

DEBATE AND EDUCATION

Position of information science in the medical and health studies curricula

Kralova E, Kukurova E, Bergendi L, Traubner P

Institute of Medical Physics and Biophysics, Faculty of Medicine, Comenius University, Bratislava, Slovakia. eva.kralova@fmed.uniba.sk

Abstract

Innovation of both the content and forms of informatics teaching directed on exploitation of technical facilities and methods of information and communication technologies (ICT) in non-informatics universities study programmes and in life-long education is still actual today. Expanding knowledge base of the life and health sciences requires to form new skills to educate the end-users and facilitate an immediate information access.

Theoretical and practical teaching in pregradual medical and health studies includes the basic contacts of students with the modern technique and special medical devices supported or completed by computers. The teaching of information science and corresponding subjects represents small but important part of medical and health studies curricula at all medical faculties in Slovakia (Fig. 2, Ref. 8).

Key words: information science, health and nursing Informatics, medical studies, health studies, eHealth.

In the current information age, increasing amount and specialization of knowledge suppose that both physicians and nurses have access to the latest scientific information to assist in the delivery of high quality health care.

Information systems used in health care include the people, structures, processes and manuals as well as automated tools that collect, store, interpret, transform and report practice and management information (Fig. 1).

eHealth is a term used today to describe the application of information and communications technologies in the health sector. It encompasses a whole range of purposes from purely administrative through to health care delivery:

- within the hospital care setting, eHealth refers to electronic patient administration systems; laboratory and radiology information systems; electronic messaging systems; telemedicine and teleconsults, telepathology and teledermatology

- within the home care setting, examples include teleconsults and remote vital signs monitoring systems used for diabetes medicine, asthma monitoring and home dialysis systems

- within the primary care setting, eHealth can refer to the use of computer systems by general

- practitioners and pharmacists for patient management, medical records and electronic prescribing.

A fundamental building block of all these applications is the **Electronic Health Record (EHR)**, which allows the sharing of

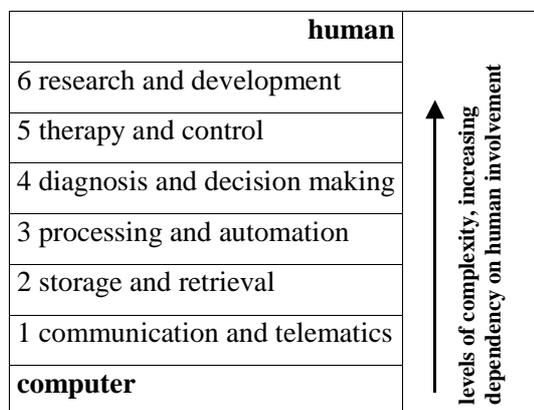


Fig. 1. Interaction Human–Computer in Medical Information Processing (8).

Institute of Medical Physics and Biophysics, Faculty of Medicine, Comenius University, Bratislava

Address for correspondence: E. Kralova, RND, Institute of Medical Physics and Biophysics, Faculty of Medicine, Comenius University, Sasinkova 2, SK-813 72 Bratislava 1, Slovakia Phone: +421.2.59357337

Acknowledgments of grant support: GP KEGA of Ministry of Education of Slovak Republic No. 3/2030/04.

necessary information between care providers across medical disciplines and institutions. An EHR is a health record of an individual that is accessible online from many separate, interoperable automated systems within an electronic network.

Other important uses of eHealth are found in the areas of continuous medical education and public health awareness and education.

Health and nursing information science is the study of how health care data is acquired, communicated, stored, and managed and how it is processed into information and knowledge. This knowledge is useful to nurses in decision-making at the operational, tactical and strategic planning levels of health care.

Computers and Information and Communication Systems are useful for medical and nursing:

- practice,
- education.
- research,
- administration.

The **nursing informatics (NI)** is the application of computer science and information science to nursing. It represents combination of computer science, information science and nursing science, designed to assist in the management and processing of nursing data, information, and knowledge to support nursing practice, education, research and administration. Nursing informatics can be applied to model the human processing of data, information and knowledge within a computer system in order to automate the processing of nursing data to information and the transformation of nursing information to nursing knowledge. All nurses need appropriate level of competence in both nursing theory and skills for their practice (Fig. 2).

