

Oral Presentations

Evolution of Ticino Hospitals Information System

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Introduction: With this presentation we will bring you a general outline of the evolution of the Medical Information System (called Patient Medical Record System, PMI) of Ticino Cantonal Hospitals Corporation. The planning for such a system began in 1995; the idea was to install the system in all departments of the hospitals network that is composed of 8 hospitals disseminated in an area of approximately 2800 km². The system has been first installed in a single neurosurgical department that is also served as a test for the whole system and gradually expanded to nearly all services in the remaining hospitals.

Our experience: After initial fears from many doctors about the confidentiality of patient data and the difficulties in learning for people with little or no experience with computers, the system was well accepted. This acceptance led to more and more requests of integration in the PMI of other subsystems, such that of laboratory results and radiology images and reports. This was of course done not without problems, trying always to maintain the ease of use that characterizes the system. In order to make still lighter and easier the tasks of residents that keep records up to date it was decided that they had to enter only repetitive data for the patients (remote anamnesis, risk factors, etc.) and data that is relevant for the present case. The requests for more and more integrations led us to completely change the initial concept of medical record system, for a new one with at least two layers, a first one for the patient data entry record that include also laboratory results, radiology reports and images and a document managing system, accompanied by a second one for many others sources of medical information, such as results and reports from external laboratories and institutes, data from ECG, Holter and other cardiac examinations, data from ultrasound scanning machines, and so on. This layer will make accessible a lot of data that will be automatically included and available in patients' clinical records. We are currently speaking with some manufacturers of medical equipment so that their software sends to this layer a set of data that we have specified in the design of it so that any patient may be clearly identified and the corresponding tests results and reports linked accordingly. We are now dealing with manufacturers that agree to our requests and with others that make many objections to them. This is because firms that develop own software for specific applications are not easily motivated to modify their applications in order to make them compatible with standards, even if in use in many hospitals.

Discussion: A large number of institutions are giving attention to electronic medical records. One of the main problems to face is the integration in a single system of the information coming from many subsystems and also the integration with non patient-specific information. The problem of learning how to use the system is also to consider, having in mind that residents change continuously and that they are responsible for basic data input, so all needs to be kept relatively simple to use and a lot of information is required to be easily and quickly available. Last but not least, the need that manifest doctors that use such systems for real time statistics and availability of anonymous data for clinical studies and quality controls.

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Comparison of Evaluation of Web Presentations of Czech Medical Institution and Foreign Radiological Educational Websites

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Introduction: Our work is a follow-up to studies published at Mednet 2003 [1] and Mednet 2004 [2] about evaluation of presentations of health related websites. Last year we presented evaluation of only Czech websites. The aim of current work was to evaluate methodology of Rankmed (automated system for evaluation of websites) on non-czech language websites. Main inclusion criterion was a radiological educational content of the website (whole or a considerable part). Secondly, resources were selected with respect to covering a whole spectrum of online CME resources (from big portals to one-man-sites). 10 resources were selected. We compare this group with previously evaluated groups of Czech websites.

Methodology: We appraised 10 English-language websites (10 radiological educational websites) and 54 Czech health related websites (17 hospitals, 8 medical faculties, 16 firms and 13 portals). For evaluation was used methodology of system for automatic evaluation of web presentation – Rankmed. Methodology of evaluation is based on 20 parameters, which are divided in 4 groups describing different formal aspects – Presentation, Navigation, Function and Credibility). Statistical significance of differences was tested.

Results: We stated similarity between new tested group (radiological CME resources) and previously tested four Czech groups. The most similarity was reached with Portals (9 parameters) and with Faculties (8 parameters); similarity with other two groups – hospitals and firms – was very low (2 both). Several differences was found in comparison with mean value of all Czech resources, the radiological educational resources obtain notable better score at parameters of Presentation and at several parameters of Navigation (number of steps needed to reach defined information, highlighting of links) and Credibility (presence of authorship and date of publication). Substandard score was reached in parameters (overlapping of a content of the page out of the screen, presence of foreign language version and number of dead links). The correspondence between radiological educational websites and Czech sites was reach at parameters availability (very good for both groups, about 99.4%) and also at atively poor faultless of html code.

Conclusions: We proved that there are significant differences and similarities among web presentation of tested group of radiological educational websites and Czech health related websites. The interesting finding is similarity among radiological educational websites and Czech health portals and educational institutions (medical faculties). Authors consider this finding is an evidence of possibility of using of system Rankmed for evaluation of foreign language websites, because evaluated foreign websites were, in fact, educational portals.

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A Web-Based Decision Support System for Modelling Telecare

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Introduction: The integration of new healthcare services based on ICT systems have shown not to be an easy task. Several barriers [1] are often highlighted as obstacles. To be successful in the operation of home based monitoring systems (telecare), it is required that feasibility studies are to be carried out in advance. Pilot projects can be implemented to capture organisational changes, direct benefits, and economic implications caused by the adoption of such systems in the medical practice. However, these complex projects may not be replicable and imply extra costs and time. The design of a Web-Based Decision Support System (DSS) Tool, that allows analysing and planning telecare projects under different scenarios before they are adopted within the Healthcare System would be cost effective. As a first step towards developing the DDS tool, this paper reports an insight on System Dynamics (SD) approach applied to a novel telecare service, part of an EU funded project (the REALITY project).

Methods: Three countries were involved in the REALITY project and data of various medical conditions were collected for further analysis and model implementation. Patients were trained with handheld monitoring devices linked to local medical centres via the internet. Supplementary description of this project has been described somewhere else [2]. Data collected from asthma patients e.g. peak flows, drugs ingested, sleep quality and several symptoms were used for feeding the “rates” and “stocks” of the SD model. Simulations and Analysis of the system were achieved using iThink software and graphical comparisons were made between data collected and simulation results.

Results: A SD Model consisted in three phases, recruitment, training, and service in operation, was obtained. Positive and negative feedback loops were identified and model validation was achieved using the global service of use in four different sites. There is uncertainty about GP’s system frequency of use, at a first glance, there was a few server activity indicated by GPs. We are still analysing data for understanding and completion of the model.

Discussion: Currently, SD is been used in waiting list analysis, social and health care policies, and disease modelling in the UK. Implementation of systems methodology in the telemedicine field has been suggested before [3], but little work has been done on the formal modelling of telecare [4,5]. Capturing the behaviour of telecare within the Healthcare sector, through a Decision Support System, may be a suitable option to understand, analyse, and predict organisational healthcare changes. It is highly desirable, a simulation tool that allows the evaluation of decisions and policies in a safe, fast, and low cost environment. We propose a SD model that will be able to trace for factors of success, failure, and systemic effects.

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Medical Informatics in Undergraduate Medical Study

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Introduction: The main goals of medical education are to equip students and graduate clinicians with the required knowledge and to provide them with the strategies and skills for applying it in the real practice. Variety of strategies are applied for teaching in medical schools ranging from traditional one way lectures to interactive online methods. The way medicine is taught and learnt has changed dramatically in the past two decades. Education technologies and the revolution in information technology have a great impact on medical education and research.

The field of medical informatics (MI) is an essential component in the current and future medical practice and education. It is considered as an important medical learning and practicing tool. MI is defined as the scientific field that deals with storage, retrieval, sharing and optimal use of information, data, and knowledge in healthcare [1], or the science underlying the acquisition, maintenance, retrieval, and application of biomedical knowledge and information to improve patient care, education, research, and administration [2]. This study was designed to assess basic MI skills of undergraduate medical students at College of Medicine, King Saud University, Riyadh, Saudi Arabia, as part of a plan to introduce new MI course(s) for undergraduate medical students. Currently no MI or computers skills courses are provided apart from two computer skills lectures embedded in one special topic research course.

Methods: A total of 101 third year undergraduate medical students, 70 male, 31 female, age; 21.7 ± 0.9 year mean \pm SD, responded to a questionnaire exploring their knowledge and interest in MI, including typing and word editing, file management, literature and medical searching, effective use of email and internet, FTP, web designing, Power Point, data entry and spread sheets.

Results: More than 97% of students have computers at home, 90% of them are using it for internet and email. However 35–60% of students were familiar with word processing and only 26–49% is familiar with file management. Only 49–54% of students are familiar with effective internet and email use, while 90% of them are using the Internet for medical information search. More than 87% of the students believe that MI is important in their medical education, and 77% want to have MI training during their medical studies. No significant differences were observed between male and female students.

Discussion: The results demonstrated the lack of professional MI knowledge and skills for medical students, with a high level of access to its technology and strong interest in learning and acquiring MI skills. There is a big need for MI to be integrated in the undergraduate medical curriculum so that

students at time of graduation should be able to utilize biomedical information in the changing healthcare environment. Computer-based education and, MI have the potential in helping students to develop problem solving skills and improve and provide new methods of learning [3]. The UMI-21 medical schools in USA reported increases in levels of educational experiences over two years after introducing MI as a component of medical student education [4]. They suggested that MI has an important curriculum topic in most medical schools [4]. In conclusion, MI is becoming an important tool in medical education and the MI skills are needed in both medicine learning and practice.

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SPreading EXcellence in Health Care: Application of the Internet in collaborative scenarios

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The SPEX project explores the significance and business potential of a model of healthcare service based on the creation of networks of excellence. The healthcare market seems particularly suitable for the proposed approach with centres of prestige building up meaningful collaborative liaisons with peripheral points of care. The realisation of such a cooperative scenario heavily relies on the use of the Internet. The experience of the pilot site in Barcelona is presented. It focuses on the shared management of patients that are candidates for heart transplant programme or other types of cardiac surgery. The objective is to shift some elements of the procedure (notably those not dependent on medical equipment) from the centre of excellence (Hospital Clínic Barcelona) to the peripheral structures (Hospital General de Vic). In doing so, the following benefits are expected: 1) better use of clinical competences available at the centre of excellence; 2) increased resolution level at peripheral centre; 3) more equitable treatment opportunities; and, 4) optimisation of time and costs. The technical solution adopted has been designed as a common web portal that provides a virtual space for the interaction between the participating healthcare centres. It incorporates data presentation, protocol management and security policies.

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Risks and Benefits of Internet Use Among People Living with HIV/AIDS in Peru

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Introduction: The use of the Internet to meet sexual partners has been associated with human immunodeficiency virus (HIV) transmission and a syphilis epidemic in men who have sex with men (MSM). People who seek sex through the Internet also tend to use this resource to search for information about sexually transmitted infections (STI). Almost all the studies related to the Internet and HIV/STI come from developed countries, where factors such as the place and cost of access are different than in developing countries.

Objective: To evaluate the use of the Internet for seeking sex partners and information on STIs among persons living with HIV.

Methods: We conducted a cross-sectional study among clients of the Vía Libre Clinic, an HIV treatment center in Lima, Peru, between May and June of 2004.

Results: 100 HIV-positive persons (64 men and 36 women) were interviewed after written informed consent was obtained; 59% reported using the Internet in the last 12 months. Of these, the majority (73%) accessed the Internet at a 'cabina pública', 16 (27.1%) reported having gone online to search for sexual partners and 5 (8.5%) reported having sex with a partner they found over the Internet. Internet sex-seeking was significantly more common among men who have sex with men (MSM; 15/16, or 94%) than among men who have sex with women (MSW; 1/16, or 6%; $P = 0.032$). All 5 participants (100%) who reported having sex with a partner found online were MSM. No women reported having sought sex partners via the Internet. 76% (45/59) of the HIV-positive persons who had accessed the Internet in the past year used it to find information on HIV and 39% (23/59) to seek for information on other STIs. Among those who used the Internet to meet sex partners, 87.5% (14/16) also sought information related to HIV, compared to 72.1% (31/43) of persons not seeking partners ($P = 0.31$).

Discussion: Among HIV-positive persons who attend our clinic, more than half reported access to the Internet. The majority use the Internet to look for information about HIV/AIDS, and more than a quarter, almost exclusively MSM, use it to search for sex partners. These findings suggest that the Internet is a convenient tool to engage high-risk men with online HIV/STI prevention.

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Tailoring and Managing Contents in the Digital Publication VITAE

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Introduction: Advancements in IT and the growing trend for virtual information have influenced the need for enabling technologies. Enterprise networking and computing are the central technology for practice and delivery in health sciences, which are one of the knowledge areas to gain most from these developments. The Web has come to serve as an everyday platform for learning where academics, researchers, students and professionals need access to the most current information. Portals are currently a gateway to information and services on the Web and it would be difficult to work in any IT related field without them.

The Centre for Biomedical Image Analysis (CAIBCO) at the Institute for Tropical Diseases, Universidad Central de Venezuela, has as one of its goals the dissemination of biomedical research knowledge generated by the academia in the Ibero-American region. Although there are well-known prestigious first-world institutions working in this field, the pathologies behave differently in different countries. Malaria in Africa and the Americas has diverse transmission modalities, having also different prevention strategies, *Sparganum Proliferum* a rare parasite recently identified in Venezuela has been detected in only eight clinical cases world-wide in the past, scorpions of the Genus *Tytilus*, the main local cause of envenoming, may be completely unknown to medical students in developed regions. Moreover, Venezuela as one of the leading countries in the study of tropical diseases has academic knowledge that could contribute to the general body of knowledge.

Methods: A knowledge meta-portal, a portal that is a gateway to other portals, was developed (<http://caibco.ucv.ve>) providing access to thematic pages on diseases such as Malaria, Chagas, and Scorpions [1]. However, it is more than a site providing content; it offers also an integrated set of tools for interactive creation, management and publication of biomedical knowledge. The following tools are currently available: a virtual conference generator, a digital book publisher, and the Vitae tool. VITAE is a digital publication, regularly published as a showcase of the work of individual researchers, focused at increasing the accessibility and influence of biomedical research to health care professionals, students and decision makers in organizations. Until recently, the information (e.g.: clinical cases, research papers, epidemiological alerts) was manually set up, stored in flat files (.html,.doc,.gif,.jpg,.tif,.psd,.ps,.pdf,.ppt,.xls), and published. The effort involved in preparing each issue, inflexibility of the process, redundancy and lack of data integrity, were some of the difficulties encountered.

Results: Since 1999, twenty-three issues of VITAE have been published, containing clinical cases and on-going research reviewed by forty editors in different specialization areas. The Vitae Tool is a strategic web application to improve the generation and publication of VITAE issues making it easier to set up web pages that house publications and that also have links to other outlets. It was developed using a 3-tier architecture [4] on a Solaris/Oracle9i platform with Java technology [3] and agile development methods [2].

Discussion: Some of the results obtained since VITAE is being published are: on the average 4000 monthly visits, support by local pharmaceutical industries, and as its content is certified by qualified researchers VITAE is a point of academic reference. Although the potential benefits of this type of initiatives are rather obvious, difficulties remain in how best to assess the effect of an IT project

on technological change. The meta-portal and its tools allow a firmer commitment of the involved institutions to promote science and technology in the region. Through the diffusion of the various research activities carried out locally and regionally, it may also facilitate the establishment of long-term collaborative research projects and reinforce institutional research and teaching links, as well as promote the generation and dissemination of new knowledge and relevant information, such as statistical data. A further and central question to consider thoroughly is the organizational commitment for the continuous gathering and updating of information and definition of strategies to guarantee effectively that this is done properly. The commitment should endure the different possible organizational changes at different levels.

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Evaluation of Persian Web Pages Related to Health and Medicine: A comparative study

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Introduction: Access to the internet commenced in Iran from 1995 and went public from 1998, and in recent years 7% of the Iranian population use internet regularly or temporary. However, 45% of population live in rural areas and don't have access to internet at all. Obviously, the rank is far away from estimation goal of 4th national developmental program which is 30% internet users for whole population. Persian weblogs own the 4th rank in the globe while the population of internet users are only 0.001 compared to universal rate of internet users. There are about 100,000 medical doctors in Iran and about 1,000,000 paramedical health personnel.

Methods: First step was collecting information about number of registered Persian domains. These were obtained from official resources of Iran Telecommunication Company. We also calculate total number of ISPs and their clients rate, all over the country. The same data in Arabic and Turkish were also analyzed then WHIOS and google.com search tools were used to find how many websites are published in Persian language. Finally, twenty Persian keywords related to health, hygiene and disease were used by advanced google.com search. Rate of these pages were calculated and compared to overall rate of Persian WebPages. Keywords were selected in a way, not to be confused with other languages with the same alphabet.

Results: Totally, about 6,000,000 Web Pages were found and about 250 registered domains were in Persian while the global rate of these data was 10,080,000 and more than 1000, respectively, referred to official data. Rate of health related WebPages was about 1,480 while the same subject in English was 2,120,000. We found about total 5,000 Arabic pages, of which 832 pages were about health and

medicine. While there are 6,000 internet users in Iran and there are 648 Internet Service Providers and total population is 64,000 while the same rates for Turkey and Arabic countries revealed 5,800 users, 67,000 total population, and 354 ISPs and 10,500 users, 300,000 total population and 145 ISPs, respectively.

Discussion: Although Iran is a agricultural country and about half of its population live in rural areas and still rank of internet users is lower than global standards, rate of published webpage are not that low and is the same with rank of Arabic Web Pages while Arab language population is five time bigger than Persian language population. Persian Web Pages are just half of Turkish ones while the population is twice that of Persia. Persian health related Web Pages are one fifth of total ones; this proportion is the same as English Web Pages. This reveals attraction and paying attention to e-health in Persian speaking population and especially health professionals but it seems that more education and management is necessary to improve rank of users and published Web Pages. The important point is that most of these pages are published by individuals, not official organizations who provide public health services. So we offer more knowledge and support by the governors to accelerate growth of this technology and enhance accessibility for our society members to live more healthy and confidentially.

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Medicoport Domain Specific Information System

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As a conclusion of furious improvements on medical area, the number of documents that are published on the web increases. Summarizing the content of the documents and queries through a set of index terms can lead to poor retrieval performance due to two effects. First, many unrelated documents might be included in the answer set. Second, relevant documents which are not indexed by any of the query keywords are not retrieved. Traditional IR systems use these strategies. To solve mentioned problems we design a domain(medical) specific meta-search engine. It is named as Medicoport. Medicoport and solves the problems that are mentioned before with three main approaches:

1. Using ontology based topical crawler as a retriever.
2. Using UMLS Specialist Lexicon as a primary index.
3. Using UMLSKS for generating related concept terms of user query terms.

The first two approaches represent solutions to the first problem, which is the answer set has many unrelated documents. The second problem of information retrieval systems is relevant documents which are not indexed by the any of query keywords are not retrieved and generating related concept by UMLSKS is the solution of this problem. The systems like Medicoport are required in medical area as a type of knowledge retrieval system.

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The Ephemeris Project: An Internet-based system of journaling, mentoring and advocacy intended to preserve those personal values and ethics fundamental to the Healthcare Professional Student [<http://ephemerisproject.com>]

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Introduction: In an age of advanced medical technologies, The Ephemeris Project promotes and provides a venue of introspection and self-expression among healthcare professional students helping them participate in effective and compassionate care of their patients. Today's healthcare students must learn to balance the science of biomedical research and advanced medical technologies with the ethical implications and effects of such science on the patient and in particular on the physician-patient relationship. The implementation of tomorrow's technologies will require healthcare professionals to have an ethic-centered view of these technologies, cognizant of their science yet imbued with an appreciation of the enormous humanistic value inherent at their core. There must be assurance that the benefits of these technologies are fully realized and their expanding sphere of influence does not disenfranchise the patient nor depersonalize the physician-patient relationship. The inclusion of reflective writing about patient encounters can be 'therapeutic, cathartic and beneficial' to the education of students and help them appreciate that their life's work is truly one of 'privileged human relationships'.

Methods: The Ephemeris Project provides a substantive Web-based portal, database and 24/7 email support/advocacy for Healthcare Professionals. Its platform is a personal/private journal which is entered on the website hosted at <http://ephemerisproject.com>. Each journal entry is simultaneously emailed to the user and collated in the user email account, sorted by journal entry and date. There is also a public message board program so that Health Professionals can publicly journal and share their stories, feelings and experiences. All public journal entries are monitored, moderated and mentored by a healthcare professional. Mentorship is essential, for this program cannot be effective without someone with whom the user can contact, confide in and seek advice. This Mentoring is provided by the experienced medical board of *The Ephemeris Project*. Links to publicly accessible commentaries and writings from leaders in the field of the History of Medicine, Biomedical Ethics, End-of-Life care, Philosophy and Literature will complement the program.

Results: In the first ten months of the Beta version of the program, 48 health professionals registered as users. Comments from these registered users have been favourable and personal communications with medical, nursing, social work and pastoral students have been positive and encouraging.

Discussion: The Ephemeris Project, using information technology which is familiar and available to all students, can make a sentinel contribution to the education of the healthcare professionals of tomorrow. The comfort of personal reflection, poetry and self-expression, that is reflective writing, can help students come to terms with the angst of illnesses and despairs of death. By writing thoughts which elucidate their feelings more clearly than the spoken word, they can become better healthcare professionals. The use of information technologies such as The Ephemeris Project to share these personal, age-old feelings with peers world-wide serves to strengthen the healthcare professional-patient relationship and foster compassion, empathy and ethic.

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e-Health & Learning: Health informatics training courses for practitioners in Bangladesh (e-HL-HIC)

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Introduction: The “E-Health & Learning: Health Informatics training Courses for practitioners” (www.ehl-bd.org) is a 12-month project started on April 2005 with the aim to support the health informatics training needs of Bangladeshi medical practitioners. It is co-funded by the European Commission within the Asia IT&C programme 2004. The purpose of this project is to actively fill the lack of computer and informatics skills observed among health practitioners in Bangladesh, a problem also known as “computer illiteracy”. With the use of e-learning techniques and ICT tools, the project will support the informatics skills of healthcare professionals, thus assisting them in their daily practice of healthcare provision and improving their working routine.

Methods: The organization of in-class computer courses, the use of a Medical Portal and a series of virtual lessons are seen as an eminent step forward to improve international co-operation and understanding. Furthermore, it is a basis for the worldwide implementation of secure healthcare networks, electronic health records and provision of high-quality websites for health-related information of consumers and patients.

The courses will be divided into two areas; the first covers Computer Training Courses (CTCs) and it enables people to demonstrate their competence in basic computer skills. This course is specifically designed for those who wish to gain a benchmark qualification in computing by helping them to develop their IT skills and enhance their career prospects. No prior knowledge of IT or computer skills is needed to study CTCs. The CTCs syllabus is designed to cover the key concepts of computing, its practical applications and their use in the workplace and society (the topics covered are: Basic concepts of IT, Using the computer and managing files, Word processing, Spreadsheets, Database, Presentation, Information and Communication, Open-Source Software in Health-Care). It is broken down into eight modules, where each must be passed before gaining access to the courses in the second area.

