

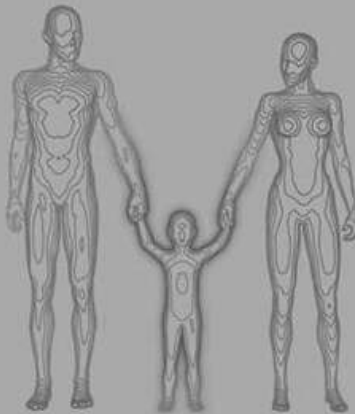
**Family medicine: in 3 books. —
Book 1. General Issues of
Family Medicine: textbook (IV
a. I.)**

The book explores the theoretical basis of family medicine. It also seeks to analyze the social preconditions of the need for family medicine, the main aspects of the family doctor's practice, the working process problems as well as the means to solve them. The book summarizes years of experience in teaching family medicine at leading medical universities of Ukraine.

The authors outline modern views in general practice and the concept of its development; describes the organization of outpatient care in the most widespread diseases of the therapeutic profile; study the methods of providing emergency assistance in lifethreatening conditions. The textbook provides information on the diagnosis, treatment, prevention, prophylactic medical observation, examination of incapacity for work, which will allow the doctor to properly assess symptoms, determine a list of diseases for differential diagnosis, and in future — to formulate a diagnosis and plan treatment and rehabilitation activities.

FAMILY MEDICINE

IN **3** BOOKS



Edited by
Professor **O.M. HYRINA**,
Professor **L.M. PASIYESHVILI**

BOOK **1**

GENERAL ISSUES OF FAMILY MEDICINE

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O.M. Hyrina, Professor L.M. Pasiyeshvili

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Chapter 3

FUNDAMENTALS OF INFORMATICS, EVIDENCE MEDICINE, SCREENING DIAGNOSIS, CLINICAL OBSERVATION, TELEMEDICINE

3.1. FUNDAMENTALS OF INFORMATICS

Creation of systems management in modern health care is impossible without appropriate information processing. It is connected with the fact that organization of management of health care is based on the determination of resources effectiveness which were used on every stage of providing medical care to the population. That is why not only statistical analysis is used, but at first analysis of medical-economic performances on primary, secondary and tertiary levels of medicine should be considered.

Modern information provision must meet some requirements (Fig.1).

Traditional scheme of the modern information provision of health care means that every hospital due to its possibilities makes own bases and creates appropriate information provision. Personal medical bases of the population of an administrative unit (region, city) are more appropriate to modern aims and are created at the first stage of medicine. In these bases medical, statistic, as well as medical and economic information about every citizen during his/her life is processed. In this case, the general practitioner, as a doctor of the first contact, has some benefits, such a doctor has information of the patient's movement within the unit. Besides, the general practitioner makes examination routes of patients and treats his patients, so family doctor has direct relation to the division of the amount of medical care and its costs.

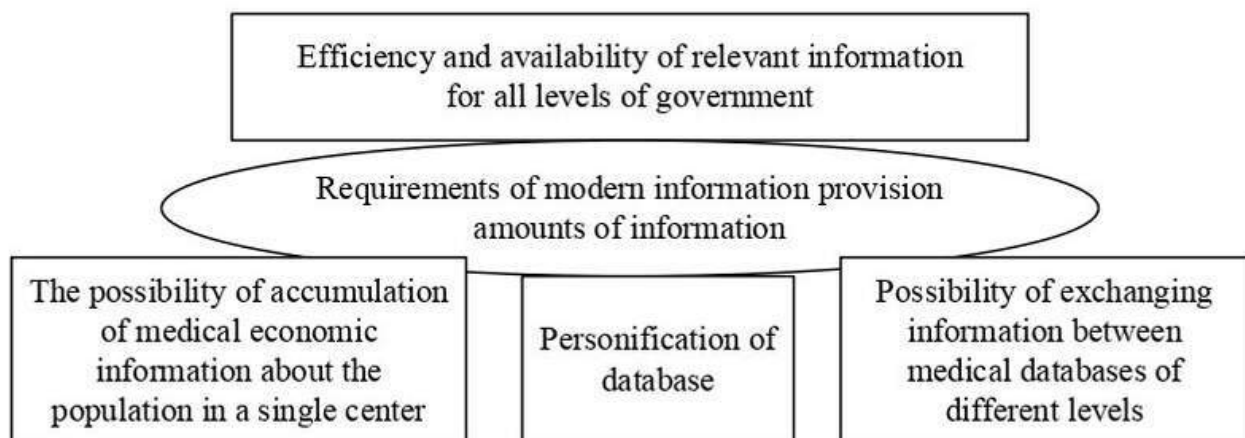


Fig. 1. Requirements to modern information provision of health care on the example of the center of primary medical care