Telehealth as a component part of health and nursing informatics represents the process of using information and communications technologies (ICTs) to deliver health information, services and expertise over short and long distances. Telehealth applications are important tools for enhancing health care delivery, particularly in rural and remote areas where health care resources and expertise are often scarce or non-existent (teleconsultation: telemedicine, teleimaging, telepsychiatry, education/training in health disciplines: telelearning, telementoring, health information transfer for health care providers, health care information for patients).

The programme of informatization in Slovakia was formulated in official governmental documents. Strategic aims in the fields of education, including education both medical and health professionals, were formulated, nowadays.

Realization of concept of pregradual education and other forms of health professionals education in biomedical informatics represents the integral part of informatization process in health service. Building up the **Integral Information System of Health Service**, and modern hospital and other health service information systems in Slovakia assume immediate preparation of qualified users.

Absolvents of all study programmes at Faculty of Medicine of Comenius University in Bratislava receive, besides theoretic

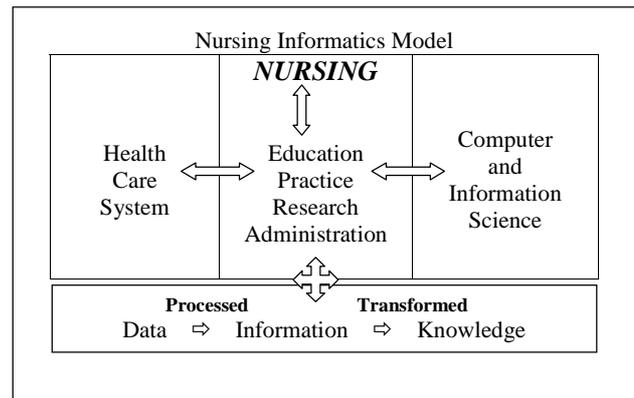


Fig. 2. Nursing Informatics Model (7).

cal knowledge from biomedical and medical sciences, also the basis of scientific work in given professional branch, methods how to obtain scientific information from internet and how to work with multimedia. Health professionals need tools for searching the information systems to improve the quality and efficiency of medical care, to acquaint themselves with new health care regulations and new medical information.

Realization of Information science teaching in doctoral, bachelor and magister studies at the Faculty of Medicine of Comenius University in Bratislava

Starting from 1986 working with computers was included into medical curricula at the Slovak medical faculties. The basic principles of work with ICT are given in the 1st year of medical and health studies in separate compulsory teaching subject. At the Faculty of Medicine in Bratislava the teaching of informatics with orientation on using ICT and internet is realizing by Institute of Medical Physics and Biophysics.

Study programmes accredited at the Faculty of Medicine of Comenius University in Bratislava have accepted the most important needs of information society.

Syllabus of information science as supporting teaching subject for all scientific disciplines is based on demands of pedagogic and scientific institutions in Slovakia, recommendations of WHO and EU for the profile of given study programmes absolvents (1, 3).

It is focused on general professional ability of students and absolvents health studies in effective using ICT for support their direct, distant and life-long education.

During the last school year 2004–2005 teaching of Information science was given in 8 bachelor, master and doctoral study branches, in presence and external forms (General Medicine, Dentistry, Nursing, Public Health-care, Obstetric Assistance, Physiatry, Balneology and Therapeutic Rehabilitation, Laboratory Diagnostic Methods in Health Service, Regeneration) (6). Moreover, the subject Information Systems in Health Service was given by institute for study branch Biomedical Engineering at Faculty of Electrical Engineering Žilina University in Žilina.

Syllabus of information science comprises the work with software products used in medicine and scientific work: background of informatics in the given study branch (International Council of Nurses – ICN, International Classification of Nursing Practice – ICNP), practical work with databases in medicine and information systems in health service, hospital information (i.e. Hospital Information System HIS Care2000 <http://www.care2x.com>) and hospital management systems (Hospital Management System HMS <http://www.medinous.com>) including laboratory information systems (LIS – <http://www.pcs.cz>, <http://www.akord-soft.cz>, <http://www.artman.sk/>), computer processing of medical documents at clinics and ambulance of practitioners including EHR, work with special software products used in medical and health service, statistical and graphical medical data processing, scientific information searching, biomedical and bibliographic databases viewing, using of electronic interactive media (medical dictionaries, atlases, electronic textbooks, computer models etc.), biomedical monitoring, telemedicine and communication possibilities of internet. Seminars as a form of practical teaching are directed to general and special topics according specific needs of given study programme. Realization of informatics teaching process is supported by set of textbooks (2, 4) originated at faculty and based on multidisciplinary team cooperation (5).