The second area covers Health Informatics Courses (HICs); these courses are designed to familiarize individuals with the application of information science and computer technologies in healthcare, biomedical research, and continuous professional education. The topics covered are: Introduction to Healthcare Informatics, The design of Healthcare Information Systems, Decision-Analytic Methods for Evidence-Based Medicine, Computer Aided Learning in Health Care, Telemedicine: lessons in Healthcare and

Networking, Health Data Management & Statistical Computing, Confidentiality & Security in e-Health, Mobile Healthcare Communication and Computing Devices.

Through a combination of lectures and hands-on computer exercises, participants will be introduced to the conceptual and technical components of health informatics. All courses are Web-based. The teaching techniques used include: lectures delivered using video-streaming technologies, downloadable supporting material, reading assignments, self-assessment quizzes and on-line interactive discussions. Health Informatics Experts located in Europe will hold a series of virtual seminars delivered in Bangladesh using video-streaming technologies; in this way participants can follow the courses from their institution or from their location if they have a computer and an Internet connection. This is not meant to be a completely self-study program; interaction between participants and instructors is part of the learning experience.

Results: After sending a letter of invitation and a questionnaire, the consortium received an unexpectedly large response from doctors, especially young doctors and students of post graduation course. A total of 342 doctors registered to attend training courses. We analysed and aggregated the data retrieved from questionnaires; the results presented an interesting overview on the level of IT skills among Bangladeshi doctors. The project is not finished yet, the courses are scheduled from September 2005 to March 2006. When all courses are finished a final full review will be done to measure the level of progress in ICT skills and competences, the satisfaction using e-learning techniques and other indicators.

Discussion: We grouped the practitioners into four groups: admitted to CTC+HIC courses (103 applicants), admitted to HIC courses (57 applicants), and two waiting lists (182 applicants). The expected results of the project are to provide participating healthcare practitioners with a theoretical and practical understanding of the role of informatics in healthcare settings as well as provide a sound basis for implementing, developing, maintaining, and managing information resources and computer systems in healthcare.

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Access to e-resources in the Medical Libraries in the Czech Republic

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The primary purpose of the specialized medical libraries in the Czech Republic is to provide scientific information to support health care, education and research by library information systems. The internet

and WWW have changed completely the way libraries deliver information services and have created perceived alternatives to libraries. Hybrid libraries derive much of their value from selection, organization, analysis and linking performed by highly skilled human beings aided by increasingly advanced software systems. Journals are still an important vehicle for disseminating peer reviewed research results. Many questions remain unanswered concerning the electronic publications: mainly the issues dealing with pricing, licensing and archiving. In this context it is a real challenge to make strategic choices on how e-collections and e-services should expand in a library. However in a medical library the expectations of the physicians put a strong pressure on the librarians and drive them to improve and to extend the accesses to electronic resources. The authors of the article present the extent and possibilities of access to e-resources by consortial licences in medical libraries in 2004–2008 and with regard to new technologies and tools.

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An Internet Application to Manage an OWL Ontology for Medical Computational Problem Solving

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Introduction: There is a plethora of medical algorithms in the web, which refer to Medical Computational Problems (MCPs) and provide all computational facilities required to solve a Medical Problem. MCPs are medical problems, the solution of which deals with mathematical or statistical models, signal or image processing, and estimation of parameters. The main problem in exposing MCPs is that the existing information about them is scattered and poorly organized. This paper presents an OWL Ontology Model that manages MCPs by means of organizing and visualizing their existing knowledge. Furthermore, an internet application that deals with the Ontology Model and provides an infrastructure to describe and associate MCPs, algorithmic solutions, and algorithmic implementations is built. Finally, an innovative algorithm that constructs the problems vectors from the ontology individuals is illustrated.

Methods: In order to create a Medical Computational Problems – Knowledge Base (MCPs-KB) a prototype MCP ontology model was designed and implemented by use of the Ontology Web Language (OWL). The tool Protégé with its OWL plug-in was used to build the MCP ontology. The user space and three computational spaces – medical problem, solutions, and implementation – are proposed in order to provide a detailed accurate description of the MCP Ontology. The problem space consists of medical computational problems; the solution space is composed of algorithm solutions, whereas implementation model objects assist in carrying out the solutions. The user model objects consist of the users and their different capabilities. A high level MCPs-KB can be modelled as a collection of these objects, their intra-relations within each space and their inter-relations across the spaces. The Unified Medical Language System (UMLS) Metathesaurus was utilised in order to achieve concept consensus by providing a tandardized medical terminology. To describe MCPs references in a structured manner, the BibTex OWL- Ontology was adjusted into MCP Ontology. An Internet Client-Server application was built by utilizing Remote Method Invocation (RMI). The Client is the one that connects with the RMI Server through RMI. Two common examples of the Client's requests from the RMI Server are: to represent a MCP description in OWL and to search for a particular MCP or algorithm. The GUI client is a dynamic user friendly interface; different user categories are equipped with different interfaces depending on the actions. The RMI Server receives the request, manages the MCPs-KB and returns the results to the client. Specifically, the RMI Server creates and searches instances of the MCP ontology

in regard to the client request through Jena-API. Moreover, the RMI Server assesses the services of the UMLS-Knowledge Server and receives the UMLS descriptions of MCPs Keywords and MCPs Categories through UMLS-API. A novel algorithm that constructs the MCPs vectors from the ontology individuals is built. These vectors are defined by a matrix based on problems, Concept Unique Identifier (CUI) Keywords and CUI Categories. The CUIs are automatically received by the UMLS-KS and stored into ontologies. These vectors are used to estimate the similarity of the problems, by calculating the cosine of their angle, in order to achieve an efficient search in a MCPs-KB.

Results: In order to evaluate the MCP Ontology by the use of the Internet application, twenty-three cardiology algorithms and their MCPs were described. These MCPs refer to measures of cardiovascular reflexes, risk assessment in myocardial infarction diagnosis of ventricular hypertrophy and tachycardia. Most of those MCPs were originated by the Institute of Medical Algorithms. These formulated descriptions provide a prototype MCPs-KB. The algorithm that estimates the similarity among MCPs is used in the search process in order to help the knowledge problems authors to identify if a problem exists in the KB.

Conclusions: The research in question deals with the construction of OWL ontologies able to describe MCPs. The aim of this work is to provide an internet application, which will assist expert users in creating a MCPs-KB by utilizing the MCP Ontology and searching efficiently MCPs and their solutions by introducing and exploiting cosine based similarity. This approach inherits the benefits of UMLS, which standardizes the medical terminology. The final aim of this project is to build a Medical Computational Problem Solving Knowledge Portal. This portal could be used in clinical research or more broadly in medical research, by providing existing solutions of MCPs.

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The Danish National e-Health Portal – increasing quality of treatment and patient life

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Introduction: The population is ageing, the drug cost is rising and the chronically ill is getting younger. The purpose of this presentation is to show the impact an eHealth initiative has on the optimization of the healthcare sector. A health net ensuring information flows between the Physicians and an Internet Portal providing access for the citizen, are two important tools that can be used in this optimization.

Methods: The presentation will describe the Danish National e-Health Portal and Health Net. The Health Net has connected the different Danish IT-Health-systems since 1994 by providing an infrastructure for exchanging messages from one system to another. In 2003 the Danish National e-Health Portal was launched providing a platform for extending this communication to now also include Citizens. At the same time the portal provides on-line access for the Physicians to information and patient data across the entire country. The Portal provides access to information such as Lab Results, EPR, Medicine profiles, waiting lists, etc. and facilitates the communication by providing booking and e-Consultation.

Results: The Physicians now have a better foundation for decision-making. By given access to his own health information and supporting a pathway approach the patient now is encouraged to participate active in own treatment.

Discussion: What is needed to get started? A successful implementation first of all needs a powerful Management with participation of the most important Stakeholders. The project has to make fast results focusing of the Stakeholders benefits. Communication standards are needed – but the recommendation

is to take a pragmatic approach and use existing already implemented standards, and get started to benefit from the e-Health as soon as possible.

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The Project of a Webpage for Consultation of Histology of Difficult Skin Diseases

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The project of a webpage for consultation of difficult skin diseases will be described. Medical professionals, participating in the project, in need of an opinion of experts, will send their histological slides to the coordination centre of the project in Zurich. Their slides will be scanned and high resolution images covering the whole tissue sections will be obtained using the automatic CoolScope slide scanner (Aperio) and put on the server. These images will be made available to the group of experts from participating centres (Zurich, Lausanne and other). The experts will access the images over the Internet using the virtual microscope interface with possibility to zoom the images dynamically and move smoothly around the slide. Authorization will be required to work with the images. The dermatopathologist who contributed the slide will be answered by the coordination centre. Technological aspects of this approach will be discussed. We will demonstrate that present capacity of the network as well as the power of common PC computers is enough for a histopathologist to make a correct diagnosis. This projects is aimed not only at the users who want to consult their cases. Selected cases will be made available for teaching and serve as a reference as well.

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Building a Bridge between Psychotherapy and New Internet-based Technologies: The VEPSY updated project approach

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In the last years the rapid development of the Internet and new communication technologies has had a great impact on psychology and psychotherapy. Psychotherapists seem to rely with more and more interest on the new technological tools such as videophone, audio and video chat, e-mail, SMS and the new Instant Messaging Tools (IMs). All these technologies outline a stimulating as well as complex scenario: in order to effectively exploit their potential, it is important to study which is the possible role played by the Internet-based tools inside a psychotherapeutic iter. The major aim of this presentation is to provide a framework for the integration of old and new tools in mental health care. Different theoretical positions about the possible role played by e-therapy are reported showing the possible changes that psychotherapy will necessarily face in a cyber setting. The VEPSY website, an integration of different Internet-based tools developed within the VEPSY UPDATED Project, is described as an example of clinical application matching between old (and functional) practices with new (and promising) media for the treatment of different mental disorders. A rationale about the possible scenarios for the use of the VEPSY website in the clinical process is provided.

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PubMed Access from Mobile Devices: Existing solutions and a new prototype

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Introduction: Clinician information needs often become apparent while on the move: at patient home, on ambulance, in the ward. An attempt to satisfy these needs can be made by accessing digital archives of papers and guidelines, the most important being PubMed. However, access should be made through a computer, which is difficult to bring where needed. Palmtops are an obvious solution to the hardware problem, which should be complemented by suitable software, able to deal with screen and input limitations [1]. Aim of the present paper is to describe two available solutions for accessing PubMed from a mobile device, and a new prototype.

Methods: By means of six usage scenarios, we analysed the features of three available interfaces to PubMed, two of which for palmtops (standard PubMed website, PubMedOnTap, PubMed4HandHelds), to summarize implemented features and issues. In particular, PubMedonTab [2] is an application developed for PalmOS and PocketPC devices, while PubMed4HandHelds [3] is a web portal specifically developed for handheld devices. The final aim was to develop a new system drawing upon the best features of previous systems. We also analysed the possible implementation techniques for such a system, i.e., as proprietary application, as J2ME midlet, as web application. We then qualitatively and quantitatively compared our system with PubMedOnTap and PubMed4HandHelds, by evaluating the provided features and the number of steps needed for carrying out a number of typical operations.

Results: Starting from this study, we developed a new prototype interface as a web application, using PHP and MySQL on a Linux server. The web application connects to the PubMed site through the recently provided web service interface, i.e., by means of the SOAP protocol [4]. The implementation choice was made for three reasons: larger audience, due to the availability of web browsers on palmtop and smartphone devices, the possibility of joining the system to a desktop search interface, and finally the possibility of implementing a long-term repository on the server side, able to overcome memory limitations on the device. In fact, we also developed an integrated interface for desktop computers, which may be used to review and refine palmtop searches. When compared basing on 12 typical of operations on the interface widgets, our system performs slightly (but not significantly) better than the one with comparable features (PubMedOnTap), while the other does not provide the same range of capabilities.

Discussion: McAlearney et al. [5] recognised that doctors who use handheld computers in clinical practice are generally satisfied with them because they perceive that the devices helped them increase productivity and improve patient care. Among the reported barriers, there is the impression that the devices are not easy to use. In an attempt to overcome this problem, we started from the experience on already available systems; furthermore, by noting that the doctor's work is often made at the desktop, we tried to create a link between the two working environments, i.e., mobile and desktop-based. Although only preliminarily tested, the developed prototype seems to be suitable for the task. In practice, we implemented most of the features found on both systems (including clustering), by following the web application approach of PubMed4HandHelds, which in our opinion is more powerful and open. Further work should be done to more thoroughly evaluate the human interface aspects, as well as to produce a better desktop integration interface, which is currently at an earlier stage in respect to the palmtop one. The prototype, called "MedHome", is available on the web at the address <http://mitel.dimi.uniud.it/medhome/>.

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Internet accessible ECG prolongs the “Golden Hour” for ED physician in Diagnosis of AMI

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Patients are in the emergency departments (ED) all over the world because of the diagnosis of acute myocardial infarction (AMI). The ElectroCardioGraphy (ECG) interpretation from the cardiologist is necessary for an ED physician to make a correct clinical decision promptly. In order to standardize this vital judgment for suspected AMI cases, especially during hours of limited staffing, such as the night and weekend, we propose an Internet ECG access for the on-call cardiologist who receives a consultation request from the ED physician. Such access allows the cardiologist to easily make a better diagnosis via the web, instead of using a faxed ECG report that may have various artefacts. Following this, the physicians involved may discuss the optimum treatment plan, over the telephone, by using additional information and data on the specific patient, such as levels of myoglobin, CK-MB, tropolin etc. With this approach, diagnosis can be achieved within three hours, the “golden hours” between the first sign of AMI and the administration of the first therapeutic drugs or a catheterisation intervention. To achieve the best outcomes for AMI patients, we are developing a web-based ECG reporting system that is accessible to an associated 24 hour AMI task force. As a result, the patient safety can be greatly improved by this AMI protocol in the Emergency Department.

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The Evaluation of Internet as a Tool for Evidence Based Medical Research

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Introduction: The term “evidence-based medicine” is relatively new. EBM was defined as “a systemic approach to analyse published research as the basis of clinical decision making.” The fast growth of the health literature has caused confusion to doctors who want to implement evidence-based medicine (EBM). New and better resources that summarize and synthesize the literature are available to facilitate the integration of evidence into practice. Determining the modules of internet resources and how to use them is an important step in finding evidence for the quality in clinical practice. Aim of this study is to examine the value of downloaded knowledge via internet for evidence based medical research, according to the opinion of doctors, who are involved in systematic medical research.

Methods: A questionnaire was distributed and answers were taken from 58 postgraduate students, in Thessaloniki and Alexandroupolis, in Greece. The doctors asked were 27 women and 31 men with median age 32 years old. Internet was used as a research tool by all of them for at least 5 years. Targeting to examine the whole spectrum of articles downloaded, we reported that 42 of the postgraduate students were speaking English and the rest of them were speaking French or German too. In the questionnaire used there was the definition of EBM in order to help the students answer more effectively. The students were asked their opinion about the quality of medical articles that are available via internet and the possible role of Internet in defining updated medical guidelines.

Results: Almost all students have used internet medical advice as a tool for research purposes circumstantially, while systematic downloading is referred from only 42 persons (72, 5%). About the quality of the advice taken, that is characterized as “simply useful” by 45 persons (77, 5%), “adequate as the only way of making medical bibliographic research” by 13 persons (22, 4%) and “containing too much useless staff” by 35 persons (60%). Only 3 students are subscribers of electronic journals, while 12 persons have subscribed in a print form of a medical journal since now.

Discussion: Although quality in medical electronic information is needed, Internet allowed incredible access to masses of data and information. Every internet user is aware that he must be careful with such an overabundance of “unfiltered” data. Evidence and data do not immediately translate into evidence based practice. The need for development of search strategies in evidence-based medicine has been apparent nowadays and is met in international bibliography. Only valid and relevant information can help solve the problems of clinical knowledge in practice. The main question is then how practicing clinicians can learn about the innovations and acquire the recent information that can help them to change their practice for the better. The volume of medical literature, enormous and constantly growing is difficult to manage. The increasing availability of secondary data sources for daily patient care provides practical and rapid access to all this information, enabling improvements in the quality of care. Thus, Internet is a modern and cheap instrument to obtain information for clinical practice, but there must be a critical approach to downloaded data, until scientific organisations establish adequate cyber-filters for medical Knowledge.

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Continuing Medical Education in Greece: Preferably via Internet

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Introduction: The widely accepted need for continuing medical education (CME) is a growing reality throughout Europe. Following the integration of Greece in the European Union (EU), national training programs for health professionals have become more numerous than ever. Internet has been used for educational purposes not only in undergraduate but in postgraduate level as well. Health education

became open accessed to health professionals very fast, but is also available to every internet user. Patients are nowadays much more informed about their illness, so doctors have to study much more than their colleagues used to do in the past. Aim of the present study is to record the available opportunities of continuing medical education in Greece.

Methods: We used information derived from the Greek Ministry of Health, the National Health System Legislation, the European Union subsidized national training courses for health professionals for 2005–2006, along with information from the educational meetings held by medical associations and scientific medical societies.

Results: The congresses for doctors and nurses held by the scientific societies provide aside from knowledge, a certificate of attendance, and a number of credits for continuing medical education (CME credits), however registration requires mandatory payment. During 2005–2006, 325 subsidized national seminars were performed for health professionals, but none of the above programs accepts unemployed doctors. interestingly, the above referred courses are organized by the Greek Ministry of Health , and only 5% of the money given by the Europe Union are used. It is not easy for a doctor to be accepted to a free course in Greece since the candidates are often 100 times more that the number of accepted participants. The National Health System Legislation includes education activities in the duties of doctors, and suggests a scoring system that is completed by department directors in Hospitals, offering information for each doctor's professional value and effectiveness, including scientific qualifications as well. Medical societies and medical associations organise regional, Hellenic and international scientific meetings targeting to doctors' improvement and the promotion of quality in clinical practice. The training in Internet use for accessing medical information is offered by Greek Medical Associations and help doctors of various ages to Keep in touch with Medicine and Medical Progress. CME credits acquired through internet courses are helpful, however none of them is Greek. Tele-medicine and tele-surgery are already represented in Greece by the respective medical societies

Discussion: Continuing medical education depends mainly on personal motivation for each health professional in Greece. Thus, on-line education is very important in our country. The use of Internet as a tool of education became popular, because it offered free educational articles, even whole e-books and was available to poor students and to health professionals with low income. In Greece, a country with very low payments for doctors and nurses, internet offers quite the total educational information for the majority of health professionals.

Libraries in small Greek Hospitals are inadequate help for a doctor who cares for his career and wants to be updated. Medical courses and congresses organized by Medical Societies are too expensive and frequently held in big cities. internet is building bridges between doctors and Knowledge. Participation of doctors in educational programs through internet is increasing, but the organization of internet courses by Greek Societies does almost not exist. The payment pathway is forbidden for the majority of doctors since the payments are too low. Pharmaceutical companies offer free educational journeys to doctors and nurses, but are sometimes a non-ethical choice for a doctor who cares for the general impression created for colleagues and patients.

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Determination of Dental Enamel Defects by means of an ARSD Prototype

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Introduction: The purpose of this work is to create a diagnosis device with non-invasive technology capable to detect defects on the surface of dental enamel, as well as its location and size. The prototype consists of an automatic device which uses the optical reflectometry method and consists of a laser beam with a specific wavelength as a transmitter, optical fiber like transmitter and a photodiode as receiver [1]. This mechanism makes sweepings in both X and Y axis in order to cover the whole dental piece acquiring data to *d* microns. The data acquisition system is made up of a card that allows to convert the analogical voltage data into digital voltage [2], the data obtained is sent to the computer where it is stored in a text file. The reception data and graphic software is an interphase that allows the user to handle the stored data after the acquisition, it reconstructs the image of the tooth, dividing it in its anatomical thirds and heightens the defects on the dental enamel surface [3].

Methodology: To perform this study, 50 teeth were collected. The extractions were made by a stomatologist who used elevators, leaning on the tooth mesial face to avoid damages on the dental enamel. The samples were washed in a water spurt and they were preserved in a physiological solution at 0.9% of sodium chloride and they were kept in labelled sterile plastic containers, then a sweeping with the prototype was made to each one of the samples.

Results and experiments: A first superior premolar was chosen like sample and it was placed in the ARSD prototype, a sweeping was made on the tooth surface in a zone of 11 mm. x 0.5 mm. each 20 microns of distance, whose images were reconstructed in 3D and to which a sweeping with the metallographic microscope and also a radiographic take were done. In the second stage, phosphoric acid to 37% was put to the sample during 60 seconds and next it was washed in a water spurt during 60 seconds.

Discussion: X-Ray as a diagnosis method has the disadvantage of a minimum but continuous radiation to which the stomatologists as well as the patients are exposed and neither the defects in the dental enamel such as demineralisation in initial stages can be observed. Another diagnosis method not much reliable is the visual inspection. The explorer as diagnosis aid has the disadvantage that when sliding on the enamel surface the minimum defects go unnoticed due to its point size, which does not perceive them. In comparison with some of the exposed methods, the ARSD prototype has the capacity to detect defects to *d* microns, as well as its exactly location.

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Application of the Transmittancia Method for the Detection of Internal Defects in Dental Pieces

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Introduction: The purpose of this work is to develop a prototype with non-invasive technology using the transmittancia method for the detection of internal defects in dental pieces. The system consists of an automatic device which uses of transmittancia optical method and a laser beam with a specific wavelength as transmitter optical fiber like transmitter and a photodiode as receiver [1]. The working form of the proposed mechanism is reading in the following way: the optico-electronic device is positioned by jeans of tracks X and Y, reading begins from the cervico-distal part, placed in the left lower part of the simple, making movements from the X-axis track, starting from this point movements to d microns [2], hill be made in a rising direction (cervical to incisal), later on it hill be returned to the starting point by jeans of Y axis track, which hill advance the optico-electronic device in the direction of towards mesial in d microns in order to continue readings and so to cove the whole simple surface. The acquired data (voltage) is sent through a data acquisition card to the computer which makes a data conversion into 2 dimensions image on a gray scale, which represents the internal structure of dental pieces [3].