Primary information about the population comes across a doctor's automatic workplace makes databases. Other medical staff can use this system too. It is necessary to predict possibility to confirm new data about new patients, to delete information about patients, who die or move to another place, and to edit some options (changes in surnames, addresses). Changes in information are necessary in case of sending patients for treatment and examination to other medical departments. It is necessary to pay attention to the fact that during the primary filling of the base the personal code for every patient is created in automatic regime and when a few workplaces are organized a local net is implemented.

Databases of local units give possibility to create registration of population (of a city, region) according to summation. System administrator using special developed interfaces does this work. To correct any current information, if necessary, is possible with using e-mail or electronic media. It is useful to create technologies (protocols) which give the ability to do analysis and changes of information in primary databases without installation of computer nets at polyclinics. You can use the same protocols for registration concerning medical care at FAP. These protocols are passed to the clinic of the general practitioner every month, where information is analyzed and recorded to the databases.

The introduction of information technology in general practice/family medicine is based of the law of Ukraine of 4.02.1998, No. 74 "On the National Program of Computerization"[20] and the Order of the Ministry of Health of Ukraine as of 13.07.1998, No.191 "On Industrial Scientific Medical Information in an Integrated Information Field of Health of Ukraine"[35]. Particularly, the introduction of information technologies in the healthcare industry is connected with interaction at different levels of medical care. Medical cluster involves the pooling of available computer equipment of health facilities according to levels of medical care (medical services), used together and working as a single, unified system for solving problems, in particular for increasing the effectiveness of therapeutic and preventive measures, ensuring financial therapeutic and preventive measures, ensuring financial transparency and reliability, simplifying administration. The medical cluster uses a single software system with a communication Protocol.

An important step in the information support of general practice/family medicine is the order of the Ministry of Health of Ukraine dated 25.07.2008, No. 409 "On Approving the Concept of the Sectoral Program 'Electronic System for the Recording and Exchange of Health Information between Agencies, Institutions and Organizations of Health' " [36].

It is important for family medicine to use telecommunications and organized systems, which give access to patient's protocols on different levels of medical care. Medical cluster as a flexible information system can provide the technical prerequisites for the introduction of electronic passports of the patient and development of telemedicine.

The health system in Ukraine and particularly in primary health care requires the creation of modern management systems based on modern information provision. Its purpose is to reach the effectiveness of the resources invested at all levels of medical care

CHAPTER 3

to the population, using both statistical and medico-economical indicators at three levels of medical care.

In addition, a special workplace with necessary protocols is created to ensure personalized recording of emergency calls, the cost of emergency care provision and statistical diagnosis. This information is transmitted to the database of family medicine clinics. In the same way, a population register for district and municipal sanitary and epidemiological stations is created which is necessary for the routine immunization of the population.

Medical information about the patient is focused on the primary database, which is recorded by the family physician's assistant during the reception, or it comes as statements and consulting conclusions of the relevant inpatient and outpatient institutions of secondary and tertiary levels.

Except medical information, economic information is recorded into the database (the cost of services performed by the medical staff of the clinic; consultations, hospitalizations), that allows the doctor to make a detailed health-economic analysis. The main functions of the automated workplace of a family doctor are shown in modern computer systems of providing the activity of a family physician (Fig. 2). A family physician must be connected with all the necessary directories, for example the reference qualifier ICD-X, directories of medical services of the main staff of the family medicine clinics (including the log of paramedics for paramedic—obstetric unit procedures, reference diagnostic procedures, the log for hospital treatment and procedures of outpatient surgery), the log of drugs with the international classification, temporary medical social norms (the Order of the Ukrainian Ministry of Health No. 191 dated 05.05.2003 “On Approval of the Temporary State Social Standards in the Specialty “General Practice — Family Medicine”), the log of medical facilities, staff and other.

Modern computer information provision of family medicine provides managed health care (services), integration of the work of medical institutions of the region in a single medical and financial field, which ultimately will contribute to the implementation of the principle of medical economic feasibility.