One of results of informatization process should be also more extensive exploitation of internet sources and information offer in digital libraries by students. Teaching of information science forms the background to accelerate this process. Their effective using expects: knowledge of searching systems for successful navigation in internet and fast scientific orientation in internet, ability to formulate searching strategy with the aim to find relevant information, orientation in internal and external biomedical databases, including citation index, orientation in on-line catalogues of academic libraries.

From these reasons the students have Web access to various biomedical databases as PubMed, NLM Gateway, EBSCOhost, Bibliographia Medica Českoslova, SCOPUS, Current Contents, Embase, CancerNet, Cliniweb, Cancerlit, ENTREZ, The Genomes Database, Online Mendelian Inheritance in Man – OMIM (9).

Knowledge and corresponding tools obtained by study of information science as a general working technology can be applied and improved in other related study subjects or in medical practice using diagnostic and therapeutic methods based on computers and ICT.

Internet and its interactive possibilities represent an effective support of continuing education in the future. Examples of free access virtual seminar for nurses, psychologists, social workers, psychiatrists and educators are web pages: <http://www.vh.org>, <http://www.martindalecenter.com/Nursing.html>, <http://www.ce-web.com>, <http://www.nursing-standard.co.uk/>, <http://www.nursing-portal.com/>. Important information can be found in the web pages of International Council of Nurses <http://www.icn.ch/index.html> and International Classification of Nursing Practice <http://www.icn.ch/icnp.htm> etc.

Content and forms of the teaching are not rigid, but they are modified with respect to needs of medical practice, increasing knowledge level of students and teachers and their opinions and suggestions. The development is also conditioned by possibilities to upgrade both hardware and the software.

By creating the syllabus of information science for students of medical and health studies it is necessary to communicate and cooperate with scientific medical and technical slovak and foreign establishments to improve the teaching with the aim to give the students adequate knowledge for effective application in their professional future.

Conclusions

This article summarizes the state in teaching of information science at the Faculty of Medicine of Comenius University and its content. The teaching of it is trying to satisfy the demands of European Union formulated in Standards of European Union for pregradual education at institutions of higher education.

Information science as supporting subject provides for this aim the most effective tools. Good knowledge in information science has to be reached by students namely during their university studies. Significance of information science teaching at the faculties of medicine for the quality of medical care in the future is strongly underlined, nowadays.

New general trends are directed toward forming of multidisciplinary working teams that to be able manage the medical and health care using principles of evidence-based medicine.

Pregradual preparation of absolvents of medical and health study programmes in information science allows also to obtain the ECDL/ICDL (European Computer Driving Licence / International Computer Driving Licence) certifying that the holder is competent in the use of a personal computer and common computer applications and knows the essential concepts of IT (concepts of IT, using the computer and managing files, word processing, spreadsheets, database, presentation, information and communication).

Actual information on accredited study programmes and forms of study, including the information package, at the Faculty of Medicine of Comenius University can be found on the web page: <http://www.fmed.uniba.sk>.

References

- Bergendi L.** Uplatňovanie zásad kreditového systému štúdia a reforma štandardov lekárskeho vzdelávania. 244–248. In: Slovenské školstvo v kontexte európskej integrácie. Zborník príspevkov z medzinárodnej konferencie. Nitra, UTV PF UKF a CI UKF 2003.
- Kráľová E, Pekníková M, Trnka M.** Zdravotnícke informačné zdroje na internete“. Bratislava, Wango 2004, 154 p.
- Kráľová E, Kukurová E, Bergendi L, Traubner P.** Information Science - indispensable component part of medical and health studies curricula. 52–53. In: Zaremba K, Kurjata R, Wolak T (Eds). Physics and Engineering in the Present Medicine and Health Care — the Challenges to Poland as a new European Union Member. Warszawa, PTFM 2005.

4. **Kukurová E, Weis M.** Lekárska fyzika&biomedicínska informatika pre integrovanú výučbu v schémach minútovej bázy znalostí. Bratislava, Asklepios 2004, 73 p.

5. **Kukurová E et al.** Informačná gramotnosť zdravotníckych pracovníkov — základný predpoklad spoľahlivosti NIS. In: Uldrychova E (Ed). Sborník přednášek — XI. Královehradecké ošetrovateľské dny. Hradec Králové, Nucleus HKr 2005, 116 s.