Methodology: To perform this study, 25 teeth were collected. The dentoalveolares surgeries were done by a single stomatologist, who only used elevators for the simples extraction, without using forceps in order to avoid any damage to the tooth crown. Each simple was washed and kept in a sodium chloride to 0.9% physiological solution [4], in sterile plastic containers. The study is divided in 2 stages, in the first an X-Ray of each simple hill be taken and then making a sleeping with the prototype applying the transmittancia method [5]. In the following stage, a cavity hill be done on the tooth occlusal face in direction of the apical with a strawberry of a ball form made of carbide of 1/4 mm. and 5 mm. depth and so the first stage Hill be repeated.

Results and Experiments: A simples sleeping was made and the images obtained were compared with each X-Ray taking. In the first images all the internal defects could be observed, and due to the previous fac. it can be concluded that the developed prototype is reliable.

Discussion: X-Ray, an invasive method is used for the internal defects diagnosis in dental organs. Resides, there are other different diagnosis methods such as: the electric test, percussion, palpation, that help to establish a diagnosis, even though these tests requires that the clinical one is aware of the tests limitations and reaches. The APSED prototype, being proposed, has the capacity to detect internal defects and has the advantage of being a non-invasive diagnosis and ecologically clean [6].

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Computerized Clinical System (APDSED)

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Introduction: We aimed to design and implement a database to centralize the collected information of the patients admitted to the dental practice of the Faculty of Stomatology of the Benemérita Universidad Autónoma de Puebla (FEBUAP). The database is digitalized, allowing the implementation of a system of automatic access and management [1]. Data is structured in a way that professors and students are able to access the clinical record of patients served by this practice. Clinical records provide socio-economic information as well as dental history of the patients. Dental history data is divided in the following areas: Antecedents, Dental Pulp Exploration, Dental Examination, X-Ray Analysis, Rehabilitation, Endodontia, and a special module for Analysis and Processing on the Dental (APDSED). The general system comprises a data acquisition system and a system of image reconstruction, that along with the database compose an efficient tool. This tool is able to store and process in an organized way the acquisition files [2], x-rays images, 2D images, 3D images of reconstructions of the extracted dental samples [3]. The system itself becomes an assistant in the diagnostic, detection and prevention of problems such as early demineralisation [4].

Methodology: The creation of the database system was carried out following the requirements already present in the current general clinical history existing in the FEBUAP. We enlarged modules required for the research currently carried out by the Non-invasive Methods Laboratory for Stomatologic Diagnosis. Designing the database of the clinical history and the system APDSED was a complex process covering design decisions over the following conceptual levels: Students, Professors, Schedule of Clinics and Clinical Histories, APDSED. Subsequently, the mapping between the conceptual and logic design was carried out. Finally the bottom end design of the database was completed. For the implementation the Data Base Manager System (DBMS) MYSQL was considered. To construct the system, a series of interviews and consultations with the dentists were performed. This verbal interchange was made with the purpose of obtaining sufficient information to accomplish a correct design of the interface. The software engineering model used was the one named “of prototypes”. This model provides a good focus on the design of the final user interface and the security options for management and confidentiality are

required in the Stomatology Faculty. The union of these two methodologies produces a good system of automated clinic history.

Results and experiments: At the present time, this phase is still hold by the collection of data from the hard copy database. The information collected does not surpass 10% of the total of records in the practice of the FEBUAP. The experiments performed over this amount of data have shown that the system operates well; it is friendly, and efficient for the user.

Discussion: According to the bibliography consulted, there are not clinical histories database systems found in Dentistry Faculties around the country. Therefore, it is considered that this system can be proposed for use in other University Dental Practices.

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Searching Multilingual Medical Content in the Web

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Introduction: Medical document retrieval presents a unique combination of challenges for the design and implementation of retrieval engines. We introduce a method to meet these challenges by implementing a multilingual retrieval interface for biomedical content in the World Wide Web. To this end we developed an automated method for interlingual query construction by which a standard Web search engine is enabled to process queries in user's native language from the biomedical domain in order to retrieve documents in user desired target languages (currently, English, German, Portuguese, Spanish and Swedish are supported).

Morpho-Semantic Indexing: To cope with various morphological processes in different languages we developed a term normalization methodology, called Morpho-Semantic Indexing (henceforth, MSI). MSI uses a special type of dictionary with entries consisting of sub-words, i.e. semantically minimal units. Sub-words are grouped into equivalence classes (represented by Morpheme identifiers, MIDs) which capture intralingual as well as interlingual synonymy. A morpho-syntactic parser extracts sub-words from texts and assigns MIDs in a three step MSI procedure (cf. Fig. 1). The result is a morpho-semantically normalized expression in a language independent representation. Its usefulness for cross-language indexing and retrieval has already been proven [1].

Retrieval Interface: Using domain and language specific corpora (cf. Fig. 2) we created a target list (B) of data including surface words, word bigrams and trigrams (data) as well as their frequencies freq(data) within these corpora. All target queries are subsequently translated to a set of MIDs (C). This data is encoded in a table FreqTab (D), each record being a quadruple (data; freq(data); MSI(data); language(data)).

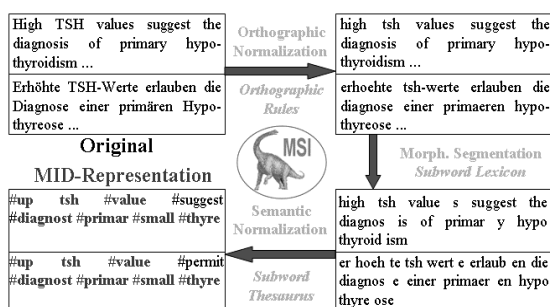


Figure 1: Morpho-Semantic Indexing

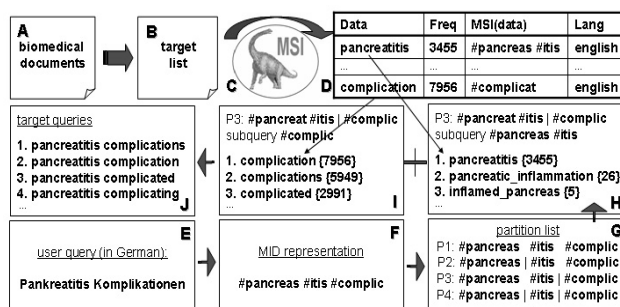


Figure 2: Interlingual Query Construction

A user can choose his favoured target language on a web interface (<http://www.morphosaurus.net> → WebTools → Morphoogle). These user queries (E) are sent to our query construction tool. Again, these queries are initially transformed to a set of corresponding MIDs (F). We now further process these MIDs to a list of possible MID combinations – called partitions – which consist of sub-queries (G). All sub-queries are compared to MSI(data) in FreqTab at which all matching records are returned (H, I). Out of these records we generate possible target queries by a set of combination rules, together with a score which can be used as a measure for its lexical relevance (J). Finally, these target queries are sent separately to a standard Web search engine and merged by a simple frequency heuristics.

Discussion and Related Work: Test runs on our retrieval interface using the OHSUMED collection [2] are still due. Future work will focus on problems in the query formulation process such as matching problems due to a lack of coherence of the underlying lexicon and language specific problems [3].

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The Italian Translation of NLM MeSH and its Web Application

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Medical Subject Headings is a leading biomedical vocabulary created and maintained by the US National Library of Medicine, used world-wide by information scientists. MeSH contains at present more than 23000 descriptors and over the last decade has been translated in an increasing number of languages. The Italian translation, prepared and yearly updated by the Istituto Superiore di Sanita' has been available free-of-charge for consultation on the website www.iss.it/sitp/mesh, since October 2004. During its first year of web availability, the Italian translation has been accessed by a variety of visitors (clinicians, librarians, information specialists), accounting over 21 000 pages visited. Due to the

relevance of MeSH, the Italian translation has been adopted for indexing and cataloguing purposes by a selection of Italian Libraries, and by patient-oriented websites, as a national standard for biomedical resources indexing. Major problems during the translation process were the lack of updated biomedical English-Italian linguistic tools, chemical nomenclature (actually the largest section of 2006 New MeSH), and impossibility of translating the scientific English terms currently worldwide adopted. Future plans include the translation of English synonyms and the development of an enhanced search interface: both innovations will multiply access points, making translation browsing and retrieval easier and more effective.

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Information and Knowledge Management in Addiction Prevention

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Introduction: The way we structure and organise our knowledge changes constantly. It always implies historical, political and cultural dimensions. With globalisation and new media developments different systems clash into, influence or exclude each other, overlap and merge. No doubt this will also affect the content – the one truth is being replaced by a variety of truths, some aspects of truth might disappear altogether. This has already proved to be a challenge in regard to all questions of quality, especially in the context of health issues and commercialisation.

One of these challenges for health related web services is to tailor the services according to the target audience. Further criteria for quality assessment are transparency, authority, actuality, accountability, accessibility, privacy and data protection and also management and evaluation. The weighting of each criterion is to be seen in relation to the objectives. Whereas this is by now almost common knowledge in the context of (non-commercial) medical web services in a narrower sense, with quality assessment systems evolving everywhere, web services in the context of health promotion, addiction prevention and behaviour change are a different matter and require a more complex approach.

Methods: The difference lies mainly in the fact that hierarchical information architectures with one-way-communication-channels and non-transparent filter systems tend to be the standard solution in the former case – with many possibilities for easily implemented quality measures –, but that these structures are not appropriate for the latter: Since the architecture should correspond to the underlying philosophy as much as possible, matrix designs, interactive networks with multiple-communication-channels seem more suitable to ideas of empowering, activating, participation and taking on responsibility for one self.

One example for an interactive network is the German portal PREVNET that started in 2004. Its target audience consists of professionals interested in addiction prevention (= user of the information services) and professionals actively involved in the prevention networks of the Federal government and the LÄNDER (= user of the interactive services). PREVNET aims at a positive impact on the structure and organisation of knowledge in the field of prevention, providing a processed and easily accessible variety of information from multiple sources in combination with interactive services for community building. The programming takes into account that the technically pre-shaped MÖGLICHKEITSRAUM (space of possibilities) has to be in pitch with the philosophy and has to further it: Information flow, decision and working processes and data structures are modelled accordingly. The technical configuration

is to guarantee a maximum of participation as well as a maximum of accountability, transparency and security for each member.

Results: In the case of Prevnet it was possible to implement a variety of quality securing measures – f. ex. automatic generating of input date and author name – into the structure itself. The extent members use the potentials of the portal - and help the users to assess the quality of the information – f. ex. by providing more than the minimum requirements – is being operationalized and used as indicator. The question is now, whether it is possible to transfer these principles into a general quality system for other web services with similar design (and to incorporate them into tools like www.prevnet-quality.de).

Discussion: In future web service architectures will have to provide more and more inbuilt quality measures to ensure the adherence of criteria like transparency, accountability etc. Instead of peer-review-systems or quality labels the systems themselves will provide information on the quality of the services provided.

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Open Source E-learning for Medical Schools in Bosnia-Herzegovina

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Introduction: The former Yugoslav republic of Bosnia and Herzegovina (BiH) with a combined Muslim, Serbian, and Croatian population, is trying to build new frameworks for effective teaching and learning in medicine. Apart from cultural and religious diversities, the country is struggling with serious financial difficulties and with “brain drainage” of young physicians to more developed countries. Five medical schools, Sarajevo, Banja Luka, Tuzla, Mostar, and Serb Sarajevo are collaborating in an EU supported Tempus project, Dictum (www.rzuser.uni-heidelberg.de/~r28/DICTUM/index.php) with the support of EU member partners from Germany, Belgium, Austria and Denmark.

The internet infrastructure in BiH is still far from the level found in western European countries [1] As an example, a bandwidth for an entire medical school could be in the order of 1–2 Mbit/sec and charge for use of internet is still proportional to traffic. On the other hand many medical students use the internet regularly from their homes and there is an increasing knowledge and understanding for the use of IT in medical education both among teachers and students [2,3]. The present project was established to try to help the medical schools in getting started with e-learning on a user-friendly and cost-free basis seen from the BiH perspective.

Methods: The open source platform Dokeos (www.dokeos.org) was installed on a Linux server in Aarhus, Denmark using PHP and MySQL. Large parts of the Dokeos platform has already been translated into Croatian language but the portal interface and student and teacher guidelines were translated into

Croatian for optimal usability. As a first step entry levels for each medical school was created, but the system allows branching structures to be build as a growing process.

Results: Presently (fall 2005) the platform is established with data security and backup, and courses are starting to be uploaded for the fall semester of 2005 (www.dictum.info). Experience from the use of Dokeos is abundant from other countries but we still have not been able to test it in BiH.

Discussion: The present study has shown that it is possible to establish a user friendly and very low-cost e-learning platform for use in a developing country. There are several benefits from establishing the platform in an industrialized country like Denmark. Available infrastructure and technology was available since a similar platform is already in use at the University of Aarhus (www.aula.au.dk). We have previously tested the system with users of low IT literacy and found the platform very user-friendly. Access to an e-learning platform will provide teachers and curriculum planners with knowledge of the concept of e-learning and will allow them to start experimenting without opposing economical burdens. In the future we anticipate that if use of the platform will grow substantially, and hopefully also the availability of IT infrastructure will grow similarly, and the e-learning facilities may be migrated the relevant servers in BiH.

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Patients Internet use in Danish General Practice

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Introduction: The Internet plays an ever increasing role in everyday life and in the future will become an important factor in the relationship between patients and physicians [1,2]. The present study was performed to investigate patients' use of the internet to search information about health related issues, the importance of internet searching before the consultation, and whether they discussed their use of the internet with their physicians.

Methods: Survey using a written questionnaire in waiting rooms of 4 Danish consultations over three days in December 2003. The study included 100 patients.

Results: 51% of patients had used the internet to search health related information within the previous 6 months. Only 7% had search specifically before the actual consultation, 90% had never discussion information found on the internet with their GP and only 4% had been recommended a health related website by their GP. 48% of patients indicated an interest in internet-based consultations. Patients search mostly for information on specific diseases, less on general health issues and 75% indicated that they found the information good or very good.

Discussion: Use of internet for searching about health and disease by Danish patients is somewhat higher than comparable figures from Norway [3] and the US [4–6] but the difference may be related to concurrent growth and penetration of the web.

It was somewhat surprising that patients and physicians did not communicate very much about internet use for health and disease. It might be because patients did not want to question the doctors' authority but may also be a matter of time available for consultations. We conclude, however that an improved internet usage would require more focus on communication between physicians and patients about eHealth. The results show that in Denmark, where 80% of households have internet access, and more than half of the population uses the net daily (www.dst.dk), the internet is frequently used for eHealth and patients are generally satisfied with what they find.

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Use of Web Resources in Personalized Disease Management: How to evaluate success?

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Information provision and educational activities are crucial to the success of disease management programmes. By utilizing online health resources clinicians can respond to individual patients' learning needs in a more personalized manner. Applications supporting personalized information provision to patients based on Internet resources are a newly emerging area of research. In order to advance the field, sound metrics and evaluation methodologies are needed. STEPPS is a prototype system that personalizes the selection of patient education material collected from online health resources on the basis of structured and coded Electronic Patient Record data. The system was recently assessed in a formative evaluation study, contrasting the performance of STEPPS to that of random resource selection and to online searches using Google. In the study, clinicians reviewed online information material and assessed its relevance for specific patients. The reviewers were blinded both as to the source, as well as to the method by which the information was retrieved. Drawing on the experiences from this study we will demonstrate the challenges of evaluating personalized patient-oriented applications and discuss alternative solutions and approaches. Our findings are of relevance for both informaticians interested in the development of personalized applications and for clinicians involved in disease management.

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Knowledge Sharing and Decision Support for Healthcare Professionals: The Doc@Hand project

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Introduction: Colorectal cancer is the second most common cause of cancer-related death in the majority of western countries, after lung cancer in males and breast cancer in women. It is accepted that primary care plays a crucial role in the early detection of lesions. However, in spite of its importance, this process does not always happen in a timely and adequate manner, thus jeopardising the proper management of the disease. By making available the necessary information to the clinicians and drawing their attention to specific points, the possibilities to reverse this state of affairs increase. The Doc@Hand project (DH) develops such a tool and explores its use in clinical scenarios. A specific application supporting colon cancer referral from Primary Care to tertiary level is reported in this paper.

Methods: The aim of Doc@Hand is to support healthcare professionals' work by bridging the gap between patient's related data and unstructured information and knowledge. This would significantly enhance the ability of doctors to exploit this integrated information for more effective and cost-effective decision-making. DH incorporates the following functionalities: 1) Transparent access to heterogeneous and geographically dispersed databases owned by separate, but cooperating organizations; 2) Proactive search for relevant information without the need for the user to perform an explicit query-based on domain ontology as well as static and dynamic information about the user profile and current activities; 3) Representation tools and intuitive interfaces to easily filter and navigate through the information; 4) Integration of existing decision support systems; 5) Extraction of knowledge from unstructured and semi-structured documents; and 6) Cooperative environment to support virtual communities in alignment with the collaborative schemes proposed by the emerging models of health care delivery.

The system is composed of a server side and a client side. The server side uses a Web services based architecture and works as a central node of a network of organisations, sharing their repositories or parts of them, according to a defined set of rules and policies they have agreed upon. The client side can be either a desktop PC or a mobile unit such as a tablet PC or a notebook. The information search is based on a proactive "push model" that relies on a semantic subsystem. The triggering mechanism for DH to operate can be of different kinds, notably through the use of existing modules of Decision Support (DSS). These modules are not a part of DH application but it should be interfaced through DH in order to get the benefits of the detection of a condition plus the access to the contextual information.

In the specific colon cancer pilot, DH has been customised to support the following process levels:

1. Effective screening at Primary Care. This is founded in the existing clinical protocols implemented either in textual documents or through DSS modules.
2. Prompt referral from Primary Care to Specialised Care.

3. Follow-up (at risk group) at Primary Care. These are the individuals with no cancer declared yet but with an increased risk of developing the condition. They are kept under the responsibility of general practitioner but an increased frequency of monitoring is required.
4. Early diagnose & treatment at the specialised care. Once the patient is referred, put them on the protocol track for reaching the diagnosis.
5. Consulting, guidance, support.

Results: The project is currently under execution. Benefits are expected in terms of professional time saving with an overall target figure of 60%. More specifically, it is foreseen that the use of the DH system will have an impact in 80% of the working situations, and assuming that one hour per day is devoted to retrieving data, this would result in 29 minutes saved/day. In a year, the saving would be in the range of 96 hours. Considering an average annual salary of 50,000 euros per doctor, this would translate in a saving of 3,000 euros/year/doctor.

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The Google Approach for EMR: The “Web-EPA” as open standard by Rhön-Klinikum AG

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Introduction: The future urgent requirements of integrated healthcare include unhindered access to all medical history documents of the treated patient. For this reason an internet-like architecture is set up at the Rhön-Klinikum AG to allow browser based access to all medical records in the 39 clinics of the company.

Methods: Together with two international major software companies a prototype was set up and a feasibility study for the system was done. It consists of a Master Patient Index/Matching Tool, a Rights Management Tool, a Document Link/Index Database, a Messaging Component and a Web Frontend. The Software integrates fully into the standard product platform of the participating software companies. Documents are managed only over Links and Pointers, no Document dumps are drawn into the Database of the system. Additionally a separate test was done with the Morphosaurus Tool, a special search engine for medical documents, which can be integrated in the platform in the long run.

Results: The prototype could prove full function. Three primary systems from other vendors could prove to integrate seamlessly over a simple whitepaper with described simple procedures. It was proven, that the known infrastructure from the new German Health Card and the Health Professional Card can be integrated over the given interfaces. Furthermore integration into the German BIT4Health project architecture is fully supported. The system is now in the phase of roll-out for 2 clinics in a first run.

Discussion: The given system brings the idea of the internet-architecture to the EMR and can integrate a heterogeneous environment of distributed filesystems over “link and index management”. Additionally a Master Patient record and a rights management system is integrated into this new environment. The system is explicitly targeted to all existent EMR Systems and gives them an easy way to integrate.

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MSurvey.net – A Platform for User Profiling and Medical Surveys

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Introduction: For Marketing and Market Study purposes it is often needed to have a selected user base interviewed by phone or online questionnaire. At the Leipzig Graduate School of Management it is planned for the future to conduct such surveys for scientific purposes. For this reason a tool has been set up, which allows users to register for a free medline service according to their submitted profile.

Methods: A PHP-based user profiling and medline-crawling tool was set up, which allows to classify user by their specialities and a MESH subset of subspeciality keywords. As a service the tool can then periodically submit newest medline results to the user. In the backend of the tool an additional questionnaire tool has been set up. This tool will allow to categorize users in quite granular subsets of the population and questionnaires can be conducted online or by phone quite easy.

Results: Until now 238 users registered for the service at an average growth rate of 20–30 users per week. A critical mass for starting surveys has not been reached now.

Discussion: The service may build up an interesting user base for scientific medical surveys on market opinion or different special questions of a medical community. A still open question may be for an adequate system of additional remuneration of participating users. But for now the building of a big enough user base will be the first issue to solve.

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Responses to Unsolicited Patient email Requests Seeking for Medical Advice: A German study reloaded

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Introduction: Consumers seek for health advice online, but online medical advice has not been explored systematically. In our work a study from 1998 from Eysenbach was redesigned to investigate the situation in Germany: To explore the attitude of physicians toward unsolicited e-mails a request was composed simulating an acute medical problem.

Methods: The email was sent out to 128 doctors randomly over Germany. After 3 weeks or after the doctors responded, we sent out an explanation about our request and an electronic questionnaire asking for some simple opinions on medical advice by e-mail. The reply e-mails and questionnaires were then graded and results were calculated over a special scoring system.

Results: Exactly 50% of the Emails were answered, 8,5% didn't reach the hospital and the rest were not answered. 67% of the answering doctors replied after 24 hours. 42% diagnosed right and 11% mentioned that online health advice is illegal. 11% get over 50 e-mail requests in a consulting matter per day and 22% of the doctors would consult online if they would be reimbursed. 89% of the doctors are sceptical against online health consulting. In our Scoring System only 2 of the reply e-mails reached all criteria to be a "valuable business service".

Discussion: Patients seek health information via the Internet, but there is no overall policy on how to handle the requests. Overall doctors in Germany are very sceptical about this form of consulting and see more danger than chance. As a business model an email health consulting service seems not to be too feasible at this point of time, but may be useful in a specialised setting, e.g. with known patients.