The personification of medical services and the cost of their provision within the norm for an individual, the budget of the district, the budget of the region provide budget transparency. This gives the possibility to calculate a real need for funding of family medicine clinics, as well as the needs of the population in outpatient and hospital care, which will facilitate the transition to mandatory health insurance. In such a system, a family doctor can control the formation of flows of patients to secondary and tertiary levels. Thus, a family physician performs the function of medical manager. Medical management will provide services to the population based on contracts. In such a situation, conditions become a real new form of remuneration of general practitioners, based on the amount of the population that they serve, and the quality of work with primary and secondary disease prevention.

For PHC reform of the principles of family medicine automated control system (ACS) based on personalized databases of the health status of the population and the available system resources with application of modern computer technology are necessary. In this

**The main functions of an automated workplace
of a general practitioner**

<ul style="list-style-type: none"> • Filling electronic cards of the patients and case histories, registration of results of examinations with the expectation for statistical diagnoses according to ICD-10; • registration of drugs for individual patients; • connection with work of health insurance; • assembly of clinical groups of adults, children, pregnant women according to the orders of the MH of Ukraine; • observation of patients with disabilities; • review and control of chest X-ray. 	<ul style="list-style-type: none"> • Control of cytological examinations of women; • automated implementation and monitoring of immunization of population; • registration of the information about received first aid; • referral to other medical facilities for examination monitoring and returning of advisory opinions; • screening followed by treatment with profiles; • assembly of electronic passport of the family
<ul style="list-style-type: none"> • Measures of primary prevention of cardiovascular diseases, diabetes, mental pathology; • accounting sheets of temporary disability; • monitoring the volume of health services and the cost for each patient 	

Fig. 2. The main functions of an automated workplace of a general practitioner

regard, we need to introduce a mechanism to control the cost and quality of medical services that will allow you to change the system of remuneration of health workers.

A basic prerequisite for reforming the current health care system is the transition to the category of “medical service”, which covers medical and economic components. Under these conditions, medical care becomes adjustable based on the real value of the personal norm.

Modern information and technological support as well as the creation of an integrated information field are necessary to organize the work in the system of managed health care.

Computer information software allows you to integrate a safety management system and to monitor it.

Without modern computer and software it is impossible to carry out comprehensive monitoring of the health status of the population, to form flows of patients and to guide them and resources flows, to exercise effective control over the observance of the norms and standards of treatment and, ultimately, to ensure the transition from line-item budgeting to modern methods of economic management in the health sector.

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Medical database of the establishment of family medicine should be personalized taking into account the most complete volume of medical information. In addition, each patient should have personal codifier. Statistical, medical, economic, financial, personalized information shall be transmitted on the modem connection in the medical database of the other levels. The institutions of family medicine certainly have to take on a dial-up connection and process the information transmitted from the medical databases of other levels. The medical information database of family medicine should be used in local area networks.

The widespread introduction of computer technology and modern information technologies in everyday medical practice is still waiting for its implementation. At the present level, it is impossible to manage PHC medical services, secondary and tertiary level of medical care using traditional methods of record keeping on paper.

Medical information system is called the complex methodological techniques, including hardware and control algorithms for collecting, storing, processing and transmitting information in medical institutions. Medical information system (MIS) can be classified into several levels. First, the easiest one is associated with the automation of medical records. Such automated systems include the incorporation of patient statements, internal transfers, diagnostic information, assignments, and financial questions and thus help compiling various reports. In the medical information system of the second level we are talking about information from diagnostic devices obtained in the form of various printed research materials. At the second level of MIS, the results are indexed, scanned and saved in electronic systems. At the third level, MIS contains input, processing and storage of information in the workplace. On the third level the electronic medical record plays an active role in the decision-making process and integration with expert systems, for example, in diagnosis, the choice of drugs. The fourth level MIS requires national or international identification system of the patients, unified terminology, standards, testing and treatment, information structure, coding, etc. MIS of the fifth level involves an e-mail inquiry about health with virtually unlimited sources of information. This system has information about alternative medicine, behavioral activities of the individual (smoking, exercise, using of preventive nutrition, and so on).

Personal medical electronic passport that contains data from all sources of information about patient's health should be formed in the computer software information system of family medicine. Optimal medical electronic passport is the placement of the passport on a special device that combines flash memory and a controller (16 GB).

The introduction of patient's electronic medical passport in family medicine has the following advantages:

- Ability to observe objectively the dynamics of the structure of public health with the allocation of risk and the identification of their location and professional activities;
- Improving the quality of decision-making in emergencies due to the patient's status;
- Increasing the responsibility of medical staff providing emergency or medical services;

- Creation of an information database to provide legal protection for both patient and doctor;
- Implementation of preventive health measures to achieve their maximum effectiveness;
- The introduction of an effective system of mutual settlements in the provision of medical services to the population, including services through pharmacies;
- Real opportunity to reduce the costs of medical care due to the reliability of the diagnostic information.