6. **Kukurová E et al.** Informatikum manažmentu klasickej a projektovej výučby predmetov so zameraním na fyziku a informatiku. Bratislava, Asklepios 2005, 160 s.

7. **Kwantlen University College:** Nursing Informatics (cit. 13.2.2006). Available from <http://www.nursing-informatics.com/>.

8. **van Bommel JH, Musen MA.** Handbook of Medical Informatics (cit. 4.5.2005). Available from http://www.mieur.nl/mihandbook/r_3_3/handbook/home.htm.

9. **Pekníková M.** Medical information portal. Bratisl Lek Listy 2004; 105 (10—11): 392—394.

Received March 25, 2006.

Accepted April 12, 2006.

BOOK REVIEWS

Dated to the end of the last years and to the beginning of the year 2006, two monographic works appeared on the book market, one in Czech Republic and the other in Slovakia. Both books marks two perspective further evolution pathways of neurosurgery.

The first book to be mentioned is **Neuroendoscopy, authors Zdeněk Novák, Jan Chrastina, edited in Prague, Maxdorf Jessenius, 2005, 137 pages.**

The introductory part presents interesting facts and details related to the origin and formation of neuroendoscopy. Neuroendoscopy at present times forms wide basis for new neurosurgical specialization evolution. Because the authors department gained an experience with several hundreds of endoscopic surgeries during years of work, this monography therefore becomes the first complex textbook dedicated to neuroendoscopy in our contry. The three subsequent chapters summarises the basic knowledge about the treatment of hydrocephalus, the proper dealing with cerebral cysts, mainly of arachnoidal origin, and summarises the experience gained in neuroendoscopy performed outside cerebrospinal fluid space, especially in brain tumor surgery, surgery for intracerebral haematoma and head injury. Every chapter is preceded with thorough pathophysiological description, followed by detailed description of the endoscopic surgery itself in 33 selected illustrative cases, presented together with surgical results and outcomes. The entire text is accompanied by 250 color photographs and illustrations, as well as CT/MRI scans used for presurgical trajectory planning in virtual reality and during postoperative follow-up. The closing chapter is dedicated to findings, that can be claimed to be the fundamentals of new discipline. Therefore their work has pioneering features for the development of new branch of neurosurgery and it can be expected to become an inspiring handbook for the people interested in and favoring neuroendoscopy.

The author and editor of the second book is **Bruno Rudinský (Ed.) Spinálna chirurgia, Slovak Academic Press, Bratislava 2006, 313 pages.**

The book summarises the results achieved in many foreign well established and equipped clinics. Neurosurgical Clinic of Trnava Univerzity unequivocally belongs to the list of these

prominent departments due to the systematic work of the main author together with his fellows. The fact, that prof. Rudinsky is nowadays well-recognized personality in neurosurgery, helps the colleagues from Czech Republic, Switzerland, Germany and United States to add their own work to the contents of the book. Although the content is centered on the surgical treatment of painful conditions in various spinal affections, especially of discogenic origin, there is a space dedicated to diagnostic problems, especially CT and MRI, and physiotherapy. The present-day therapeutic interventions together with the modern technology employed would be hard even to image for the present generation of neurosurgeons without precise image documentation. The items in documentation is numbered according to their order of appearance up to 25, but there are subnumbers reaching even 60, so that the total number of intraoperative images, CT/MRI scans or any other modern technology outputs, especially minimally invasive endoscopic approach, 3D fluoroscopic navigation, stand up dynamic MRI scanner or neuromodulation, is reaching one thousand.

The initial attempts at lumbar disc herniation or posterior osteophytes surgery currently underwent transformation to a new discipline, dealing apart from the original content with spinal stabilization techniques and materials, or with functional disc prostheses, or vertebral body replacement together with courageous surgical approaches, especially regarding thoracic or lumbar spine, or thoughtful attitude to the treatment of spinal stenosis, myelopathy and spondylolisthesis. These new steps are put together with the importance of spatial relations of the spinal vertebra and spinal column geometry for the choice of the proper treatment modality.

The book presents in logical and persuading order not only the contemporary opinions about spinal surgery, but it becomes unintentionally real textbook. Going to the fundamental principles the book witnesses the high professional level of the author together with his school, that had gained international appreciation and the leading position in Slovak neurosurgery.

P. Nádvořník