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Landscape and Future Development of Open-Source Applications in Healthcare

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When deciding for a Healthcare IT-solution meanwhile not only small size companies but also mid and big-sized ventures also evaluate Open-Source Platforms against pure Commercial Solutions as the use seems to get more and more feasible.

The different reasons may lie in a changed general mindset about software and implementation and maintenance settings. But also the disappearance of disadvantages like limited support and limited user-friendliness seem to come into play, as commercial providers e.g. like IBM or Healthcare Consulting GmbH in Germany provide services and support in configuring and developing given Solutions.

The Author will give two examples from the Remote Data Entry (RDE) and from Clinical Information Management Systems (CIS). Overviews of real cost and process effects in

1. A big International Pharmaceutical Enterprise and
2. A German hospital

will be discussed and practice problems and juridical/technical/infrastructural key points will be raised from the example shortly.

At the end a short overview of Open-Source Initiatives, license models and software will be given and an overview on decision models and common decision problems will be given. In an Outlook actual trends for the use of Open-Source will be interpolated from the examples, the actual system landscape and a preliminary survey on the use of Open-Source in German hospitals.

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An Information Model for Cystic Fibrosis Patients and Carers

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Introduction: The purpose of this doctoral research study was to explore and analyse the information requirements of adults with Cystic Fibrosis (CF) and the carers of children with CF, and to determine if their information needs and sources change during the different stages of the disease. The objective has

Disease-related Categories	Web Sites	Alternative to Internet Information
<i>Diagnosis</i>	www.esiason.org	Cystic Fibrosis by Hodson & Geddes
– Symptoms	www.cysticfibrosis.com	British Medical Journal articles:
– Testing	www.cff.org	2001;323:1207 24 Nov
– Genetic Testing	http://bmj.bmjournals.com/cgi/contents/full/ BMJ 1998;317:411 (8 August)	CF Association Australia: CF Newly Diagnosed Hospital CF Clinics
Nutrition and supplements	www.cff.org/publications/files/nutrit ionforyourtoddlerCF2.pdf www.cff.org/publications/files/nutritionand CFchangesthroughlife.pdf	Growing Older with CF: A Handbook for Adults, CF Trust UK.
<i>Medications</i>	www.cystic-l.org	CF Today Newsletter UK (Autumn 2004): Ask the Expert.
– Prescribed	www.cfservicespharmacy.com	CF Trust UK: Antibiotic Treatment for CF
– Side-effects	http://cmbi.bjmv.edu.cn/medline/ antibiotics.html	
– Oral, intravenous	www.familydoctor.org.handouts/680.html	
– Alternative medicines		
– Antibiotics: Resistance		
Transplantation	www.lundsforlife.org www.wevebeenthere.org/main.htm www.2ndwind.org/ www.transplantbuddies.org	Lung Transplantation, The Australian Lung Foundation. Growing Older with CF: A Handbook for Adults, CF Trust UK.

been to arrive at an information model that reflects the needs of CF patients and their carers during the different lifetime stages of the disease.

Methodology: Both adults and carers of children with Cystic Fibrosis, who are required to be dedicated to a treatment regimen that involves once or twice daily physiotherapy, and a commitment to taking a range of medications several times a day, require research methodologies that are flexible and unobtrusive. Techniques including the analysis of content information posted on US and Australian CF bulletin boards were used. The outcomes of these findings were verified during 32 semi-structured interviews conducted in rural and urban area of adults with CF and carers of children with the disease. The cohort was also divided into people who had used the Internet and those who had not, to arrive at the differences in information sources and categories of information sought.

Results: An increasing number of people are turning to the Internet for health-related information [3]. There are literally thousands of articles that can empower patients and carers of patients with chronic illnesses to become involved in the self-management of disease [2].

The content analysis of the bulletin boards has confirmed the benefits that the Internet provides to patients and carers. From a research perspective, interviews are needed to substantiate the analysis gathered from the bulletin board messages, and the information requirements that are left unsatisfied. The top categories of messages posted in the US were queries regarding diagnosis, with general chat/communications next, and in third place medication-related questions and advice. In Australia, where newborn screening normally diagnoses CF, the largest number of messages posted were general communications and emotional support being requested or being provided to others. Next came advice regarding dietary issues, and thirdly, like the US-based bulletin board, questions regarding medications.

The interview outcomes, while confirming a desire by CF carers and patients for contact with others who have lived similar experiences, more clearly identified how their information requirements change over the period of the disease. This ranged from the initial diagnosis of the child with CF to the options and experiences when being put forward for a lung transplant, to the stage of preparing for death.

The following is an extract of the information model that has been prepared for CF patients and carers:

Discussion: Evidence suggests that an increasing involvement by patients in planning their own treatment produces better health outcomes [1]. These research findings have been consistent with the fact that patients wish to be empowered and active participants in their own health care planning. To facilitate empowerment, information has to be available to support patients and carers, and increasingly such information is being made available on the Internet.

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The Open Access (OA) Advantage: Evidence for preferential citation of open access articles

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Background: Open Access (OA) to the research literature has the potential to accelerate recognition and dissemination of research findings, but its actual effects are contradictory.

Method: Longitudinal bibliometric analysis of a cohort of OA and non-OA articles published between 9 June 2004 and 20 December 2004 in the same journal. Article characteristics were extracted and citation data were compared at three different points in time: at “quasi-baseline” (December 2004, 0–6 months after publication), in April 2005 (4–10 month after publication) and October 2005 (10–16 months after publication). Potentially confounding variables including number of authors, country of author, funding organization, and discipline were adjusted for in logistic and linear multiple regression models.

Results: A total of 1494 original research articles was analysed: 212 (14.2% of all articles) were OA articles paid by the author, and 1282 (85.8%) were non-OA articles. In April 2005 (mean 206 days after publication), 629 (49.1%) of the non-OA articles vs. 78 (36.8%) of the OA articles were not cited (RR = 1.3 [1.1–1.6]; $P = 0.001$). 6 months later (mean 288 days after publication) non-OA articles were still more unlikely to be cited (non-OA: 174 13.6% vs. OA 11 (5.2%), RR 2.6 [1.5–4.7], $P < 0.001$).

The average number of citations of OA articles received on average more citations than non-OA articles (April 2005: 1.5 [STD 2.5] vs 1.2 [STD 2.0], $Z = 3.1469$, $P = 0.002$; October 2005: 6.4 [STD 10.4] vs 4.5 [STD 4.9]). In a logistic regression model, controlling for country of origin, type of funding, days since publication and number of authors as potential confounders, OA articles compared non-OA articles remained twice as likely to be cited (OR 2.1 [1.5–2.9]) in the first 4–10 months after publication (April 2005), with the odds ratio increasing to 2.7 (1.4–5.2) in October 2005.

Conclusion We found strong evidence that even in a journal that is widely available in research libraries, Open Access articles are more immediately recognized and cited by peers than non Open Access articles published in the same journal. Open Access is likely to speed up research and avoid duplication of work.

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Atlas of Dermatopathology with Expert System Features (www.muni.cz/atlasses)

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Introduction: The Atlas of Dermatopathology is available on the Internet since 1998 and today about 3600 annotated images are available, clinical and histological. Histological images are available in high resolution (up to 7200 × 7200 pixels) and users interface for the access to the image detail is available. The atlas features an expert system in the form of a link of questions and answers, used in botanic keys. This diagnostic tool was already described. Another expert system targeted on diagnosing of inflammatory skin diseases is under preparation. The approach to the problem is different.

Methods: The set of morphological markers was created and used to describe diseases (how certain diagnostic unit should look like) as well as the histological images in the atlas (which signs each image contains). These markers are similar to markers used in dermatopathology [1,2]. The expert system will be accessible via a menu driven interface that users enable to describe the signs of a case in question. The description (actually a data from a HTML form) will be sent to the server, where the user's description will be compared with the database of descriptions of diseases. The comparator uses scoring approach with standardization, overcoming the problem of incomplete descriptions in the database and user's descriptions: the function compares the maximal value (as if the user's description was an ideal match) and actual value. Signs, which are not described, are not taken into account. Relation of these values is used to sort the target diagnostic possibilities.

Results: The system returns a list of diagnostic units sorted according to the score achieved with the most probable units on the top. At present the answers of the system are reasonably correct and returned list groups diagnostic units according their similarity. The system enables the user to refine the description and send the description for the evaluation again. Moreover, it is possible to select several diagnostic units and enter the differential diagnostics mode: the descriptions of selected diagnostic units are compared and those signs, which have the same descriptions, are left out. This helps the user to concentrate on important diagnostic signs.

Discussion: The system is targeted on users, which are not experts in dermatopathology; selection of diagnostic units is made with the target audience in mind. The main strength of this approach is straightforward description of the case in question (the signs are relatively independent and can be selected in any order), the possibility of gradual refining of the descriptions, the differential diagnosis mode and linking to the atlas, where users can verify the results. On the other hand the system will fail in cases where more than one diagnosis is present, in rare diagnoses and atypical presentations; such cases are the domain of real experts in the field. The expert system will appear at 8th version 8 the Atlas, which is scheduled for the end of the year 2005.

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Multimedia Documents in Teaching Pathology

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Introduction: Students of pathology need to have access to image materials. Hypertext documents are suitable for this purpose, because they are cheap, easy to maintain and modify and there is practically no size limit. We will demonstrate the textbook of pathology we are developing for our students. The atlas consists of short texts, clinical, macroscopic and microscopic images and various kinds of radiological images.

Methods: All the source texts of the atlas is in XML files, which are converted to the HTML by a set of Perl scripts. During this conversion extensive tests for completeness of the references and DTD based verification are performed. XML tags describing different parts of the source texts (anatomical remarks, clinical features, macroscopic descriptions, histologic descriptions etc.), inline and external images, itemizing environments and many other are available. Histological images are annotated, so that the students can open a window with the list of important signs and activate arrows pointing to these signs. JavaScript programming is used to get the image detail in high resolution histological images, to simulate the virtual microscope, to switch images in the image window to simulate microscope focusing, image planes switching in pictures from MRI or CT scanners as well as interval-taken images in contrast angiography. These features are available in quiz-mode as well. The Internet browser (Mozilla or MSIE) are all the software necessary to access the final HTML document. In addition, the XML files are converted to TeX format and PDFLaTeX typesetter is used to generate the text of the atlas (without images) in several layouts. Our students can download and print these files as well.

Results: The atlas consists of about 1500 images and is growing as new chapters and new features are being added. It is available at www.muni.cz/atlas/stud. High resolution histological images in sizes up to 7200 × 7200 px are composed of smaller parts of the microscopic scene, taken one by one, aligned and fused together.

Discussion: The image collection can change the way of teaching pathology substantially. We have dropped using microscopes in teaching pathology because of the image quality of high resolution histological images. The virtual microscope suits our purpose better, so as all the students get the same information in controlled way and can concentrate on important features of the diseases. The maintenance of digital slide collection is much easier and cheaper than classic approach with individual glass slide sets. The atlas can be used in our computer equipped teaching rooms as well as individually by the students from their homes or dormitories. They can comment the atlas, propose the changes and even participate on developing of the atlas itself. In future such approaches will be used in real diagnosis making in telemedical systems for histopathology, radiology and other field of medicine, where diagnostic image evaluation is crucial.

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Teaching Information Security to Medical Students

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Introduction: With the adoption of new information systems in healthcare, young doctors need to comprehend them from their conception. Therefore, all feedback provided during their training into the medical profession is essential for the enhancement of those systems, moreover in terms of information security. The Biostatistics and Medical Informatics Department of Porto Faculty of Medicine teaches Ethics and Medical Informatics to 1st year medical students. The later subject includes theoretical and practical lectures about Electronic Patient Records (EPR) and information security. This study aims to investigate the attitudes and awareness of 1st year medical students towards security issues relating to EPR.

Methods: The students responded to the same questionnaire before Ethics and Medical Informatics' lectures at the beginning of the academic year of 2003/2004 and, again, at the end of the year after those lectures. This questionnaire was anonym and presented 3 scenarios. The first scenario described a breach of patient confidentiality by a colleague, asking whether students could recognize that breach (Q1A) and also, the attitude of the respondents in knowing about it (Q1B); the second asked if the students would alter their answer to Q1B by realizing that their colleague shared a password with a friend, and that friend committed the security breach (Q2); the third scenario asked if sensitive information (i.e. related to VIPs or sexual diseases) needs stronger security protection than other sensitive healthcare information (Q3). The answers were inserted in SPSS and analysed separately.

Results: A total of 460 questionnaires were filled by the students. 52% (238) were answered before the lectures started, whilst 48% (222) after the lectures finished.

In Q1A, 98% (450) of the answers were valid. At the beginning of the year 99% (232) of the students identified a security breach of EPR confidentiality, while at the end of the year, 100% (217) did the same.

For Q1B, 60% (276) of the answers were valid. At the beginning of the year, 54% (77) students felt they would reason with the responsible for the breach, whilst 29% (42) affirm they would, instead, inform responsible authorities about that breach. At the end of the year, 44% (58) thought they would still talk with the responsible and 41% (54) would inform responsible authorities.

In Q2, 62% (287) of the answers were valid. At the beginning of the year, 74% (109) of the students would not alter their answer to Q1B whilst, at the end of the year, 83% (115) thought the same.

For Q3, 89% (410) of the answers were valid. At the beginning of the year, 44% (91) of the students felt no extra security measures should be applied, the main reason being the fact that all security measures must be effective for all cases, independently of the patient or healthcare performed. 55% (112) thought extra security measures were necessary because they affirm there is the need to protect certain social groups from discrimination. Again, at the end of the year, 38% (77) felt no extra security measures were needed whilst 62% (127) thought there were.

Discussion: According to this study results, after Medical Informatics and Ethics lectures, students feel more conscientious to report confidentiality breaches to responsible parties (Q1B). They understand better how to behave in order to protect confidentiality of electronic information and consider indirect disclosure of sensitive information, such with another person's password, a serious fault (Q2). Further, at the end of the year, students become more aware for the need of different protection levels of security depending on how sensitive information can be (Q3). We believe that the introduction of Medical

Informatics and Ethics early in the degree has an influence in the awareness and attitudes of first year medical students towards information security and EPR.

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The Internet: Help or hindrance in patient care?

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Introduction: The introduction of a new tool in any work environment affects the way this work is undertaken. Some of the ensuing changes are desired and foreseen, others are unforeseen and have a negative impact on the work they were introduced to support. Developments in technology now offer Internet access through mobile devices. This means that the environment in which patients and healthcare professionals (HCPs) are operating is changing. However, with the increased deployment of technology, are we in danger of losing sight of the most important element of care delivery and organization, that of the personal touch? Adams and Fitch [1] explored such unexpected consequences of the use of technology through the “Janus-face metaphor”, first discussed by Arnold [2].

A small-scale pilot investigation of mobile telephony to support Community Healthcare was carried out in a region in the South of England. For detailed information of the study and its results please refer to our earlier paper [1] as what we wish to do here is reflect on the parallels between the adverse effects of the use of mobile telephones and the use of the Internet in the context of the relationship between the patient and the healthcare professional.

Discussion: Arnold [2] uses the “Janus” metaphor to describe unforeseen consequences of technology application. He notes:

“Technologies of many kinds perform in ways that are ironic, perverse and paradoxical. That is to say, a certain technology applied in a certain way in a certain context may have consequences or implications of one kind, and may necessarily and at once be implicated in a contrary set of consequences.” [2]

Adams and Fitch [1] found a number of issues arose concerning support structures, service management and organization when mobile telephony is employed. The same or similar issues arise for the use of the Internet by both patients and HCPs, such as organizational issues.

For the HCPs, any technology or equipment provided needs to be supported by training, technical support and maintenance to aid the effective use of the resource. Working practices and protocols need to be developed. The challenges we face are in the way the potentially powerful resource of the Internet can be made to work for us, rather than (technological) difficulties that need to be overcome. Changes are required, both so that HCPs are able to retain the principle of equity of access to care, which is such a prized quality of our National Health Service, and to prevent their workload increasing to such an extent it becomes unmanageable. The latter is important because the empowerment of patients by technology is likely to result in an increase in the amount of work rather than a reduction.

From the point of view of the patient, equity to access of care is important. Do patients with Internet access that have lots of queries, end up taking up more of the HCPs time than patients without such access to information? How can this situation be ameliorated and how can we provide Internet access for all? These issues are further explored today, together with suggestions of how the Internet may be used to ameliorate the loss of personal touch that some patients feel has come about through the increased deployment of Information and Communications Technology in Healthcare.

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Usefulness of a Personalised Health Information Service on the Internet: The users perspective

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Introduction: The internet is a powerful communication tool. In recent years, the internet has been used in many ways to empower the communication between patients and their physicians. Many experiences, including e-mail communications, specific web sites and mobile solutions have been implemented in this field. However, little is known about the effectiveness of these services, and both optimism and concern about the impact of these technologies have appeared in previous literature. Since 2000, our institution offers an individualized health information service in its web site www.viatusalud.com. This service, called “The specialist opinion”, was performed formerly through e-mail consultations [1] and since 2002 through an on line form located into an specific password-protected personal area in the web site, the so-called “my dossier”. The use of this service has been continuously growing [2] and up to now more than 47000 questions have been answered, and this year our web site has reached more than 25000 registered users. In January 2005 we started a survey in order to assess the usefulness of this health information service and to search for improvement opportunities.

Methods: An on-line questionnaire was shown immediately after the question to the specialist had been read by the user. Three multiple choice and three yes/no questions were included. Questions looked for the impact in users’ health but also for technical aspects such as time response or understandability. Free-text space for suggestions was also provided.

Results: In this five-month period 4196 questions were received and answered in our web site. 1526 out of these users, 36%, completed the survey. 75% of the respondents reported that the service improve their understanding of health care issues, specifically those about their diseases or conditions. Moreover, up to 40% of the users said that the answer modified the attitude, treatment or management of their disease. Overall, 56% of users said that his health or those of their relatives had improved.

Time response was considered ideal by 41% of the respondents, and adequate in other 41%. Only 5% of the subjects surveyed considered that the time response was clearly unsatisfactory. Looking at the understandability of the answers, 91% said that they had completely understood all the content written by the doctor, and only less than 6% could not understood the answer. Finally, 40% of the respondents thought that the answer was very useful, 24% of them qualified it as useful, 22% said that it was informative and less than 12% reported that the answer had no value for them.

Conclusions: Tele-consultation or personalised information services are able to increase the people knowledge of the disease and even to contribute to improve the health of the users. Although currently the internet does not strongly influence health care utilization, as previous articles have pointed out [3], it seems that its role in health care is expanding and that in the near future it could be of great value to disseminate health information and to enhance communication between patients and their physicians, mainly in those with chronic conditions.

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HEALTHFACIL: On-line Continuing Professional Development in Health and Social Care

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Introduction: The purpose of this project is an on-line training programme with a collaborative venture between Higher Education and Health & Social Care organisations across Europe, encouraging more practitioners to take on the role of group Educator-facilitators and developing resources for the Health and Social Care. The on-line facilitator must have a peculiar role to effectively and safely operate on the net, working in an appropriate 'virtual environment', knowing rules, behaviours, different impact of accreditation methods, with legal and curricula effects.

Methods: The project has experienced a way to enable effective e-tutoring of professional groups, developed a school for facilitators in health and social care delivering knowledge, structures and tools to participants. Six countries are participating to the project, with trans-national exchange to apply the method in different experiences, knowledge and users needs.

To avoid the impact of production costs, standards variance and training time, an automatic producer and publisher is delivered to facilitators enabling them to immediately publish educational materials, without webmaster intervention. This tool produces multimedia contents fit also to low-speed users connections, serving a broad users base, without software added costs for participants.

Results: The evaluation was done in 2005 with 102 family physicians training. The authoring tool developed was effective empowering tutors to produce and customise multimedia courses in different languages, easily and without technical intervention. The discussion and reflection software was agreed by participants, with high rates of participation.

Discussion: The project experienced a way for the easy and effective tutorship, with low costs to produce courses, low requirements for participation.

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The National Aspects of Distance Education (DE) at High Medical Education Institution

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Introduction: The purpose of this study is to introduce distance education at Yerevan State Medical University (YSMU) as an alternative variant of education, organization of Distance Learning (DL) of certain theoretical subjects which are included in the process of training medical specialists, composition of the interactive contents to evaluate the students' knowledge and create interface on the web site of our partner scientific-medical NGO "Greatmed". The technical capacity of the YSMU for organizing a DL is on sufficient level (new computers, computer auditoriums in each faculty and department, LAN, University server). It would be desirable to have wireless connection which would enlarge the frame of students and the education as well. The Center for Research Funding Mobilization (CRFM) of YSMU assumed responsibility to organize DL at the University. First, a pilot project was realized by the CRFM on "The Art of Applying for Grants". Its staff is experienced enough in the field of applying for grants and development of competent projects.

Methods: The course has begun in June 2005 and will be finished in September. Manager and tutors of the course were elected. The material for teaching was worked out which introduced the requirements of making a grant project and also included examples, Power Point presentations and didactic materials. It is realized by 2 phases which are interrupted by intermediate and final tests. Taking into account the high price of internationally recognized software and the lack of required technical capacity for installing them, the method of electronic subscription was chosen. 80 participants have been subscribed. Each participant was given a username and a password. Also, free choice and opportunity for downloading subjects was given to them. The Power Point presentation of these subjects was created. On-line forum was organized to estimate the impact of the course where the tutors and the participants were in contact and get answers to their questions. Based on the results of the intermediate test, only 30 participants could continue their course.

Results: The course will be finished in September by the final test. The results will be presented to the authorities of the University who will define the shortcomings that were detected. This is a fine basis to organize DL system at YSMU which will develop human and technical resources thus promoting the integration of the University in international standards. Besides, the terms and requirements of different funding organizations will be presented to the young medical scientists thus giving them an opportunity to continue their scientific activities and develop their professional skills in the level of international collaboration.

Discussion: The interaction between students through the on-line forum was a unique opportunity to reveal their claims and suggestions. They note the quality of the subject of big volume and perfect organization. Also, they claim for the low quality of internet connection and lack of interactive objects (audio-, video clips, and presentations) limited opportunities for choice. However, even in case of perfect organization and provision of the above mentioned interactive interface, this course is far from comparing with DL systems of international acknowledgement. Nevertheless we think that it is possible to organize DL at YSMU with the existing technical capabilities and worked out materials. In the first phase it will include theoretical subjects. Later, in case of providing advanced technical instrumentation other clinical subjects, which contain some theoretical materials, can also be included thus minimizing the participation of professors in the teaching process.