The patient's electronic passport also helps us in ethical issues associated with read and/or use of the information by unauthorized persons. Further details on these issues can be found in References [14, 16, 17, 19, 24, 28, 29, 30, 31, 32, 33, 37, 38, 39].

The term "automation of the diagnostic and treatment process" corresponds to a more precise term — computerization such as that more fully reflects the essence of the process.

There is state program of computerization of health care in Ukraine; however, practical steps for its application are still not fully developed. In the conditions of computerization, it is much easier to apply standards of treatment and to monitor the treatment and diagnostic process at all levels. Creating medical information systems is in an urgent need of professionalism of both medical and medical engineering to create relevant programs that meet medical needs.

Medical information system can be in particular an automated information system of medical document management with the creation of personalized registry database of population, planning and making control of medical preventive examinations, X-ray examination, inoculations, accounting and analysis of the status of disability, providing medical rehabilitation and social adaptation of the disabled, accounting and analysis of the condition of patients affected by the Chornobyl accident. Input documents for medical information system are the following:

- Outpatient card;
- Dispensary patient card;
- Medical examination records;
- Outpatient examination records;
- Patient's card of day hospital;
- A list of patients who underwent preventive fluoroscopic examination;
- A list of patients who are vaccinated.

Electronic medical passport looks like a regular flash card, which is used for emergency medicine — an indispensable thing. The arrangement of population's medical examination requires creating automated information system, which is able to provide the creation of personalized databases for patients, introduction of planned activities, accounting and analysis of these events, the assessment of health dispensary, a comprehensive assessment of organization of prophylactic medical examination service.

Output automated information system for clinical examination of the population includes the following files (format dbf):

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- Rated part;
- Database of clinical diagnoses;
- Database that contains the plan of activities;
- Database of implemented measures;
- Database containing information on the aggravation of diseases;
- Database containing personal information of the dispensary diagnosis;
- Database with changed registration groups.

In an automated information system, a unified normative reference fund is used. The interface is compatible with other automated systems.

It should be noted that a doctor works on the principles of medical information and must be focused on the patient. Doctor's working hours should be devoted basically to the patient, not to papers, documents, and even computer programs that make the doctor look at a computer monitor, but not the patient. Thus, a computer program should not be long and contain a sophisticated algorithmic procedure.

The software work station of the family doctor should be established in such a way that they can collect, store, process and display virtually any medical information from specialized equipment, having access to computers such as IBM (image, X-rays, ultrasound-images, ECG diagnosis, etc.).

The basis of the information exchange between the databases is a client-server technology, working as a server PHC center as well as a client-server family clinic.

Information Technologies in Modern Medicine

The modern society is very dynamic, and medical technologies are not an exception. Today, the physician should properly diagnose, prescribe treatment correctly, choose the most convenient for the patient treatment option, not expensive, consuming not much time and effort. It should be understood that there are people surrounding doctor who don't want to pay and may force the physician to pay himself for the mistakes. The solution to these and many other tasks are in the field of information technology, which have become part of modern medicine.

No one can deny that information technology (IT) is changing the way that medicine is practised. The fact that you are actually reading this chapter is clear evidence of it. This textbook would probably not be in existence if it weren't for the availability of effective and affordable IT.

Most of the early applications of IT were geared towards number crunching. The core of any computer is the central processing unit (CPU) where arithmetic and logic operations are carried out. In the early days of computing, emphasis was on pure processing power for mathematical and statistical purposes, and at that time the impact on medicine was minimal.

Things changed however when the focus of attention shifted to the relationship between the human and the computer and the ways in which a human can become more productive and information-efficient with the help of IT. There followed a systematic anal-

ysis of human tasks and activities and an attempt to improve these by means of computer applications. Medicine then became fertile ground for development, and the concepts of expert systems in medicine emerged, with systems for computer-aided history-taking and diagnosis. In the long run, however, it was the more mundane IT applications such as word-processing and database management systems that penetrated the everyday practice of the working clinician, and even more the world of health services management. The first sectors of hospital activity that benefitted tangibly from IT were patient administration, laboratories and accounts — not surprising, considering the large volumes of numeric data that these sectors handle. At the same time, clinical activities involving calculations were greatly facilitated — the days of nomograms were numbered.

