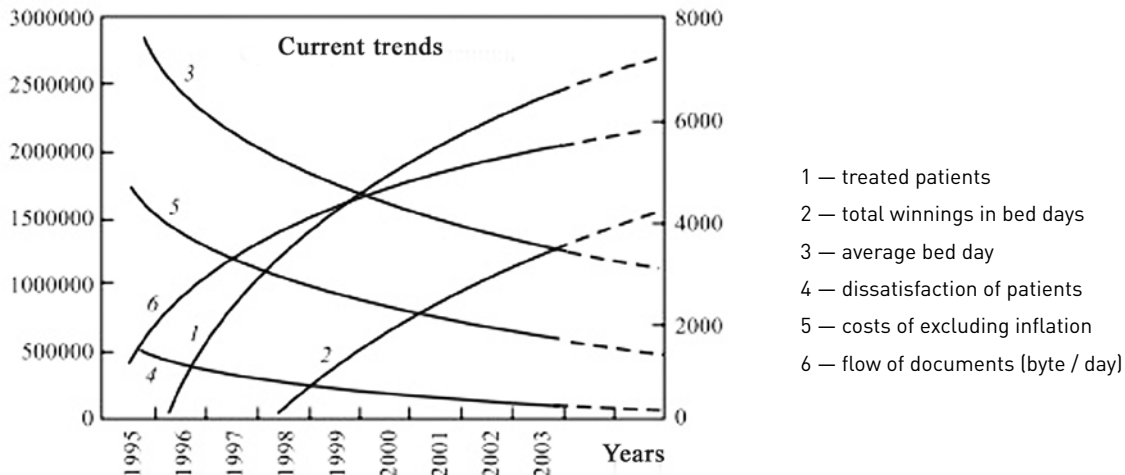
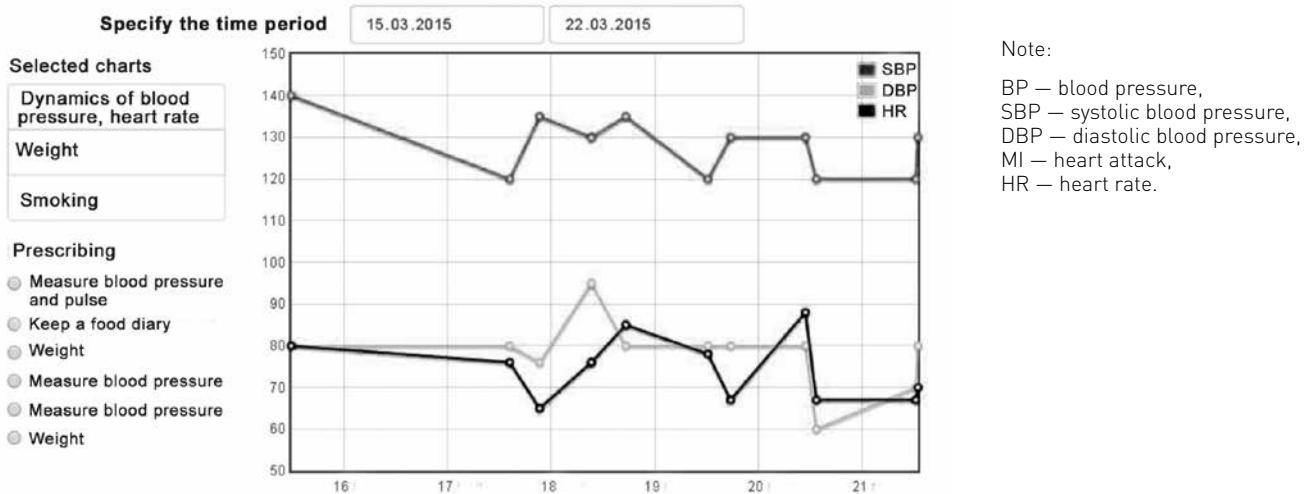


Figure 1. Trends in the use of health ICT [2].



Health card

Message exchange

School for patient

School for patient with MI. Class #1. First aid for a heart attack

School for patient with MI. Class #2. Nutrition for coronary heart disease (CHD)

School for patient with MI. Class #3. Primary prevention of cardiovascular diseases

School for patient with MI. Class #4. Non-pharmacological therapy of arterial hypertension

Figure 2. Primary and secondary disease prevention and early diagnosis

people approach retirement age, they enter a period of life associated with a high risk of costly and life-threatening chronic diseases. In this case, an important component of health monitoring can be a monitoring of physiological parameters of patients, related to the prevention and treatment of diseases; as well as the organization of telemedicine consultations, which contribute to closer contacts between doctors and patients, producing for patients the feeling of “security” under supervision of a physician (patient’s satisfaction from communication with the doctor) and increase of compliance [9, 18, 19].

A recent randomized controlled study, on the use of telemedicine in the individual management of patients, showed improvement in blood glucose control in diabetes elderly in areas, deemed as “not getting enough medical care” in the state of New York (USA) [18]. Considering the high percentage of chronic diseases in this group of patients, in some European countries telemedicine programs of self-service and therapeutic education are often implemented, which

help to raise an awareness of patients about the disease, to develop the necessary skills allowing to manage their diseases long and actively, and to provide a dynamic timely control for the prevention of complications [20–21].