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A Tele-consultation System: TELEPET for a value added service network for PET

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TELEPET project is born from the increasing interest of the last years for the Positrons Emission Tomography (PET), a methodology of functional imaging used in the study of the cancer pathologies. The results of clinical trials have shown by now that the PET represents an important tool in the diagnostic process and in the follow up of the cancer, for reducing the diagnostic invasive procedures and the health costs in the management of the patient. Today the availability of medical personnel and experienced technician in the PET is still limited to a large assembled in few centres. The objective is to improve the development of a tele-consultation system for PET; the physicians will have the new opportunities for discussing in direct line with the personnel of the excellence centres on the analysis of PET examinations, on the interpretation of the images and on the contents and layout. The main goal is to conceive an integrated computer system able to constitute an innovative interface for a clinical use. The system will integrate communication features, network interconnection, advanced diagnostic images elaboration functions and the management of sensitive data related to the patients in the daily activities of the clinical and health services.

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Web-based Intelligent Medical Tutoring Systems

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Introduction: Internet is nowadays being integrated into all kinds of education and training processes. In health education, medical educators face the difficult requirement of educating future clinicians, while simultaneously limiting medical errors to real patients. At the same time, new pressures in health care have disrupted the traditional model of clinical apprenticeship. This combination of factors has fuelled an increasing interest in applications of technology, including intelligent technologies, to medical training. With the development of WWW technology, Intelligent Medical Tutoring Systems (IMTS) are becoming a mainstream area of research and development. This web-based IMTS are installed and

supported in one place being used by thousands of learners all over the world [1]. Although many web-based educational systems have appeared recently, most of them emerged from their predecessor legacy stand-alone systems. Therefore, they not only restrict themselves in functionality, but also fail in taking advantage of the distributed nature of Internet. These systems are usually dedicated to a limited knowledge base and have rigid architecture with little possibility of modifications once released. The purpose of Intelligent Medical Tutoring Systems is to provide rich environments for maximizing learning while minimizing risks to patients.

In this work an IMTS for training in Tuberculosis has been developed and integrated in SINCO project [2]. The IMTS provides one-on-one instruction enabling participants to practice their skills by carrying out tasks within a highly interactive learning environment. Moreover, the system assesses each learner's actions and develops a model of their knowledge, skills, and expertise. Based on the learner model, it tailors instructional strategies in terms of both the content and style; providing explanations, hints, examples, demonstrations, and practice problems as needed. The figure 1 shows the architecture proposed. The IMTS is implemented as CBR system.

Methods: Case-based reasoning (CBR) [3] is a problem solving paradigm that in many aspects is fundamentally different from other major AI approaches. Instead of relying only on general knowledge of a problem domain or making associations along generalized relationships between problem descriptors and conclusions, CBR is able to use the specific knowledge of previous experiences in solving concrete problem situations (cases).

The IMTS is implemented as a multi-agent case-based reasoning system. The relation between CBR systems and Intelligent Medical Tutoring Systems is established by modelling students as cases. The advantage of this approach is that a problem can be easily conceptualised in terms of agents and later on be implemented like a CBR system.

The IMTS-CBR updates its base of cases constantly and in consequence, adapting to changes in the environment. Moreover, each one of the phases of the CBR system are automated. In our approach, the agents implement the CBR cycle phases, working like autonomous entities, acting rationally in accordance with its environment perceptions and knowledge status and exchanging information one another providing modularity and cooperation.

Results: The Web-IMTS was integrated in SINCO with the objective of teaching Tuberculosis (TB) courses. This disease was chosen because it was identified as a critical public problem in the region where the project was developed. The poor education on TB is one of the fundamental problems of the current TB control programmes. The use of intelligent system allowed training medical students and health workers geographically distant by means of personalized instruction. ITS let the system adapt to the student's preferences offering the teaching strategies according to their profile.

Discussion: The development of the IMTS under a modular and flexible architectural approach, allows its use in other medical areas. The potential reuse of existing resources offers significant advantages to the development of knowledge-based educational systems.

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A Novel Security Scheme for Health Care Web Applications

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Introduction: Law for personal privacy is based on the idea that storing personal data in a registry is forbidden unless it is allowed by a person's explicit approval. Software development evolves towards centralized web enabled applications. This development is reasonable and decreases development and maintenance costs. When a web application is used by several users, there are challenges in protection of privacy. Application should encrypt selected data items, such as personal identification codes, in a way that the data items from different organizations remain separate and are encrypted using different keys. This way the person can be indicated but not identified outside the organization that owns the data.

Solution: We propose a solution that uses client controlled security. By client controlled we mean a security scheme, where the client organization generates the encryption key and never reveals it to any unauthorized party. The data will always be in encrypted form when it is outside the client organization and can be decrypted only by a client who knows the key. For the end user this encryption is fully transparent and the basic user does not need to know the details of the system. Client side key generation provides freedom in defining organizations. From our perspective an organization can be anything from a single user to a group of hospitals.

Our solution is very general and works on all major web browsers and operating systems. Furthermore, there is no need for any installations to be done by the client. These properties make our solution very cost effective. The total cost of ownership (TCO) stays very low due to the fact that the system needs practically no maintenance.

Our solution can also provide integrity of the protected data. This means that the protected data cannot be altered in any way without being detected. Integrity is accomplished using hash functions and encryption.

The client can generate encryption keys with a tool provided with the system. The tool is web based and requires no installations. The keys can be stored on any media, e.g. hard drive, USB memory stick or other removable media. Also a Smart Card can be used to hold the key in a tamper resistant PIN protected environment.

Discussion: The health care domain has numerous applications for this security solution, e.g. a database containing patient data for clinical research from several organizations. While maintaining privacy we can combine patient data produced in several organizations for further scientific analysis. A trusted third party, which cannot find out patients identity, can be used for aggregation of data. It is also possible to aggregate the data without the trusted third party. In aggregated data, all data concerning a certain patient can be indicated and at the same time it is not possible to identify the patient. These properties make it possible to offer gathered data for outside organizations as well as individuals as material for scientific research.

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Statistical Analysis through the Internet

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This presentation is focused on internet sources, which are able to give assistance with statistical analyses of data. Special attention points to high-quality textbook search, method selection guide and statistical analyses on-line system search. Textbooks and guides pick out criterion such as credibility, citation frequency and presence of typical methods for medical applications (Survival Analysis, Sampling, Meta Analysis). Sources enabling on-line calculation cannot compensate for big commercial programmes. On the other hand, these on-line analyses are always available and we can often find useful procedures in them, which are often absent in big packages. Our poster shows selected sources briefly. WWW addresses of various language varieties are also present.

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Mobile Access to Streamed Lecture Materials

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Introduction: Increased number of university lectures at the Faculty of Informatics at Masaryk University Brno is being recorded via digital video cameras as part of the process to provide students with easily accessible auxiliary reference study material [3]. Also, short films are produced to cover topics hard to present during classical presentation. All this digital video material is made available through streaming servers both in real time and for later perusal. While personal computers can be used to view the films, we extended made it accessible through small mobile devices (mobile phones, PDAs), owned by practically all students.

Lecture streaming: Several lecture theatres has been equipped to support automated recording of lectures. The raw digital material is further processed into different streaming and downloading formats and access is provided through a web portal [1] to authorised users only.

After three years of the lecture recording we confirmed the initial hypothesis that these records play a very important role in the educational process. They give access to a teacher personality (his/her way of presenting a subject, explanation, reaction to questions etc.) in a more permanent way. Instead of going to consultation, students can easily access difficult parts and re-play the teacher's presentation without overloading her. This leads to more individualised teaching and learning without an increase in the number of teachers – faculty can keep just a smaller number of the best teachers and virtualises them to a large number of students. Another by-product is the support of (temporarily or permanently) handicapped people with limited possibility to actually attend the lectures.

Methods: Increased popularity of lecture records lead to new requirements for the access, including the access through mobile devices with capabilities to process multimedia content. The PDAs and the

latest version of (smart) phones have enough processing power for real time video presentation and the improvements in mobile networks (the availability of protocols like GPRS, HSCSD and more recently EDGE, CDMA, and UMTS) currently provide enough bandwidth.

The application has been developed within the NSYS framework [2] which provides an environments for development of multimedia applications in an operation system independent way. The whole system consists of the NSYS video portal which runs on a video server and the NSYS terminal, run on the mobile device. The NSYS terminal process the video stream and submit the resulting content to the local video player. It also takes care of direct interaction with the user. The currently supported mobile devices must run under the Symbian operating system and must have RealPlayer application available. Also, the NSYS terminal requires FlashLite system [4] for installation. Both RealPlayer and FlashLite are available on most mobile phones capable to play video. The installation instructions and the code are available at [5].

Mobile access: Thin client for mobile devices (phones or PDAs) supporting J2ME, FlashLite or WAP is currently available. It supports audio and RealPlayer video streaming formats. The access to real time audio only stream can be used e.g. by students that were not able to get to the lecture on time or by visually impaired students. The system is in experimental use by students at Masaryk University and the current experience is encouraging.

The application can be used to access any audio or video material in the supported formats. It is possible to use the same clients to access the TV production, provided it is converted and streamed by. e.g., the Helix Producer and the Helix server. It can be also used in health care and other environments where a continuous monitoring is required but the individuals who access the monitoring information must remain mobile.

More advanced use is limited by two major factors: the network bandwidth and the processing power of mobile devices. As the introduction of the 3G networks could mitigate the former, and Moore's law helps with the later problem, we have little doubts for the future of mobile access to video material.

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High-Definition Video Transmissions for Medical Applications and Education

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Introduction: Enabled by current high-speed networks, high-definition (HD) video transmissions have become an essential tool for many applications. The HD video brings resolution, which is more than

4x larger than common PAL resolution, thus capturing more details and increasing the image quality dramatically. In this paper, we focus on using the HD video for two classes of medical applications: synchronous (real-time, interactive, collaborative) applications, which require low latency to provide perception of interactivity, and asynchronous (non-interactive, unidirectional, streaming, broadcasting, video-on-demand) applications, where the latency is not that restrictive. Because of high demands of HD video, these two classes of applications bring about distinct sets of problems. While complex processing and efficient compression schemes may be applied for asynchronous applications, the synchronous applications may include only very simple processing or no processing at all, which imposes huge demands on performance of underlying infrastructure.

Available technologies: The full HD video with effective resolution of 1920×1080 requires as much as 1.485 Gbps with 3 color planes (YUV), 10 bits per color plane, interlaced 60 Hz field rate, and 4:2:2 sampling resulting in 2/3 data reduction. This is commonly known as raw 1080i HD video, usually transmitted over Serial Digital Interface (SDI).

For real-time perception, the end-to-end latency of video capturing, processing, network transmission and displaying should take less than 100 ms (Fig. 1). This ideal environment is clearly unreachable for intercontinental network transmissions, because in many cases just the network latency exceeds this limit. For transmissions spanning hundreds of kilometres, the latency over optical network is in order of milliseconds and therefore almost ideal environments may be created provided processing is fast enough. This is usually implemented by sending raw uncompressed video in RTP/UDP/IP packets over the networks. There are several systems available [2,3], and the one developed by CESNET and Masaryk University based on UltraGrid features capture-to-display latency between 41–55 ms (not including network transmission). However, the whole system requires not only extreme network bandwidth, but also very fast capture and display computers and very costly low-latency HD SDI capture cards.

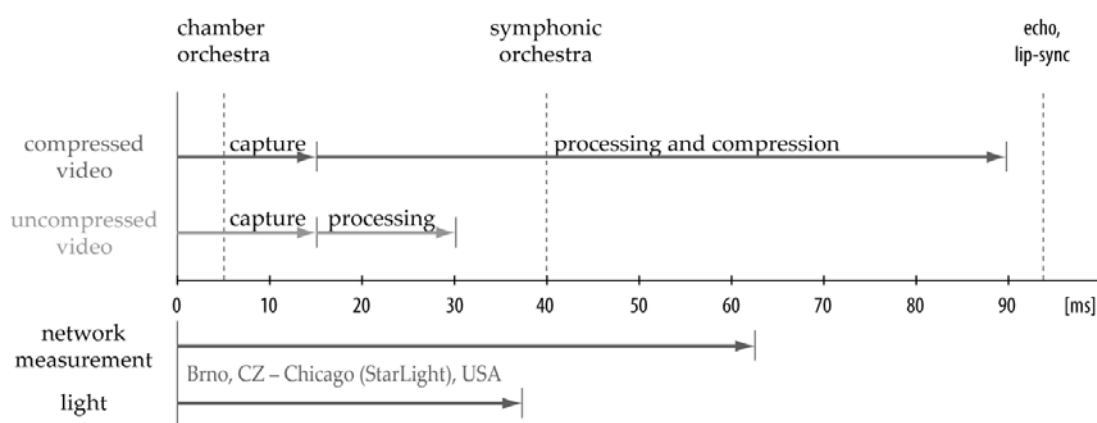


Fig. 1. Latency limits and video processing latencies [1].

When latency of the transmission is not limiting, advanced compression techniques may be employed to reduce necessary bandwidth. Most commonly HD video is compressed using MPEG-2 standard with 19.2 Mbps bandwidth, known as HDTV. Recently a new MPEG-2-based format by SONY called HDV has emerged, having 30 Mbps requirements, intentionally very close to DV for standard definition (SD) video, with affordable equipment readily available. Developed again at the Masaryk University and CESNET and utilizing open-source software VideoLAN [4] for displaying, there is a prototype of application for transmission of HDV over IPv4 and IPv6 protocols that can run on commodity hardware.

The price paid for efficient network transmission is latency increase – such systems usually have capture-to-display latency ranging between 500 and 2000 ms.

Use Cases: The synchronous transmissions are suitable for remote consulting and virtual councils, where image quality is substantial, e.g. in pathology. Complemented with haptic interaction (force feedback), it can be used even for remote training of medicine students, so that professor can lead the hand of a student during virtual operation to teach him/her the exact movements. The asynchronous transmissions are ideal as a supplement for remote education of students in areas with high demands on image quality. Furthermore utilising either native or virtual network multicast [6] for unidirectional transmissions, it is possible to reach rather broad audience with the technologies already available.

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Coordination Centre for Departmental Medical Information Systems

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The main task of the Coordination Centre is to perform management, development, coordination, and publishing activity in medical informatics in connection with implementation and operation of selected information systems with departmental force in the following areas:

1. National health registers (e.g., National cardio surgery register, National register of oncology, National register of vascular surgery, National register of cardiovascular interventions, National orthopaedics register).
2. Other health information systems (e.g., Ophthalmologic register, Register of intensive care, Hospital infection register).
3. Hygiene registers (e.g., Register of inoculums, Register of work tasks arrangement, Register of venereal diseases, Register of tuberculosis, Register of acute respiratory infection, Register of common-use objects, Register of the quality of drinking and recreational, Register of decrees of the chief sanitary).
4. Specialized medical information systems (IS Citmed, IS Rankmed, IS Eumed).
5. National register of persons refusing donation of tissues and organs posthumously.

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Evaluation of Websites Built by Patients who Underwent Endoscopic Thoracic Sympathectomy

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Introduction: Treatment of palmar hyperhidrosis with endoscopic thoracic sympathectomy (ETS) became popular in the last decade. Following an increasing number of individuals receiving the procedure, a large number of them had reported to be suffering from post-operation side effects. Due to the diminutive percentage of devastating side effects, medical literatures had paid little attention towards this issue. For better understanding of side effects after ETS, we evaluate the websites built by sufferers who underwent this procedure.

Methods: We knew the URL of the support group of compensatory sweating (CS) sufferers in Taiwan from the report of a local newspaper in August 2004. And upon browsing their website, we got the link to the Swedish Sympathetic Association, and through which we came across the ETS and Reversals discussion forum (US), World Against Sympathectomy (US) and additional links to similar websites across Australia, England, Japan and Spain. The Taiwanese Web page was done in Chinese, and those from Sweden, the US., Australia and England was in English, in addition to the Spanish site in Spanish and the Japanese site in Japanese. The Japanese site and Spanish site were excluded from this study due to language obstacle. Totally eight websites located in seven countries were identified. Six websites were included in this study. Of the three physicians participated in the evaluation of the web pages, one was a neurosurgeon, one was a dermatologist, and one was an ophthalmologist. All three physicians had sufficient knowledge on the background of ETS. The neurosurgeon provided ETS operations in clinical practice, the dermatologist offered non-surgical treatment for hyperhidrosis, while the ophthalmologist never came in contact with any patient of hyperhidrosis. We had predefined key points for evaluation, including: 1. What are the goals of these websites? 2. What are the common side effects? 3. Two of these sites containing discussion forum, some patients reported their results after reversal procedures. What were their comments?

Results: The goals of these websites include 1. Warn potential victims not to undertake ETS. 2. Get ETS banned. 3. Get the medical boards to adopt a defined standard of what exactly constitutes informed consent. 4. Get ETS syndrome recognized as an “official” disability. 5. Get compensation paid to ETS sufferers. 6. Punish fraudulent doctors. 7. Research into a working reversal procedure. 7. Understand the path physiology of hyperhidrosis and CS. 8. Find treatments for side effects. 9. Obtain emotional support. Since these sufferers were deeply troubled by the side effects, all websites polled consistently held a high expectation toward the reversal procedure. Certain serious side effects were highly consistent among different web pages. By far the commonest complaint of the sufferers is compensatory sweating.

From several self-reports it seems that the severity and extent of compensatory sweating may change even several years after ETS. Many complaints were about no sweat on face and neck. ETS surgery can cause a total inability to sweat from the nipple line up. Extremely dry hands were also a common problem.

There were three self-reports about the result of reversal by removal of clamp, two patients found some improvement after this procedure, the other didn't.

There were two self-reports about the result of reversal by removal of clamp, these two patients did not find any improvement after this procedure.

There were five self-report about the result of reversal by the nerve graft. None of them was effective. One of the self-reports was made 3 years after the sural nerve graft, and the only effect was the recurrence of palmar hyperhidrosis. This patient also complained that the reversal procedure made his side effects worse.

There were four self-reports about the result of reversal by the nerve graft, no one found this procedure to be effective.

Discussion: Evaluation of these websites was helpful for the understanding of side effects after ETS. This kind of information is important for all physicians providing this service and all people preparing to undergo this treatment.

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EurasiaHealth Knowledge Network: Web-based multilingual Resources for international Community

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Introduction: EurasiaHealth Knowledge Network (www.eurasiahealth.org) is a Web portal featuring a library of multilingual health resources, databases (of events, Internet Medical sites, regional projects, grants and funding), electronic bulletins, mailing lists, and interactive forums. Launched in April 2001, it builds upon the resources developed through the American International Health Alliance's (AIHA) healthcare partnership program in more than 350 healthcare institutions from 20 countries of the NIS and CEE, and the United States. The primary focus of the EurasiaHealth Knowledge Network (EHKN) lies in 10 subject areas—such as community health, emergency medicine, health management, HIV/AIDS, infection control, maternal and child health, medical informatics, nursing, primary healthcare, and women's health—that represent common, critical issues throughout the region. Resources in some of them are organized into user-friendly toolkits. Visitors can search databases, download text and multimedia documents, participate in discussions on forums and post messages to mailing lists, suggest resources for inclusion, upload their own material, and pose questions to EHKN staff.

Resource identification: The goal is to identify the best practice resources in national languages and to translate the most important training manuals/practice guidelines from English into Russian. Sources of content: produced or suggested by AIHA partnership organizations; produced by AIHA; identified by AIHA staff; produced by other organizations (by special agreements); submitted by visitors through “recommend a resource” forms. As of July 1, 2005, the Multilingual Library comprises 1,600 documents (in 23 languages); the database of Internet Medical Sites includes 640 links (in 18 languages).

Multilingual solutions/Search functions: Information “About EHKN” is posted in 20 languages. The EHKN has identical Russian and English versions, with all search options available in both languages. Databases can be searched by keywords, language, and subject. Multilingual Library can also be searched by document type. Users can also search for resources specifically for health professionals or for patients, current research, or country-specific resources. The Web site provides a searchable glossary of healthcare terminology in Russian and English.

Methods: Web site usage statistics, e-mail surveys of mailing lists subscribers, analysis of other sites that link to EHKN.

Results: Serving international audience – 2 mailing lists have 820 subscribers from 5 continents. Users downloaded documents 28,272 times during the second quarter (April – June 2005). The most frequently downloadable materials were manuals and guidelines on HIV/AIDS and other clinical guidelines developed or translated by AIHA. The EHKN Web site received an average of 14,255 visitors per month during the quarter (or about 4,750 visitors per day). Usage of the site during the quarter was up 109% over the 2nd quarter of 2004, and usage month-to-month over the previous year at the end of June was up 75%. Monthly Grants and Funding Bulletin, Health Resources Digest, and a bi-monthly Free Resources Bulletin are actively used by subscribers, are reposted on other Web sites and sent to other mailing lists in Europe, Asia, and Africa. The EH Community contains contact information of 993 specialists from 36 countries.

Discussion: Analyses of EHKN users show that it is actively used not only by the primary audience for which it is intended (healthcare specialists in NIS/CEE countries), but also by representatives of international organizations working in these regions, US healthcare practitioners working with non-English-speaking patients, and healthcare specialists/NGOs from other developing countries. EHKN is now listed among the main multilingual health care resources by many medical libraries and international healthcare Web sites. Future plans for expansion of EHKN include the development of additional specialized toolkits and further collaboration with other organizations to develop and translate new resources. The HIV/AIDS-focused portion of the site will continue to expand with new and updated translations into Russian of essential manuals for the care and treatment of HIV/AIDS.