The next significant development was the convergence of information and communication technologies. This led to a veritable boom in networking both within and between organizations. The first major effect of this, in the early 90's, was the evolution of data sharing concepts and the emergence of integrated information systems. The hospital information systems developed and started to take rich data (sounds, images, movies) on board. The acquisition, storage and transmission of medical data, especially from medical instrumentation, became more digital, rendering the total electronic health record feasible. The second major network effect, in the mid 90's, was the explosive growth of the Internet. It became feasible to move data and information quickly and cost-effectively between any of two networked PC's on the planet. This increased the potential for the communication of medical information among health professionals and patients immeasurably. The full impact of the Internet on medical practice has still to emerge.

There is no sign of slowing down in the rate of development and proliferation of information and communication technologies. In the next ten years we can expect more sophisticated human-computer interfaces with efficient voice and handwriting recognition; the penetration of techniques such as telesurgery into mainstream clinical practice; sophisticated undergraduate and postgraduate computer-based training; and better structuring and portability of integrated electronic health records. The challenge for health professionals is to harness the new power at their disposal for the benefit of their patients.

The health information technology (HIT) is the information process application involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data, and knowledge for communication and decision making. HIT represents computers and communications attributes that can be networked to build systems for moving health information. Let's have a brief glimpse at the background of the information technology in medicine.

Worldwide use of computer technology in medicine began in the early 1950s with the rise of the computers. In 1949, Gustav Wagner established the first professional organization for health informatics in Germany (Fig. 3). Health informatics also called Health Information Systems is a discipline at the intersection of information science, computer science, and health care. It concerns the resources, devices, and methods required for optimizing the acquisition, storage, retrieval, and use of information in health and biomedicine.

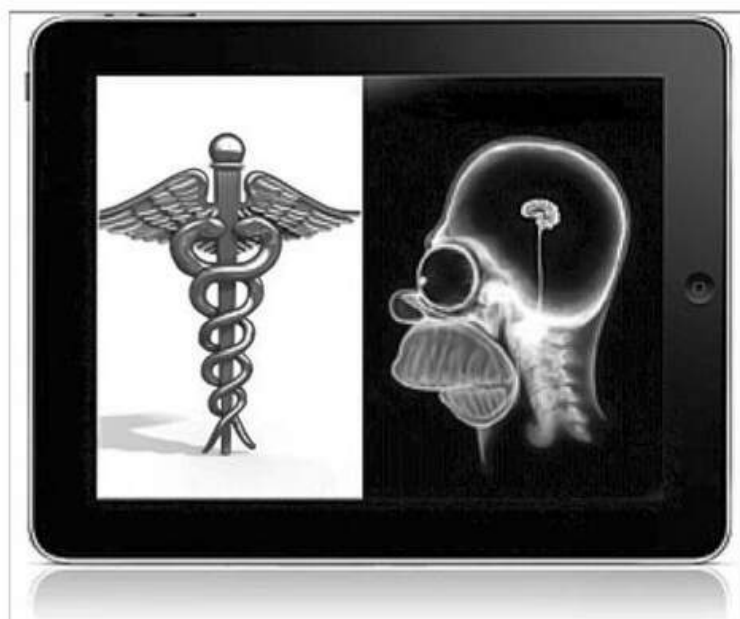


Fig. 3. Telemedicine emblem

The health informatics tools include computers, clinical guidelines, formal medical terminologies, and information and communication systems. It is applied to the areas of nursing, clinical care, dentistry, pharmacy, public health, occupational therapy, and (bio)medical research.

Specialized university departments and informatics training programs began during the 1960s in France, Germany, Belgium and The Netherlands. Medical informatics research units began to appear during the 1970s in Poland and in the U.S. Since then the development of high-quality health informatics research, education and infrastructure has been a goal of the U.S., European Union and many developing economies.

IT in Medical Education

With the development of IT, there has been a significant change in medical education all over the world. The changes are so that the majority of medical students is computer literate these days. New information on medical topics is readily accessible via the Internet and Handheld computers such as palmtops, personal digital assistants (PDA). Information technology can assist medical education in various ways such as in college networks and Internet. Computer-assisted learning (CAL), virtual reality (VR), human patient simulators are some options. With the help of college networks and Internet, the medical students as well as the teachers may stay in contact even when they are off college.

Rapid communication can be established with the help of e-mails and course details, handouts, and feedbacks can be circulated easily (Fig. 4). Many medical schools these days use online programs such as "Blackboard" or "Student Central" to underline and coordinate their courses. Such programs allow quick access to information and quick turnaround of evaluation and messaging, and allow all tutors, assessors, and students at



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