Materials of Conferences

INFORMATION MODEL OF HEART

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Information model of heart was developed considering the requirements of the major theories of the most systems and the classic management theory. To analyze the peculiarities of functioning of the information model of heart and its elements a structural-functional scheme has been constructed, it contains four functional modules that are linked to each other on principle «reality – image of reality – project of reality alteration – realization of alterations».

Module 1 – situation model of interaction «specialist (cardiologist) – patient» that has formed and is characterized by traditional periodical consultation in case of patient's complaints or preventive and maintaining treatment.

Module 2 – scheme of heart-vascular system (HVS) within the limits of the concept of a man as a hierarchical structure of management that includes two related contexts: a man from the position of his biological nature – an interaction between heart and functional structures of organism is formed, they are represented as network structures and the man – as a conscious system that includes factors of his way of life, environment, including ecology, customs, ethical and moral settings that influence the condition of HVS (genetically-determined factors are studied as prognosis parameters that display a predilection for separate diseases).

Module 3 – a system model that consists of a number of blocks. Block 1 is the database (DB) that is realized with the defined relations between tables that contain data on HVS diseases, medical preparations, treatment methods that allow specialist to shorten the time needed to access an inquiry information relating his current problem while working in the program complex – automated workplace of cardiologist (AWP-K). While creating the DB we have optimized the table structure «ICD» (international classification of diseases) and «clsp-harmagroup» (pharmacological groups of medical preparations) with usage of programmes that were developed by the author group (Certificate of official registration of program for PC № 2011610223 RF of 11.01.2011; Certificate of state registration of database № 2011620419 of 08.06.2011). Block 2 is the system of monitoring the current information on dynamics of an organism's parameters of each «patient», its preliminary processing and storing in DB; provides reliability, adequacy, urgency, and confidentiality of the contained information. Block 3 is an interface between a specialist («cardiologist») and system bocks that provides him with an access to the monitoring data of a specific «patient» and to model construction blocks that reflect an influence of internal and external factors upon the heart work as well as the ability to carry out a comparative analysis of the current condition of a «patient» with a «standard» and visualization of modeling results using the system of calculated informing and preventive indicators of HVS condition. Block 4 is a set of models of type «stimulus-reaction» for «training» according to the data of observation and prognosis of possible reactions to combinations of factors «on-line»; interacts with blocks 1-3. Block 5 is a set of models based on mathematical methods and methods of expert systems; it uses data of blocks 2 and 4 as initial and regulates their work. Block 6 is a program complex of medical management decisions generation, it realizes methods of decision support including those for making up text projects on HVS condition.

Module 4 explains the realization of system on specific program-apparatus means. It consists of five blocks that linked via communication channels: automated workplace of cardiologist: model server; server of processing data on parameters of patients' organism condition; personal mobile facility of non-invasive control (in number that is sufficient to meet the needs of a certain number of patients); system of data transfer between mobile devices and stationed access point.

The realization of the described informative model allows us to broaden abilities of a specialist to undertake a basic diagnostics of heart diseases and forecast the development of the pathology; define the localization of myocardium damage in examination of a patient; create special models, for example, to carry out instrumental research on revelation of an impact of a complex of factors upon the predicted condition of HVS.

The research was carried out with a financial support of the Federal Target Program «Scientific anf scientific-pedagogical specialists of the innovative Russia» for 2009 – 2013, state contract № 16.740.11.0045 of 01.09.2010.

The work was submitted to International Scientific Conference «New technologies, innovation, invention», Turkey (Antalya), August, 16-23, 2011, came to the editorial office on 27.07.2011.