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Computer-based Medical Algorithms: Overview and experiences

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Introduction: An algorithm is a step-by-step recipe, guaranteed to terminate, for performing a specific task. Medical algorithms are computational encapsulations of medical knowledge. Computer-based medical algorithms can potentially be powerful tools to enhance medical care. In this paper we provide an overview of the range and scope of medical algorithms as well as potential benefits from their usage in

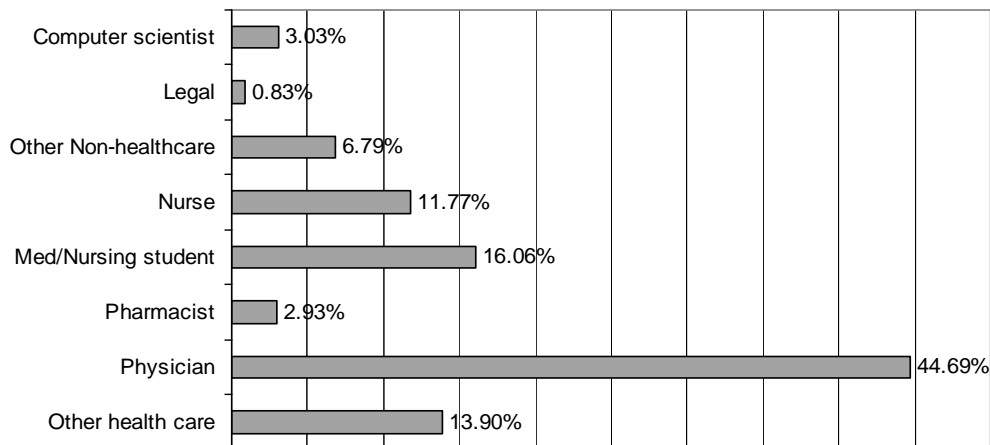


Fig. 1. Registered users by profession as of August 29, 2005. Total, 19,685.

medical care. Some of these include reduced errors, task automation with cost containment, standardized care, quality management, and improved documentation.

Types of Medical Algorithms: Johnson et al. [1] identified the following 16 types of medical algorithms: 1. Coding & look up tables, 2. Comparison with normal population standards, 3. Data conversion, 4. Decision rules & triaging, 5. Decision trees & flow diagrams, 6. Diagnostic criteria, 7. Diaries and symptom tracking, 8. Functional state description, 9. Grading and scaling, 10. Probability & statistical analysis, 11. Prognostic scores, 12. Questionnaires, 13. Risk determination, 14. Simple classification, 15. Simple formulas, 16. Therapeutic indications and contraindications.

In contrast to clinical guidelines, which are typically brittle, hard to validate, and not easily customisable or transportable, published medical algorithms are robust, modular, can be combined sequentially or in parallel to aid in complex decision making, and are typically supported by clinical studies in the peer-reviewed biomedical literature.

Potential Benefits of Medical Algorithms: Properly conceived and developed, medical algorithms can replace subjective judgments with objective decisions validated over an appropriately matched patient population. For example, in anaesthesiology, scoring systems for predicting difficult tracheal intubations [2] have been devised based on measurements of cephalometric features. Widespread use of such algorithms, rather than subjective evaluation, can promote standardization and automation of anaesthesiology administration. This, in turn, can result in decreased medical errors, reduce costs and improve documentation and efficiency of practice. Conversely, failure to use an algorithm can result in errors, since practitioners may not use all clinically relevant information or they may reach erroneous conclusions, especially when under work or time pressures [1]. When implemented on a computer, medical algorithms can deliver results in seconds, freeing the practitioner to focus more on patient care.

The benefits of medical algorithms can be fully realized only when algorithms interoperate with electronic health record systems and are available to the practitioner at the point of care. This eliminates the need for tedious data entry, enables up-to-the minute documentation, and provides the opportunity for clinical alerts. However, creating such a resource is not straightforward. Executable forms of possibly thousands of medical algorithms have to be encoded and embedded in a distributed computing framework that can query the appropriate health and laboratory information systems. The front end of such a resource must be able to decide automatically, possibly using heuristic tools and ontologies, the applicability of potentially relevant algorithms to the patient in question. Such applicability is modulated

by patient age, ethnicity, gender, comorbidities and other factors. Internet-based technologies, due to their flexibility, support for distributed computing, and ability to inter-operate across heterogeneous environments, appear to be most appropriate for this purpose.

MedAL – The Medical Algorithms Project: A free web-based resource, the Medical Algorithms Project (www.medal.org) has existed since 1998. It was created for the express purpose of disseminating medical algorithms in computer-executable form, the vast majority of which were hitherto available only in paper-based media. The latest version (16.0) contains over 8,000 algorithms covering 45 medical specialties, and is visited by over 1,000 users every weekday. Free registration was introduced in September, 2004, and as of Aug 29, 2005, there have been 19,685 registered users from over 180 countries. See Fig. 1 for a breakdown by profession. MedAL includes a Spanish language subset. All of the algorithms can be executed online as MS Excel spreadsheets. The ultimate goal is to convert all to web-based forms.

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e-Compendium for Laboratory Medicine and Internet

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Introduction: Amount of information in laboratory medicine is increasing. The processes of laboratory consolidation and/or centralization take place throughout the world, the co-operation among specialists is essential and problem in communication should be prevented. Laboratory medicine in the Czech Republic is separated into several disciplines: biochemistry, haematology, immunology, microbiology, toxicology and others. Therefore, it was necessary to initiate an interdisciplinary project with the aim to develop knowledge database for laboratory workers. The purpose was to enable access to condensed knowledge of high expert quality and recommend further reading in relevant databases and internet sources.

Methods: The working team was established under the umbrella of Czech Purkinje Medical Association some ten years ago. Original database system was developed and rules for different kinds of records were set up. These rules originally comprised mainly definitions of laboratory properties and quantities (according to IUPA/IFCC description of property, i.e. System-Component; Kind-of-property [Unit, Procedure]). Separate description of System (e.g., Plasma), Component (e.g., Glucose) and Kind-of-property (e.g., substance concentration) was elaborated as structured text. Similarly, structures were recommended for other elements (diseases, laboratory procedures and principles, statistics, chemometry, etc.). All documents in the database can be sorted (by means of several criteria) and managed as controlled documents by the special document controller. There are links among documents and definitions. Internal links inside documents enable automatic creation of hypertext. Database is maintained by both authors (AJ, MZ) in co-operation with group of about 40 co-workers.

Results: The entire database contains about 15000 records of laboratory properties and quantities defined by more than 40 characteristics. The definitions are linked to about 5000 documents (containing mainly description of components, diseases, procedures, etc.). During 10 years of operation, the two output lines developed: database for laboratories (properties, procedures, quality system documents, etc.) and educational hypertext (e-Compendium, containing mainly description of components, medical texts, statistics, etc.). Database for laboratories is a commercial product with 4 upgrades per year. e-Compendium is generated yearly and CD ROM is distributed to laboratories under the sponsorship of scientific societies and partners from diagnostic industry. Version 4 (December 2004) of e-Compendium contained 3715 records. At present, version 5 is under preparation and more than 4000 records are expected. More links to relevant internet databases are implemented.

Discussion: Described system improves quality in clinical laboratories, serves as a powerful and complex educational tool for all specialties of laboratory medicine and supports standardization in clinical laboratories.

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Link Popularity and Other Quality Criteria Used in Evaluation of Paediatric Information Resources on the Internet

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Introduction: Internet information resources in healthcare mostly lack a complex quality evaluation [1]. This fact may pose a serious danger of misuse of this information by health care professionals and more probably by the lay public. As it was previously reported, we developed Citmed, automatic online system for retrieval and appraisal of educational web pages related to the healthcare [2]. The main evaluation benchmark is a link popularity (number of links pointing to the particular site), which is a version of web impact factor, analogue of journal impact factor established measure of quality of scientific journals [3].

As a part of the system development process it was decided to broaden the scope of the web which is used by Citmed's automatic retrieval engine to acquire new resources while only health web catalogues were used so far. Since the most popular search engine Google™ uses link popularity as one of the main criterion for ranking its search results, it was hypothesized that this search tool could be used for automatic retrieval of new and potentially valuable resources. To test a quality of web-pages returned by this engine, we decided to focus on paediatric pages, as they are quite well represented on the Internet.

Method: Ten common search terms related to paediatrics were entered into Google™ one by one; search was limited to documents in English only. Out of each result list, the first 30 web pages were used for evaluation. Ranking of the web pages in the result list, type of the web pages (non-profit/commercial), ORIGIN of the web page (authorship, domain, country of origin), type of author (institution/individual) and presence of the HON code on the web page were recorded.

Results: 300 paediatric related web pages were reviewed. Out of all web pages 93% were relevant, 52% were created by non-profit organizations, 44% by commercial ones, 5% were of unclear origin, 91% were institutional, 88% clearly stated authorship and 65% had visible date of last update. The American web pages were the most frequent ones, followed by British, Canadian, Australian and other ones. The HON code was detected in up to 26% of them; on average, 37%, 23%, 18% of the pages that ranked at the first, second and third of the result list positions, respectively, had HON code.

Conclusion: The proportion of web pages of higher quality was relatively high. Especially, the pages found at the beginning of the result list, were more than third of the pages complied with HON code of conduct. Google search showed to be a useful search engine for quality resources, though, each found page should be always treated with caution and briefly evaluated by user or by editor of Citmed when considered for use.

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Legal Form Change of the Hospital and Impact on its Information Systems

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Introduction: Masaryk hospital in Ústí nad Labem, allowance organization, is the first hospital in the Czech Republic where mySAP ERP information system was implemented for managing economics, logistics and metrology linking into the hospital information system, pharmaceutical system and MIS. Now the hospital is waiting for the change of the legal form.

Methods: Change of the company is possible by many ways or their combination legally. Change of the legal form in allowance organization brings additionally the need to change its accounting. That means change in the configuration of the economic information system. But it is important that the closed down organization must still keep its separate accounting for some period. Which are the possible solutions of changes in the information systems of the organizations in changing legal form and the experiences in concrete hospitals are the subjects of this presentation.

Results: The change of the legal form of the hospital is not an easy step forward, but is possible and realizable.

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Health Information on the Net: From classroom teaching to learning through interaction

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Techniker Krankenkasse (TK), one of Germany's biggest health insurers, provides its clients with a wide range of health informations. Though the information itself is good and HON accredited, the form of presentation is not always. Health topics are mostly presented through narrative texts, with a didactic approach common to school and university teaching – but not fitting to serve non-health professionals. Texts on illnesses, symptoms and curation for example are often very long (e.g. a massive 2,200 words to explain all aspects of eye injuries through objects), do not contain any pictures an any other, interactive features. In addition, reading on the screen is often difficult, often boring and therefore highly ineffective. TK is convinced, that the Internet offers a wide range of possibilities to make health topics much easier to understand and to remember, even in the long run. Techniker Krankenkasse is currently developing some interactive tools, which are designed to increase the acceptance of the Internet as a source of health information for non-professionals and improve the effects of the Internet use regarding short- and long term knowledge. In Mednet 2005, TK will present some of its developments.

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The Safety of Internet Medicine

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Background: Increasing numbers of patients are seeking medical consultation and prescriptions on the Internet. Many physicians and commentators have questioned the safety and appropriateness of this trend.

Objective: To investigate the frequency of adverse drug reactions among patients of a busy Internet-based medical practice.

Methods: All Internet patients for whom the author had prescribed medications during a 24-month period and who had valid e-mail addresses were contacted and asked to provide feedback including any adverse drug reactions they had experienced. The main outcome measure was reported number of adverse drug reactions that led to discontinuation of the medication.

Results: A total of 15 such adverse drug reactions were identified, either from e-mail response or through previous reports. This is 0.08% of the 19,131 prescriptions written (excluding refills) and 1.5% of the 983 e-mail responses received. All identified adverse reactions were mild, requiring no action beyond discontinuation of the medication.

Discussion: The number of adverse drug reactions encountered in Internet-based practice is quite low. Routine use of computer-assisted medical history taking and prescribing may partially account for this excellent safety record.

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Evaluation of Efficacy and Tolerability of Losartan and Ramipril Combination in the Management of Hypertensive Patients with Associated Diabetes Mellitus in India (LORD II Trial)

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The study was conducted to evaluate and confirm the efficacy and tolerability of fixed dose combination (FDC) of Losartan and Ramipril in the management of hypertensive Indian patients with DMII. The study was an open, non-comparative, multicentric clinical trial conducted in eight Indian centres in 369 eligible patients with Losartan 50 mg + Ramipril 2.5/5 mg once a day for 12 weeks. The mean pre-study SBP was 154.93 + 16.25, which was significantly reduced to 128.67 + 11.44 at 12 weeks. Similarly the mean DBP was 92.26 + 10.19 at baseline, which was significantly reduced to 79.66 + 4.61 at 12 weeks. A significant mean fall of 26.26/12.60 mmHg in systolic and diastolic blood pressure respectively was observed at 12 weeks. The JNC-VII goal was achieved in 74.35% patients at the end of the study. The mean proteinuria at baseline was 226.9 + 333.5 ug/min, which was significantly reduced to 158.1 + 219.7 at 12 weeks. Dry cough was the commonest adverse event seen (10 patients). Good to excellent efficacy response was reported in 93.5% patients and 95.7% patients reported good to excellent tolerability to the treatment. The FDC of Losartan and Ramipril is an efficacious and safe treatment option in diabetic hypertensives.

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Medical Informatics Research Projects – New ways, new problems

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Organizational and research tasks in the Czech Republic in comparison with present development international trends were evaluated on the base of the detailed analysis of the present state of medical informatics research in the Czech Republic. The following problems were outlined for the Czech National Health System within EU:

1. Deadlines of project solving
 Some tasks with approaching deadlines have only started, so there is a danger of further necessary investments in foreign technology import, which may cause an undesirable long-term dependence on foreign “know-how”.
2. Coordination of research
 There is a need of more consistent coordination of health informatics projects financed from various resources, nor were strategic tasks defining new ways and development provided completely.
3. Use of current project results
 Many new tasks often declare basic problem elaboration, although these have already been solved and published within EU projects, especially 5th and 6th frame programmes. It would be more economical to adapt EU results to Czech conditions in many cases.

4. Evaluation of projects

A number of subjects representing commercial interests incorporated in projects planning, which can result in preferences of developer-profitable project. Many of them are not consulted in sufficient extent with specialists and non-profit subjects, which should be the necessary guaranty of objective evaluation and optimal decision process connected with the international development trends.

5. Topics of projects

There is a predominance of relatively expensive tasks connected with the use of technology information resources. A prominent part of important informatics projects connected with information resources is relatively limited. The mentioned facts should be discussed to reach the desired progress in the field of medical informatics in the Czech Republic.

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Integration of Medical Services Using Semantic Grid Techniques

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Introduction: Technologies developed for Semantic Grid [1] promise information, knowledge and resource sharing, as well as cooperation among dispersed specialists. They can help to deal with fragmentation and heterogeneity of information sources in the medical domain.

Interfaces of today's medical information and expert systems are described in machine-understandable form on syntactic level only, with semantics (i.e. meaning) available only to humans in the form of natural-language documentation. That requires involvement of human programmers every time such systems need to be integrated, unless rigid data exchange formats are used [2], which limits cooperation and sharing knowledge on ad hoc basis.

Semantic Grid builds on advances in two areas of research. Grid computing is concerned with coordinated and secure resource sharing (where resources can be processors, disk storage, data, knowledge, hardware instruments etc) and cooperation among geographically distributed groups of specialists. The current third generation of grid technologies is based on open communication standards (XML, Web Services) and extends them with state management and security mechanisms. On the other hand, semantic web [3] technologies are concerned with "giving well-defined meaning" to web documents, which allows automatic machine processing of their content.

Methods: Techniques of Semantic Grid allow giving well-defined meaning to information and services. The meaning is defined using ontologies, a technique developed in the area of artificial intelligence to capture knowledge about some domain of interest [4]. Ontologies are more than just classification systems or controlled vocabularies; they can contain inference rules and allow automated reasoning about

described entities. Ontologies written in standardized OWL language can be composed from smaller ontologies, enabling local management of knowledge, and shared over the Internet by all interested parties.

Web and grid services can be described on semantic level using references to entities in ontologies. Services' descriptions cover several aspects – the data they process, the functions they perform, quality of service, effects of execution [5]. The descriptions then can be utilized in integration of the services into more complex workflows.

Results: In our MediGrid project, a prototype design of a grid infrastructure integrating semantically annotated medical web services was created. It features a decentralized layer of grid services above a layer of primary semantic web services, which allows independent evolution of the infrastructure without affecting the primary services.

Discussion: Semantic annotations of services can be machine-processed and used in assembling services into more complex systems with little human intervention. With such help, the barriers in cooperation among dispersed medical specialists can be significantly lowered.

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The Quality of Information Resources on the Complementary and Alternative Medicine: Comparison of different evaluation methods

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Introduction: The complementary and alternative medical procedures (CAM) remain rather popular among the lay public [1]. People seek information related to these methods relatively often, either to learn more about the trivial or life threatening diseases [2,3]. The more the patients are scared by the condition, the more vulnerable to misinformation they become [4].

We aimed to evaluate the way the CAM associated information is presented on the internet within the Czech domain “cz”. A few mutually independent evaluation methods were used; the web pages focusing on the treatment of cancer and diabetes mellitus were subject of evaluation.

Methods: The web page popularity assessed by external users was tracked by measuring the number of the webpage visitors and the link popularity, i.e. number of the external hypertext links to the particular webpage. Furthermore, a score system, formulated during the project “On the Alternative Medicine

Objectively” [5], was applied in the case of different variants of CAM methods recorded at the evaluated web pages. The relation of these methods to other techniques, seen as competitive ones, was evaluated. The Sandvik score system [4] for assessing the quality of web pages was also applied. The level of concordance between the results of evaluation done by experts (medical doctors) and by the lay public was measured as well as the congruity of pooled Sandvik score results with the outcome of Rankmed [6] a system providing automated quality measurement of healthcare related information resources using parameters recommended by the Health on the Net Code (HON).

Results: The quality of web pages dealing with CAM related information on the treatment and prevention of cancer and/or diabetes in the scope of the “cz” domain is highly variable in all studied evaluation criteria. Some of the web pages scored quite well in one parameter implying good quality resource, however, when the other parameters were used, the overall outcome was rather poor. A very good correlation between the results yielded through the more subjective Sandvik score and the computerized Rankmed rating was detected, thus showing equality and similar applicability of both approaches. The ability of the respondents representing different medical specialists as well as the lay public to assess the quality of CAM information was found satisfactory.

Conclusion: The use of multi-parametric quality evaluation systems should always be preferred while the application of one or only few criteria may overly narrow the analysis and thus introduce objectionable bias. The usage of such complex assessing systems maximizes the probability of detection of the webpage flaws. Because of the growing number of CAM related web pages and their users, it is virtually impossible to perform complete evaluation of all resources. The possible solution seems to lie in a provision of accessible public tool that would enable the web users to appraise the quality of the webpage of interest through measurable objective parameters.

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Bulgarian Drug Agency’s Web Site as a Source of Information and Communication

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Introduction: The goal of the presentation is to describe the main features of Bulgarian Drug Agency’s web site as regulatory web site and the drug information it provides intended to meet certain criteria and needs.

Method: An analyzing description method has been used to outline the agency’s web site content and its potentiality as a source of different type of information. Statistical data will be presented to show the how it is accepted by the public.

Results: The web site of the Bulgarian Drug Agency /BDA/ (www.bda.bg) meets the following criteria:

- Accessibility – in terms of payment and language: the access to the web site is free, and its content is organized in bilingual manner – part of the information is presented in English, too
- Financial independence – it was made in 1998 by the team of the Information Technologies Department and funded by BDA's budget;
- Scope of information – BDA as a regulatory agency is in a position to cover different kind of information on all authorised medicinal products in the country. This information is organized in registries, OTC list, drug utilization data, specialized bulletins, and pharmacovigilance data;
- Type of information – the information provided could be classified as administrative – BDA'S structure, activities, functions, annual reports, vacancies, post marketing safety measures, latest pharmacovigilance news; legislative – law and regulations, good practices; statistical – market analyses. Making the summary of product characteristics (SPC) and Package Leaflets (PILs) of recently authorized medicinal products also available on the web the public is provided with unbiased and evidence-based information, which is one of the prerequisites for rational drug use. The regulatory agency bulletins published on the web site – Drug Bulletin and Adverse Drug Reactions are industry independent and the information they provide is mainly pharmacological, toxicological and clinical.
- Updating frequency – the information is updated on a regular basis, a weekly basis, a monthly basis, and an annual basis.

The target audience of the web site is among governmental and nongovernmental institutions, industry, science and health care professionals, patients and other interested parties. The provided information could be useful for the decision – making process when making health and drug policy at different levels.

The system for on line submission of adverse drug reactions (ADRs) is a tool for communication between the agency and health care professionals. It started in 2004. In 2004 4 (four) ADR announcements were received as on line submissions compared to 115 received as yellow cards by mail. For the period January-June 2005 11 (eleven) announcements were received by mail as reprints, compared to 60 (sixty) received as yellow cards. Data interpretation will be made at the last stage of compilation of the presentation.

A 65-day initiative has been undertaken to follow the reviewers of the web site. The observation made showed the following figures: average numbers of daily visitors – 44; average numbers of weekly visitors – 263; visitors from different countries in Europe (Bulgaria – 1100, United Kingdom – 37), Australia – 29, Asia.

Discussion: The BDA's web site is an appropriate source for obtaining information about medicinal products in Bulgaria. By having a reliable, accessible, up-to-date and open web site the agency can increase its efficiency and efficacy while in the same time being recognized more transparent in its regulatory work.

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Shared Information in Patient Care and Follow-up

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The Austrian Pediatric Hospital of Gyumri (APH) is the only pediatric hospital in the Shirak region. The Hospital is equipped of twenty computers linked in an internal network, which allows information sharing between different departments. The system works through a database in which detailed information about indoor and outdoor patients is entered.

Since April 2005 APH has also a Web site (www.oks.am) where people can see detailed information about the hospital services, can receive free consultation, can apply to specific doctors for treatments and they can take medical appointments. The site is also a way to follow up patient status once they are out of hospital. We have used HTLM, XML, Macromedia flash, PHP, Macromedia dream weaver, Java, Applet and other programs. The APH Website had 980 visitors in four months from which 578 are hospital patients. We believe that this method should be developed further, because shared information in patient care is a prior condition to medical service quality. This encourages the patients to have regular contact with doctors, to receive answers to their questions and to be treated on time. Also, It is a transparency achievement about hospital services and activities which we need to gain trust among the population.

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Quality Initiatives for Online Health Information: Are they equipped for total quality?