The support to the primary and secondary disease prevention and early diagnosis gets even more relevance (Figure 2) [4, 9]. A high percentage of the prevalence of cardiovascular disease, which flows including covertly among young and middle-aged people, and therefore a high risk of cardiovascular complications, requires a before-symptomatic diagnosis in this age group [12] in the light of the modern medicine positions, defined as predictive, personalized and preventive medicine [22]. This fact requires special approaches to the early diagnosis and correction of the identified risk factors, as well as early forms of disease in these groups of patients. A significant role is given to the use of telemedicine and to the telemedicine preventive monitoring. In the implementation of preventive measures in young patients with

no complaints and not focusing on the state of their health in this context, it is important to give an awareness of the important role of risk factors, understanding the causes of disease, the initial manifestations of the disease. This again shifts the emphasis in favor of literacy and therapeutic education for health and its self-control in young and middle-aged people.

One of the important components of the effectiveness of rehabilitation measures is their continuous monitoring and active participation of the patient. According to foreign literature data, telemedicine technologies contribute to “overcome the barriers to access a cardio-rehabilitation for large range of patients, and can be widely used in the world” [13]. Thus, the physician assumes the possibility of direct control access to comprehensive information on the patient’s condition in an online mode, receives data not only on the parameters of the cardiovascular system, but also on other vital systems potentiating “a syndrome of mutual aggravation”, and if necessary, he can make adjustments to the treatment and rehabilitation programs. Clinical experience, with telemonitoring of the category of high-risk patients in many studies, proved the prospects of development of remote monitoring systems for patients with the help of external devices and sensors of the human vital parameters, as well as increased self-control of patients [1, 19–20].

A significant increase of compliance with the treatment was proved (90%) in patients actively using methods of home self-control [12, 19], reduction in the frequency of hospitalizations [4, 23], reduction in mortality among patients with cardiovascular disease by 20–25%, compared with the traditional technology of medical care (Figure 3) [3, 5, 23, 24]. Positive dy-

namics in the application of telemonitoring systems is also achieved by increasing awareness and literacy with existing disease, the patient’s satisfaction with the quality of medical care, the achievement of patient’s consent to treatment and timely delivery of medical recommendations.

The important role is played by access to health care of groups living in geographically remote areas, rural areas, patients with disabilities, as well as patients of closed or organized groups. An example of the application of telemedicine technologies is widely implemented in the states of Georgia and Texas, where telecommunications are carried out between medical institutions, state prisons and hospices [18, 25].

The use of telemonitoring in psychological rehabilitation is successful for patients, who are in need of psychiatric, psycho-physiological or psychological care [1, 25, 26], by the audiovisual communication of the patient and the doctor. The patient no longer feels lonely and helpless, his psycho-physiological condition is improving, there is self-confidence, resulting in a marked acceleration of physical rehabilitation, improving of life quality [17, 26, 27].

The introduction of telemedicine technologies in pediatrics is topical, which is confirmed in a number of studies by a positive effect on the psychological status of the parents of sick children — the use of telemonitoring systems in pediatrics reduces the level of parents’ anxiety significantly [28]. The project of telemedicine use to support maternal and newborn health at Los Angeles Children’s Hospital and at the National Center for Maternal and Child in Mongolia showed a decrease in infant and maternal mortality and reducing the gap between the level of medical services in urban and rural areas [29].

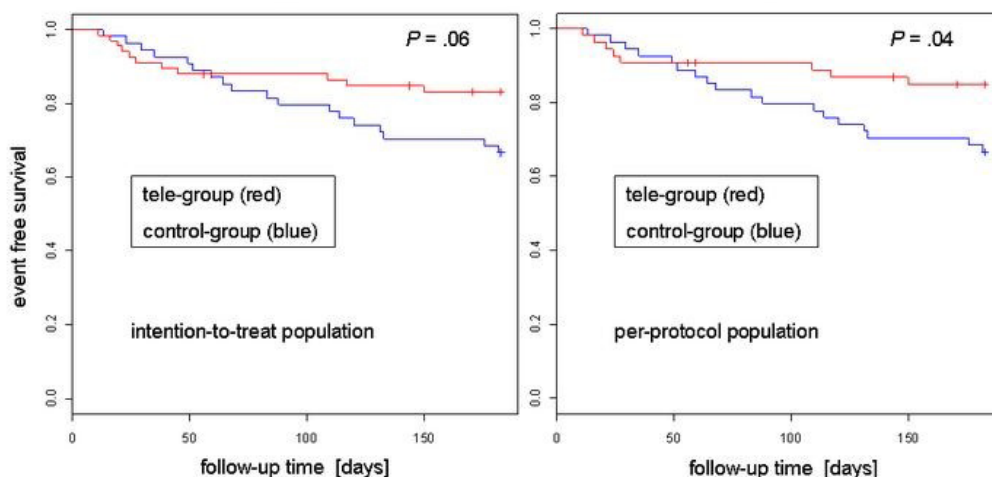


Figure 3. The primary endpoints — reduction in the frequency of hospitalization and mortality when using telemedicine technologies [23]

There are evidences of the effectiveness of telemedicine support for rehabilitation of patients after surgery [4, 7, 8, 17]; rehabilitation and telemedicine services for women before and after a childbirth period [17, 30]; the organization of consulting support for medical care in emergency situations from highly professionals of major medical centers [17, 25]; telemedicine support of the critical conditions medicine [31], as well as military telemedicine [25]. An important role has the information support of the activities in the field of a health care organization, clinical audit [3, 25].

Conclusion

The introduction of ICT with the dynamic monitoring of patients and raise of awareness about the disease in the form of virtual learning are an auxiliary therapeutic agent, which allows the patient to adapt to the disease more quickly, and to acquire the knowledge and skills necessary for the active management of their disease. Remote control of therapeutic, rehabilitative and preventive measures contribute to the growth of patients' satisfaction with medical services, improvement of life quality and cost-effectiveness of health care in all its spheres. The possibility of permanent access and remote monitoring helps to overcome both territorial and psychological barriers between doctor and patient.

Conflict of interest: None declared

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