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Parallel to the proliferation of health web sites, several attempts have been made to promote the quality of online health information through development of quality criteria sets and guidelines. In 2003, we questioned the contemporary method of quality initiatives to select and formulate quality criteria. The employment of only an empirical “bottom-up” manner in defining quality had led to a fragmented and incomplete notion of quality. According to the alternative we suggested, a better understanding of quality would be gained through a top-down approach. We proposed a framework of warranted trust, using the following four main dimensions of total quality: the epistemic, ethical, technical, and economic dimension. We are currently studying how the criteria used by some of the main quality initiatives fit into the framework of total quality. Through systematic analysis of requirements and principles in the criteria sets we analyze in more detail the various aspects of quality embedded in the four main dimensions. We also examine how well the various criteria sets are fitted to express or measure total quality. Results will be presented at the meeting. Our analysis will help information formation providers to better address various aspects relevant to the quality of their web sites.

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Interactive Telemedicine through Satellite

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Healthware is an EU co-funded project whose target is to implement and test pilots for a “Standard and interoperable satellite solution to deploy HEALTH care services over Wide AREAs”. It aims at validating and stimulating DVB-RCS based telemedicine solutions which offers satellite reception and transmission capabilities from anywhere, solving terrestrial network problems, and provide rates that allows to run interactive applications based on videoconferencing.

The project will favor 3 themes (Chronic respiratory diseases, Cardiology, Oncology) in 4 preferential applicative domains:

- Services at home for patients monitoring and remote assistance.
- Medical training for dissemination of medical knowledge towards medical staffs, nurses, auxiliary nursing staff.
- Second opinion for interactive video-communication between medical experts, sharing documents, etc.
- Teleconsultation for interactive video-communication between patient and doctor.

The scope and objectives of the project will be presented in order to invite hospitals, whose telemedicine applications may be potential users of the pilots or future operational services to join the “open user group” which will support the project by expressing their user requirements and validating the pilots from that viewpoint. More information is available at <http://healthware.alcasat.net/>.

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Web Based Software for Growth Diagnostics

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Introduction: Body height and body weight are the most common anthropometric values that are observed in children by their parents. Basic anthropometric measurements are also a common and natural part of routine medical checkups in infants, children and adolescents. Although commonly taken, this data is not always correctly interpreted: cases when anthropometric data might have served for an earlier diagnosis of e.g. an endocrine disorder still occur frequently [1].

Methods: To facilitate utilization of the growth data by parents and paediatricians, software system was developed that visualizes the data and also provides a basic interpretation. This software was written at the auxological (auxology is the science of growth) department of the 2nd Medical Faculty, Charles University. It consists of a knowledge base, its interpreter and the HTML-based graphical user interface. This platform-independent system is offered to software developers for integration into their GP systems; it will also be released as an Open Source project.

The knowledge base of paediatric auxology was prepared by expert anthropologist, specialized on children growth assessment and it contains the ontological representation of the current auxological knowledge [2]. The architecture of the system also allows full independency of the graphical user interface, described in HTML, from the interpreter of the knowledge base.

The knowledge base core interpreter, called Growth2002, makes no assumptions about the data it manipulates with. All the information it works with is dynamically acquired from the knowledge base. Its main tasks include:

- To visualize probands' measured growth data based on the ontological description of growth, stored in the knowledge base and helps the user with interpreting the growth data.
- To maintain the proband's database (SQL server or simple XML file). The knowledge base is queried for the variables stored in the database for each proband.
- To display the proband lists to the user, if required.
- To allow selection of probands from the database. Proband selection influences the visibility of the hypertext chapters viewed by the user.
- To dynamically display dialogs for entering data into the database (again it queries the ontology in order to recognize which of the input fields, how described and in what context it should present to the user).
- To allow the creation of specialized DSTs (Diagnose Support Tools) not only from paediatric auxology, but also in many other areas, for which there is a consistent ontological description available (e.g. pulmonary functions, neurology).

Results: The core Growth2002 interpreter is currently being distributed free of charge to all paediatricians in the Czech Republic as a part of a package named Compendium of Paediatric Auxology ("Kompendium pediatrické auxologie 2005" [3]). The Growth2002 interpreter, together with all of the relevant documentation, is being published as an Open Source project on the sourceforge.net public repository [4].

Discussion: Towards the user, the software behaves as a hypertext containing only the relevant information about the selected child's growth. When there is no active proband selected, the software only displays static hypertext chapter named "Body height", which contains general information about its relevance, grow charts constructed from reference standards etc. When the user selects one of the probands, the chapter "Body height" changes – it displays the proband's growth charts, tabulated data and important information selected from the original chapter. If the software knows the height of proband's parents, the chapter also contains the final height prediction of the proband. Finally, if the selected proband is a girl, the chapter contains pubertogram with the menarche date and hyperlink to the chapter describing the influence of the puberty on the body height.

By making this software available to the wide public (web dissemination, distribution to Czech paediatricians and opening it as an Open Source project), we aim to support the quality and improve the availability of proper growth diagnostics.

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XML as a Technology to Support the Information Management in Public Health Administrations

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Introduction: Internet technologies have been traditionally used by public health administrations to share administrative information through conventional web-based information systems and in other cases as a communication tool. Health administrations demand flexible Information systems able to support the collection, processing, storing and delivery of health and administrative information. That information is often dynamic (normative and information structure change frequently being necessary to modify the collecting forms and reports), demands several reports to different stakeholders (i.e. epidemiologists need incidence reports and decision makers want trends reports); requires interoperability with other health information systems and it needs to be adjusted to the heterogeneity of healthcare establishments infrastructure: operative systems, low-processing capacity, etc. XML (Extensible Markup Language) is as a key technology to deal, in an integrated way, with the flexibility, interoperability and heterogeneity requirements of information for Public health administrations. A further result of this research is a generic architecture for the Information systems development and also a methodology for the design of such architecture.

Methods: Due to no methodology were found for the design of such generic architecture for health information systems, we first developed the desired methodology. The methodology is based on the main concepts of MDA (Model Driven Architecture) and is driven by the Unified Process (UP). The methodology consists of four well-defined UP stages: *The Domain Model, The Business Model, the Use Cases Model and the Analysis Model* [1]. The outcome of the architectural design process is a set of UML design classes grouped in packages. The architecture separates the functional requisites and the non-functional requisites as shown in Fig. 1. Taking into consideration that the functional requisites are specific for the business of each Information system, we obtained our functional requisites from a public health surveillance department in a health institution in Colombia.

This organization's main business is the surveillance of communicable diseases and in consequence the main packages found where: *collection, EHC Repository, analysis, case repository, reports management and users management* (Fig. 1(a)). On the other hand, the non-functional requisites of flexibility, interoperability and heterogeneity of health information where also modelled and included in the metadata and data communication packages. Other significant non-functional requisite included in the architecture where the security and scalability represented by the three layers separation (model-view-control) and client/server architecture. (Fig. 1(b)).

Results: A XML-based information system to support the epidemiological surveillance in a province in Colombia and based on the above architecture was developed. A report of the real use of the above tool is present in [2]. The use of XML metadata and documents lets us to cope with the functional requisites of the system: *collection, store, analysis and delivery of epidemiological data*; but also to complete the non-functional requisites of *flexibility, interoperability, heterogeneity and scalability*. XML allows the dynamic creation (through a XML forms editor) of the collecting forms; the information processing and dynamic generation of reports through XSLT transformations; the storing of information as XML documents to deal with the heterogeneity of systems and communication networks and the

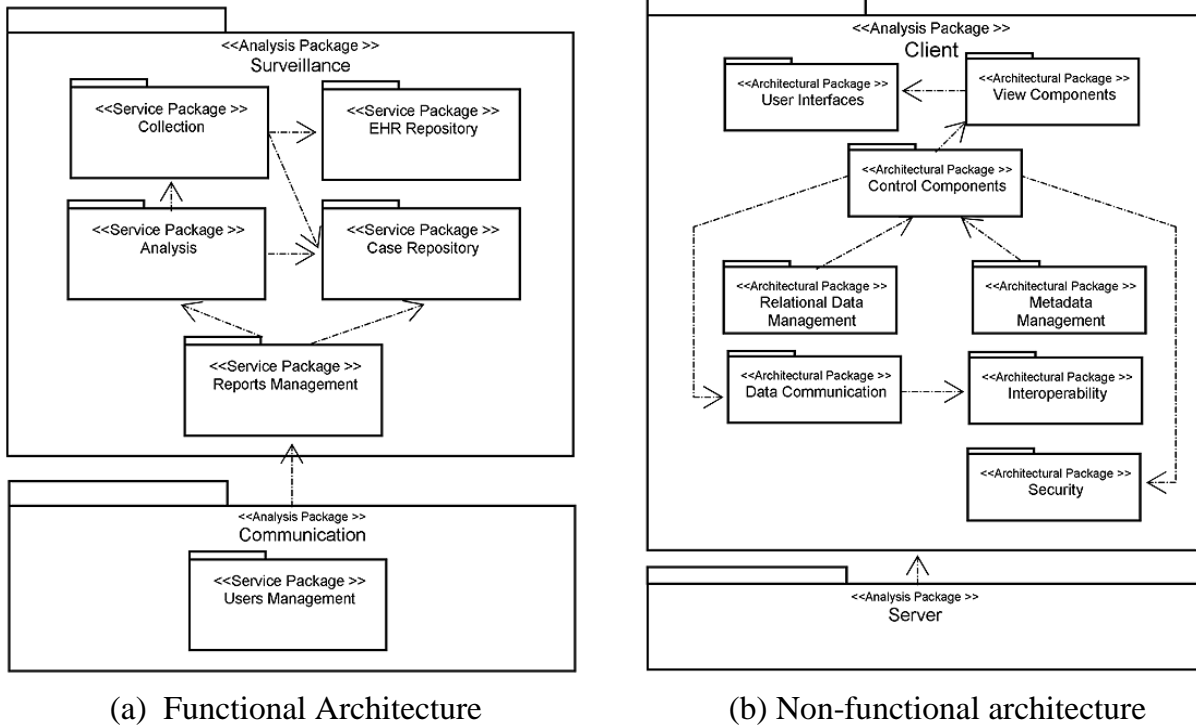


Fig. 1. The proposed architecture.

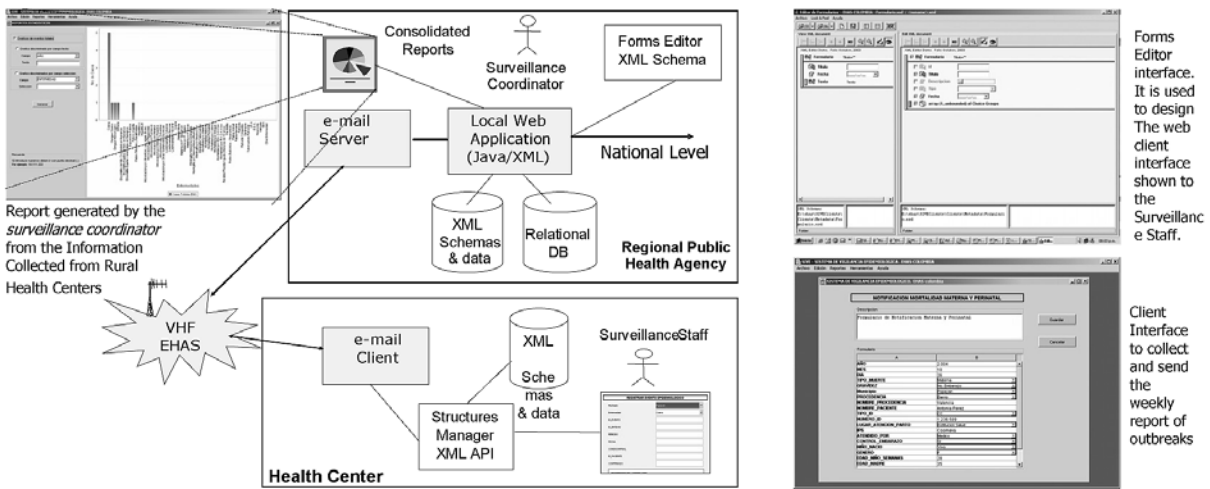


Fig. 2. The XML public health information system.

data interoperability when structuring the information as metadata files. Figure 2 shows the System architecture and its main functionalities.

Discussion: We found that XML is the right technology to implement the designed architecture because it easily implements the mentioned non- functional requisites and also covers the information

management needs expressed in the functional requisites. In addition, the architectural approach of this research provides reusability and scalability preserving the knowledge acquired during the system development.

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The Use of New Technologies in a Medical Unit. Case: obstetrics and gynecology

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Introduction: The purpose of this study is to demonstrate increased efficiency in a medical/research unit using new technologies. The investigation's nature is comparative and descriptive.

Methods: In this particular case, Obstetrics and Gynecology, we compared manual registry of breast and cervical pathologies, colposcopy images, monthly births and congenital malformations with use of new technologies. We measure the goals based on optimisation of resources and time. We consider 2 variables, resources: "human" (necessary personal) and "aterials" (equipment and physical space), and time: days to accomplish the task. The periods were, "A" (January-April 2004): the case registry process and analysis were done manually, and "B" (May-August 2004): a computer, peripheral equipment and internet were incorporated.

Results: The results showed a better approach of the human and materials resources. During period "B" less personel were employed (75%), and better arrangement of the space (13.2% of total area). The time was minimized (89.6%) from 15 days to report the cases in period "A" to 2 days in "B". The annual report was obtained in 2 days instead of 40. Moreover, it facilitated the case diagnosis, the organization of the medical records, participation in teleconferences and the medical instruction of OB/GYN residents and medical students.

Discussion: We ratify that the use of new technologies apply to medical units would increase its efficiency and allow the optimisation of the statistical work, and the registry of cases with imaging support, in relation with human resources, availability of space and time.

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Evaluating Embedded Mobile Internet for Remote Patient Monitoring Applications

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Advances in mobile internet technologies have facilitated the development of remote patient monitoring through lightweight and low power devices. To permit total patient mobility, an embedded device has been integrated with the GPRS technology and an online data analysis system to create an early warning system for life-threatening conditions. The strategic approach to a remote patient monitoring system uses TCP/IP over GPRS, a widely accepted and used mobile technology. The focus is on the security issues concerning the transfer of confidential medical data over the internet medium using secure mechanisms such as secured shell (SSH). The devised architecture ensures near real-time response to critical conditions whilst allowing long term trend analysis concurrently. Various implementations are being evaluated and recent results show that a patient can be monitored using very small amounts of data transfer by specialised doctors remotely. The security implementation for transferring various health's related parameters have been considered in the context of both data authentication and integrity to an online database. The system could deploy "control" filters, defining upper and lower limits for analysing specific medical data and a patient's ID number, thus making the process "anonymous" to all, except authorised users.

*Corresponding Author: Khamish Malhotra – kmalhotr@glam.ac.uk***Nurses Satisfaction with a Wireless Nurse Information System**

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Introduction: As a complement to the existing Medical Information System a Nurse Information System was tested in some clinics of the Ticino Cantonal Hospitals Corporation. We were initially very

sceptic about the introduction and success of such system, mainly because of the few knowledge about computers that nurse personnel that work in our institutions have. A program for instruction of nurses on PC operating systems and on the Nurse Information System was carried out. After some weeks of use every person in the department was able to use correctly the system and also satisfied with it.

Our experience: The Nurse Information System consisted basically of three modules, the Nurse Anamnesis, the Clinical Diary and the Vital Parameters, distinguished from but integrated in a more complex Medical Information System. Every component of the nurses system was discussed in an “ad hoc” group for acceptance of the solutions and elements that were going to compose the modules. Even the trolleys model on which the computer were going to be placed have been discussed in the group. It was clear from the beginning that as nearly all details of the project were going to be discussed and decided in the group the acceptance would be greater compared to an imposed solution. All persons have received instruction about the operating system and about the operation of the information system and an instructor remained in the ward during the first days of use. After three weeks of utilisation of the system questionnaires have been sent to all members of the team in order to explore the acceptance of it and the problems raised with the laptop computers and the wireless system. In general, the functionality of the whole information system was well accepted. Some problems came from the laptops, most of them due to difficulties in the use of the keyboard, without a numeric pad and due to the use of the mouse, an optical model that did not work correctly on some surfaces. Two other aspects have to be mentioned, a first one that also doctors were very interested in the use of the laptops during the visit to the patients in the ward, the second one the positive impression that gave the availability of lab results and radiology reports in real time at the bed of the patients. Also written notes have been less compared to hand written ones and where also shorter than before.

Discussion: In the introduction of a Nurse Information System as a complement to a Medical Information system there is a need to pay special attention to three factors: An adequate planning for instruction on modern operating systems, on the nurse information system and time for the development of habits for the use of computers to register patient data is necessary; the Information System should be kept most simple as possible to promote it's use, adding new functions and possibilities later; the availability of the Medical Information System is necessary to make the system more attractive, having in mind that doctors needs and not the same as nurses needs.

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Teaching about Talking to Patients: A proposed e-learning approach

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Introduction: The purpose of this paper is to build upon recent discourse analytic work in shared decision-making in general practice consultations. Discourse analysis is a way of analysing the functions

of talk in terms of the way in which actions are accomplished such as decisions, assessments, explanations etc. This approach can be applied to medical education in terms of an on-line programme that takes students and practitioners through a series of discursive exercises that can encourage them to reflect upon and change their style of consultation to a more open patient-centred manner.

Methods: This work is based upon an approach to the study of conversational interaction in terms of transcribed general practice consultations. These are then analysed in terms of three main criteria: (i) the function of what is being said in terms of the action it performs, (ii) the manner in which it is constructed to accomplish such a function, and (iii) the extent to which there is commonality and variation in participants' accounts and descriptions as the result of pursuing a range of functions. This kind of discourse analysis focuses upon the medical consultation as an arena in which such matters as requests, explanations and treatment decisions are constructed along certain conversational trajectories.

Results: The key issues addressed in this approach are (i) the use of diagnostic questions and cues with the patient; (ii) acceptances and refusals for particular patient requests; (iii) the communication of medical risk; and (iv) the power of the doctor as agent in terms of pronoun usage. The areas can all be put together as an e-learning package through the generation of virtual doctor-patient interactions which can then be analysed for the purpose of self-reflective learning.

Discussion: Effective communication is vital in medical consultations and an e-learning approach that encourages professional development in this area through a self-reflective approach could have significant benefits for the way these are conducted and the clarity of outcomes.

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Understanding the Bio-Psycho-Sociology of the Internet Behaviour in Context: Patient's ill stress, coping behaviour

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Aims: This study originally analyses the circular relations between ill stress and Internet behavior, by investigating the bio-psycho-social variables that influence cardio-vascular patients to engage, or NOT, in proactive health promoting behavior, such as looking for medical information or support online.

Background: Internet is a great, yet questionable, resource for people coping with severe medical conditions, since they benefit from online medical information before, over and above their clinician's advice (Rice & Katz, 2001; Murero & Rice, 2005). I argue that little is known about the psycho-social factors that explain why others decide to AVOID the WWW and rely almost exclusively on their clinician's advises.

Results: In our analysis it appears that the person most likely to use the Internet to find information about a disease possesses an internal locus of control, is younger, educated, and have a problem-solving personality. Based on ultimate empirical studies (Murero, 2005), implications on the doctor/patient relation, patient's ill stress coping behavior and quality of online e-learning environments are discussed. This study benefits from an international and interdisciplinary collaboration, combining medical and social sciences.

Conclusions: The role of health care providers is central in providing high quality education and counselling to patients, both on line and off line..

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Quality of Medical Information on the Internet

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The emergence of digital technologies by the middle of the twentieth century had made a tremendous and dramatic influence on humankind's inventory of recorded data and information. The Proliferation of Information has reached exponential magnitudes with the Internet and the World Wide Web. This so-called Information Explosion has been even more marked in the biomedical domain; providing better access to scholarly communication and also enhancing research activities. Definitely the cycling time of research papers has come down, making the path from the labs to the press/media much shorter and smoother. Also the common man now has better access to such information which were till recently unattainable by him/her. But like a double-edged sword it has become imperative that this is something to be very cautiously handled when it comes to issues like quality and reliability. The emergence of newer publishing models like 'author-pays' where the author bears the cost of the publishing process, Open Access initiatives, Pre-print archives and the activities of the commercial establishments for pushing their products/services have all had their own impacts on this problem.

In the Biomedical World, majority of the successful e-Journals had evolved from their print counterparts where most of their content was put under strict editorial control and rigorous peer review. So most of them did not have much difficulty in carrying it through their electronic *avatars* as well. As with most aspects of publishing, peer review also got a boost with the modern Internet technologies. Moreover, to be included in standard indexing services like the *index medicus* (National Library of Medicine -NLM- , United States of America), journals have to fulfil certain criteria which again adds to ensuring the quality of the information published.

But with the advent of the later generation electronic only and open access journals with much lesser editorial and peer review, initiatives like the pre-print archives, where articles started appearing even before peer-review and lastly but most importantly, the non-journal information resources on the internet, issues of quality began to be addressed in a big way. Many studies evaluating the quality of health related information on the Internet were conducted several of them giving shocking or disappointing results. Considering the pervasiveness of the Internet in our day-to-day lives, this has got grave and far-reaching implications on public health scenario.

This is one of the greatest issues concerning biomedical electronic publishing today. Nobody can put a rigid control over the Internet and any attempts to do so will ruin the very nature of it. At least some of us who were there in the ICANN study group constituted for developing new top level domain (TLDs) thought that the WHO was coming forward with a proposal to start the licensing of health websites by

providing a “dot health” (.health) domain-naming scheme. But later press releases from the WHO made it clear that WHO had no intentions in policing the net. And when domains like .info and .biz made a foray into the market this proposal was slowly ignored.

The end users of information are the best candidates to take decision in this regard given the present set of conditions. Responsible bodies and governments should come forward a bit more vigorously to do something in this regard but at the same time without hampering with freedom of speech.

Some Quality initiatives

- The (HON) Code of Conduct
 - WRAPIN
 - MedCERTAIN
 - MedCIRCLE
 - W3C’s PICS
 - Internet HealthCare Coalition’s eHealth Code of Ethics
 - DISCERN aroup
-

A new niche area in Biomedical electronic publishing is emerging centred on these concepts of quality and reliability, and their indicators like authenticity, currency and peer approval. And today we have around a dozen of such ‘good quality’ initiatives where indicators of quality are identified and methods and tools being developed to evaluate them. So in conclusion, 4 key areas are identified in this regard where we can expect something to be done:

- Consumer/End-user Education.
- Encouraging self-regulation of health information providers. (Disclosure, content description with meta-information etc.) This may be tagged/labelled to the main information source using tools like XML.
- Third party evaluation, which includes peer-review, quality implementing agencies, computer software and feedback from users. Again this information should be tagged/labelled in a way that enlightens the user about the genuineness and trustworthiness of the information source.
- Enforcement of existing legislation, on fraudulent or harmful information sources and enacting new legislations wherever required.

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The Quality of Health Media Information on-line: Concepts, methods and evaluation

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Introduction: This study is about the credibility of digital information on line about medicine and health.

Methods: A sample of 33 digital resources from Spain was analysed, using three parameters: functionality, accreditation and credibility. 61 indicators were selected. The study was done between January 2002 and January 2005.

Discussion: There is a need for effective systems to evaluate Web sites about medicine and health.

Results: We propose to specially filter the medical and sanitary content, especially in mass media with on line edition, and to promote his diffusion with quality, by the social benefit that supposes, in addition to his scientific utility.

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Hybrid Courses of the European School of Genetic Medicine

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The European School of Genetic Medicine (ESGM) has been offering advanced training courses to young researchers in the fields of Genetics and Genomics for eighteen years. Until now, these courses had been offered exclusively at the ESGM's Main Training Centre (MTC) in Italy. Today, using web-casting technology, the ESGM is offering its courses to students without requiring them to invest time and resources for travel to the MTC. These virtual courses are offered at ESGM-authorized Remote Training Centers (RTC) all over the world. At each RTC, ESGM lectures are shown by live web-casting, while discussion sessions and workshops locally organized by RTC faculty follow. In order to maximize interactive learning during these sessions, student questions are collected and emailed to ESGM faculty at the main site and answers are web-cast live to the remote sites. Remote Training Centers can be located within universities or other institutions of higher learning, research institutes, hospitals or clinics. The European Genetics Foundation (EGF, the governing body of the School) selects

the most appropriate institutions among the entire candidate RTCs on the basis of faculty availability, lecture space, technological resources and student enrolment potential.

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An Internet Intervention Outcomes Study of Overweight School Children

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Childhood obesity is at epidemic levels worldwide, with serious associated health consequences. Barton Schmitt, MD, a self-care advocate at the University of Colorado, recently stated, “We have over-medicalized obesity; we don’t have the resources or funding to treat all these children and adults in a medical setting.” A self-care Internet intervention was studied. By means of an interactive website overweight children may: 1) find information, 2) interact with other overweight children, 3) self-monitor, and self-manage their weight. In a study previously presented at MedNet, 1237 Children/Adolescents participated, 520 (42%) dropped out, 148 (12%) had questionable (spurious) data, and in the remaining 516 the mean BMI percentile decreased by 14%. It was hypothesized that the high drop out rate was due to lack of interaction with a real person. A 9 month study has thus been initiated using the same self-care intervention, but with the addition of school nurses and physical education teachers, acting as online mentors to overweight Alaska school children. Message templates are used to leverage the mentor’s time, in a pre-designed guided program. Mentors may edit the templates, and insert images or links to resources. Preliminary results will be presented.

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Internet Anonymity, Advantages and Disadvantages for Healthcare

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The Internet allows patients with stigmatized conditions to anonymously seek disease information and interact with patients with the same conditions, without fear of embarrassment. For example, 69% of overweight children are too embarrassed to ask a health professional for help with their weight. 50% of children with bedwetting likewise are too embarrassed to ask a doctor for help. Internet prescribing is controversial; however, medications for embarrassing conditions, e.g. erectile dysfunction, are being prescribed without seeing a doctor face-to-face. Anonymous Internet surveys can reveal research information that it is not possible with real world surveys. Causes of medical conditions not previously known and “closet” conditions can be elucidated. Disadvantages of Internet anonymity include: 1) Impersonation of stigmatized conditions by predators and pedophiles, 2) Fabrication of negative and positive consumer reports by competitors on devices or treatments, and 3) Obtaining hazardous treatment, e.g. individuals with eating disorders obtaining advice on dieting, and a youth obtaining Viagra. Security procedures can be used while still preserving key anonymity, e.g. a contact phone number to prevent minors from obtaining meds. IP address detection can track pedophiles and block postings on bulletin boards and chat rooms.

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The Art and Science of Creating Electronic Health Records – Report from the real world

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We present the pioneering work in the field of transforming historical data locked in paper medical records of British General Practitioners into quality assured and consistent and complete coded information that helps create useful electronic health records. The authors describe the methods used in creating a clinically agreed protocol of clinical entities coded to the UK NHS Clinical Terms (Read Codes). They describe the regulatory compliant technology to access imaged paper records remotely using Internet secure technologies; the process of summarisation of imaged records by medical practitioners; and the integration of summaries into the patients' EHR within the clinical information management systems of general practitioners. The authors will report on 18 months of work, highlighting their experience of handling more than 10 million pages of records and the extraction of more than 1 million items of coded, consistent and accurate data. The authors will describe the quality assurance methods they deploy to ensure the accurate and consistent recording of data. They will present the methods used in introducing newly qualified doctors to health informatics and the training programmes that equip them to deal with any clinical information management system and any clinical classification and coding system, from Read to SNOMED CT.

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Interactive Digital TV: An experiment on the dissemination of content in the health sciences via the internet

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The Digital Multimedia Library Project aims at disseminating free on-demand and real-time media-rich content using simultaneously Internet and satellite IP broadcasting. We generated video lectures via a videoconference link at 512 Kpbs to the data and satellite hub. Compressed copies of all video streams are also stored at an on-demand high-capacity (2 Tb) server. Four series of TV programmes with 20-30 min lectures on health topics were delivered by experts. Interaction between remote participants and lecturers was achieved by means of a Web-based Virtual Auditorium, integrating a video player with a text-based chat room, as well as providing access to slides, articles, links, quizzes, etc. This system was also used to deliver several on-line courses with synchronous and asynchronous video lectures on several subjects, such as neurosciences, occupational health, oncology, etc. The combination has proved to be a very cost-effective and efficient way to deliver interactive digital TV either via satellite broadcasting supplemented by a terrestrial Internet link, or via an entirely Internet-based solution. Bandwidths of 34 to 256 Kbps have been tested satisfactorily.

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DEC-NET: The first european register of clinical trials in children

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Introduction: Registering clinical trials in public registers before they start may prevent publication bias, promote collaboration among research groups, inform the public, and increase dissemination of results. None of the numerous existing registers are dedicated specifically to children. A web-based register of trials on drug therapy in children named DEC-net (The European register of clinical trials on medicines for children -Drug Evaluation in Children) was therefore developed by a network of four groups from Italy, UK, France, and Spain, with the support of the European Community as part of its Fifth Framework Programme, Thematic Programme “Quality of Life” (contract QL4-CT-2002-01054). The aim of DEC-net is to provide the scientific community and lay people with a flexible, free, and independent tool for disseminating clinical trial information concerning children.

Methods: The DEC-net register has been implemented on a web server running the Microsoft Windows Server 2003 Standard Edition, the Internet Information Services Version 6, the Active Server Pages 2.0 web development environment, and the SQL server 7.0 DBMS. ASP language and CSS have been used to generate dynamic pages. The application is compliant with the standards supported on all popular browsers.

The set of trial data to be collected fits the criteria set out by both the International Committee of Medical Journal Editors and the WHO. The main variables considered are trial identification, recruitment information, eligibility criteria, trial characteristics, study drugs, trial results, study sponsor, and location information. The ICD-9 and ATC systems have been used to classify the diseases and drugs involved and to automatically translate the terms into the language requested by the user, since the database is designed to allow access to the register in several languages. Text fields have been collected both in English and in the language of the country where the study is located (Italy, UK, Spain, and France) and the labels assigned to the coded fields and graphic elements used to compose the web pages have been translated in the four languages as well and stored in a dictionary table.

Results: The register is publicly available at <http://www.dec-net.org> and includes more than 180 planned or ongoing trials in the four partner countries.

An administrative module allows authorised users to enter, correct, and handle trial information. Data-entry is distributed across nine screens. Data checking and validation are part of the data-entry process. A modification function allows authorised users to correct data, complete missing information, or update data that may vary over time. A monitoring function can be used by the national co-ordinators to monitor overall country data-entry status. A search module allows the general public and health care professionals to search the register in several languages and in two different formats (one is suggested for professionals and includes more detailed information). The browsing module enables users to browse the register’s trials using a hierarchical list of conditions involved. The resulting pages illustrating trial details are composed by extracting text fields and labels from the trial records in the appropriate language. Security tools including firewalls and passwords have been implemented to protect the register against intruders an unauthorised use.

Discussion: The DEC-net register is the only paediatric, population/oriented trial register. Differently from existing registers, DEC-net can be accessed in several languages. The system’s architecture is flexible and could be used to register clinical trials in other medical areas without significant modifications.

DEC-net represents the beginning of a long-term project and we hope its use will be extended to other European countries.

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Standardization of Informed Health Self-Care

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Using multimedia form and interdisciplinary approach, authors suppose, that well informed patient is a better partner for physician in the prevention and clinical decision making. Such a patient will have good basis for optimal self-care, rational utilization of health care and good premises to ask and obtain the standard care of high level of quality and, thereafter, fairly contributing to the amendment of the health care as a whole. Authors are coming out of their experience and knowledge of population, attitudes, needs and behaviours of patients both in the dynamics of health and illness. Recommended diagnostic and therapeutic guidelines are instruments to be used by general practitioners to assure comprehensive enhancement of the quality of care. Equally, they represent the description of the actions, which could be expected by patients in various clinical situations and settings. These materials represent good basis for laying explanation and instructions for the utilization of health services, respecting the societal views of increasing interest for information concerning health protection and promotion and increasing responsibility for every person's own health, too. Web application, printed materials, innovated guidelines and standards will be the project outputs and preliminary results that will be presented.

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Services and Informatics System in a Healthcare Company: The problems of management and privacy law

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The informatics system in a healthcare company is an essential component of the management and it need to carry out an integration between many functions. To move many information, to gain access in a large and complete data base, in health record and file of patients, in the budget and control cost are usual application in informatics engineering of healthcare company and concern a strategic role for management. To gather personal data of the patient is a delicate function and the question is to define

a correct privacy policy: the nature of gathering information, the reason and the procedures of their employment, the doctors and health operator of the company by password and security to access. The informatics system can be defined as a platform that offers his capacity for ever unit to link by others and to manage internal operations by different way. The platform must include different functions: integration server, application server and object database. The protection of the privacy need the informatics system must consider the correct implementation in policy, process and very sure software solution. Furthermore is an important attention to manage data of people and to respect the new privacy law.

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Web Driven Technologies to Help the Busy Cardiothoracic Surgical Practice and Offer Hope for the Development of Similar Portals in Other Specialities with Benefit to Patients

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Introduction: 21st century is the era of Information technology. There has been a explosive growth of information in Medical Sciences over the past few decades. In order to keep pace with this rapid growth of information, there is need for continuous updating of medical science Knowledge. The use of print media alone will not be sufficient to keep track of all the developments in Medicine. The increased information has also to be rapidly disseminated to the end-users. The main end-users in this decade has been not only Medical professionals but also allied health professionals. There is also burgeoning awareness in the patient community to acquire necessary information.

Methods: Internet and web based technologies will offer a tremendous boost to offset this deficiency in accessing the information. The development of a website: www.ctsnet.org which exclusively helps the Cardiac and thoracic Surgeons (CTS), has resulted in immense growth in knowledge base and helps CTS practice. It begun in 1999 has grown in 7 years to a site that contains about 50 gigabytes of information.

Discussion: This website has several innovative features like video sessions, interviews with experts and also current technological developments in area of Cardiothoracic Surgery. There are also innovative technical sections which help to improve on the continuing medical education in Thoracic Surgery Speciality. Among the other features is training section which helps the trainee surgeons to incorporate the current state of the art techniques. Also there is a feature which lists the current conference schedules and events. This helps Surgeons in the busy practice to keep abreast of current developments in this speciality. This can also serve as informative source for patients requiring authentic web information about Cardiac diseases since the contributors are experts in their respective domain.

Families are utilizing the Internet to educate themselves about congenital heart disease. Most parents consider the process easy and the information obtained helpful to the understanding of their child's congenital heart defect and surgery. Internet use in this patient population is expected to increase in the future [1]. Scherrer-Bannerman et al. assessed the effectiveness of two methods of patient education, a printed manual and a Website, provided to patients waiting for cardiac surgery. Findings supported the feasibility and viability of both formats. However, the Web-based format demonstrated two additional benefits over the print-based format, namely increased social support and decreased anxiety. Other findings included the perception of increased support, lifestyle changes and more positive attitudes towards the impending surgery [2]. A vast majority of patients are realizing the benefits of the Internet as a tool to educate them, both before and after surgery. Surgeons will see the benefits of Web-based education only when they ensure that their patients have access to adequate and credible health-related

information [3]. Although the Internet is a powerful tool for improving the health-care decision-making process, users should be aware of the potential for misinformation present in unprofessional Internet sites, and should always assess the source of information provided [4].

Conclusion: Development of similar online portals in other specialities will help in improving the knowledge base with benefits to the patients.

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Borderless Communication for a Healthy Europe

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The “Interoperability Initiative for a European eHealth Area” project (i2-Health) is supporting high-level health policy goals.

- Citizen mobility and borderless care are key European Union policy priorities, which are supported by the European eHealth Action Plan.
- While healthcare is being thoroughly transformed, proper interoperability measures have to assure that patient information in digital form is at least as accessible and usable as paper based data.
- Health policy makers, health professionals, healthcare providers and the IT-industry have to work hand in hand to assure the meaningful and secure exchange of medical data.

i2-health will identify requirements and submit recommendations for the deployment of interoperable eHealth infrastructures and services for trans-European use through the definition of (1) a generic eHealth interoperability framework and common approaches to (2) patient/professional identifiers and (3) prescribing and health data messages. i2-Health will call on all the relevant stakeholders to join forces.

i2-health will review existing approaches and pilot solutions, analyze use cases, perform need and gap analyses, and develop a concrete work plan towards a pan-European solution. i2-health is an initiative funded by the eTEN programme of the European Commission. More and up-to-date information is available at the project website: <http://www.i2-health.org>.

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Making eHealth Accessible for People with Cognitive Disabilities: Focus on navigation

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Introduction: An estimated 80% (~93 million) of adult Internet users in the US have used the Web to search for health information [1]. Accessing the Web to order prescriptions, schedule appointments, or respond to health intake questionnaires is becoming an everyday skill. However for an ~15 million people with cognitive disabilities, including people with developmental cognitive disabilities (DCD), brain injury, and dementia, there is a significant need for accessible consumer health information [2]. There are a number of well-known Web accessibility guidelines available but to date there has been little focus on Web accessibility for eHealth sites [3] and on cognitive Web accessibility generally [4]. Building on previous research [5], four cognitive components required for successful Web navigation were examined: (1) situation awareness; (2) spatial awareness; (3) task-set switching and (4) anticipated system response.

Methods: A mixed method design was used, employing a convenience sample ($n = 27$) of participants with mild to moderate DCD in five usability studies. The study protocol involved videotaping each participant as they navigated the ADD-Up (www.addup.org) or MedlinePlus (www.medlineplus.gov) W3C accessibility-compliant Web sites. The participants were asked to perform a set of tasks and to “think aloud” or to be “coached” through the step if they became stuck.

Results: The video data was analysed by both qualitative and quantitative methods.

Spatial awareness is the user’s awareness of how content is located in relationship to navigational devices like hyperlinks, menus, or the scroll bar. 52% of the participants could recognize hyperlinks, 33% could activate the hyperlink with out assistance and 48% voluntarily used the scroll bar. 48% of the participants required researcher intervention to perform activate a hyperlink, and the most prevalent behaviour was the random clicking of all text. External hyperlinks that created a new browser window were very confusing for 81% of the participants, e.g., they tried unsuccessfully to use the browser BACK button and several accidentally closed the browser.

Situational awareness is a user’s momentary knowledge of their surroundings, e.g., remembering the recent steps in their task. When asked to return to the Home page, 44% participants used the browser BACK button, several accidentally closed the browser and the majority (56%) required intervention.

Task-set Switching is the ability to quickly move from one type of task to another. For the mild group (33%) moving between tasks (e.g., typing, activating hyperlinks, selecting a menu item, recognize being at the right page) was less labor intensive than for the moderate group (66%), where typing in URLs and activating hyperlinks required direct intervention (78%).

Anticipated System Response refers to the user’s perception of how the Web page should respond to their action. The “email AddUp” feature was particularly problematic with unclear feedback about how to send the message, as well as to determine that it had been sent.

Discussion: This pilot study demonstrated that individuals with mild to moderate DCD can navigate the Web to varying degrees. However, even W3C accessibility-compliant Web sites presented barriers due to inconsistent navigation, unclear navigation feedback, non-standard interaction techniques, lack of perceived click-ability, and user inability to scroll pages. More research is needed to understand how cognitive disabilities affect the accessibility of Web-based media.

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Improving Collection of Health Information in Web Surveys Using the Scale-up Estimators Approach: A case study in injury prevention and control

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Introduction: The study of rare, severe diseases is often limited by the amount of data available in official statistics. Data on injuries due to foreign bodies (FB) ingestion are for instance usually available only about death or at most about hospitalizations. These data are often to be validated with respect to completeness and integrated to cover also injuries of lower severity, not requiring hospitalization. Approaching this problem using standard methodologies is quite difficult and inefficient, mostly because of the large sample size needed to obtain reasonable estimates.

Methods: The approach we are proposing is based on the idea of using a WEB survey (WAPI) approach integrated with an improvement of the scale-up estimators for estimating the size of a hidden population, like the actual number of injuries due to FB ingestion. The scale-up estimator is a novel approach to estimate the size of hidden or hard to count subpopulations, based on the concept of social networks. Respondents are asked to fill in a WEB data collection form about the number of people known in several subpopulations (of known size) and a subpopulation E (which size is to be estimated).

Assuming that the proportion of subjects belonging to E over the number c of people in the social network of a person is the same that in the overall population we get the scale-up estimate of the size of the target subpopulation E.

Results: Application of the data will be presented using data coming from the ESFBI-SUP study, where all the otorhinolaryngologists of Piemonte, an Italian region, were asked to fill in a WEB form about the number of people they know in several known subpopulations and the number of people they remember were hospitalized in their hospital for choking injuries in the years 1999-2000-2001 (the target subpopulation). This estimate was then compared with the hospital records of the Piemonte region about all injuries with ICD9 codes ranging from 931 to 934 which occurred in children aged 0–14 in the years 1999-2000-2001, showing a good degree of accuracy.

Discussion: Same approach is now being used in the Susy Safe project, an EU funded database for the collection of FB injuries in children, where such techniques are applied with respect to the general European population.

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Mobile E-Health Kiosks for Disaster Situations in Developing Countries

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Developing countries are often hit with natural disasters, such as Tsunami leading to massive losses of life and property. Unlike the developed world, developing countries (and their parts) are at different levels of technological infrastructure. The wireless mobile communication technologies offer the potential for developing countries to use recent advances in Internet-based services (e.g., e-health) for efficiently reaching services (e.g., healthcare) to remote regions in their countries. This paper presents our experience the development and trial of e-Health kiosks based on wireless mobile technologies for disaster situations, such as the providing help to Tsunami community health centers in Aceh. This work is being carried out as one of a few trials being conducted in various developing countries under the auspices of the “IEEE/ITU-D Mobile E-Health Initiative for Developing Countries”. The kiosks are being connected to main healthcare establishments in Banda Aceh and other parts of Indonesia through the Internet to distribute load amongst healthcare centers. The trials of these e-health kiosks (and other countries like India) are expected to assist us in proposing a framework for the development and deployment of e-health in developing countries through UN agencies and the WHO.

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Telemedicine and Telediagnosis: Distributed systems and integration

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Introduction: Advanced ICT instruments are continuously being developed to allow an extensive use of distributed systems for telemedicine and telediagnosis. In Italy these systems begin to operate but is still limited the development.

Purpose: In this study we explain some ICT systems: hardware and software, created to give support in situations of outbound operating conditions such as patients located in remote areas or zones of emergency.

Methods and materials: These ICT systems have in common some concepts of communication. The local health related instrument collect the data which are then sent to a remote center where are examined and evaluated to give specialist medical support at a distance also in real time. The systems to be discussed are as follows.

WAD is a wearable instrument that can give measures like ECG, heart rate, respiration, temperature (body and environment), SpO₂, 3D inclination and accelerations.

3D TMT is a compact pre-calibrated stereo visual system that tracks user's movements by means of suitable reflective markers placed onto the patient's skin. The data are these data are then sent via the Internet to a dedicated server and become available for a remote diagnosis by biomechanics and/or orthopedic specialists.

Daphne is a support for the evaluation of the neuro-psychomotor conditions of a person through the collection of kinetic and dynamic quantities.

Site Care is a mobile unit to support telemedicine and teleassistance to use directly on the field. The data acquired on the place of the emergency include: physiologic data, as the ones mentioned in the description of WAD and geographic data. These last information can be very relevant to guide a rescue squad in and out of the critical zone. The data can be sent via a satellite telephone so SC can be used in remote areas where communication channels are short.

Results: The integrated ICT systems are an effective support and planning action from a remote control center and patients that need a telecontrol improve effectiveness and healthcare, assistance in emergency or in telemonitoring.

Discussion: The benefit and costs of ICT system approach in healthcare is always of actuality for the management healthcare services and emergency, for increasing the quality and the customer satisfaction.

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Quality Control in Web-based Injury Databases: Techniques and standards adopted in the EU Registry “Susy Safe”

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Introduction: The study of rare, severe diseases is often limited by the amount of data available in official statistics. Data on injuries due to foreign bodies (FB) ingestion are usually available only about

death or at most about hospitalizations. These data are often to be validated with respect to completeness and integrated to cover also injuries of lower severity, not requiring hospitalization. Approaching this problem using standard methodologies is quite difficult and inefficient, mostly because of the large sample size needed to obtain reasonable estimates.

The “Susy Safe” project is a European, WEB based Registry (www.susysafe.org) aimed at collecting data on injuries due to foreign bodies in the upper aero-digestive tract occurred to children between 0 and 14 years.

Methods: The approach we are proposing is based on the idea of using a Web survey (WAPI), approach integrated with an improvement of the scale-up estimators for estimating the size of a hidden population, like the actual number of injuries due to FB ingestion.

Utilizing Web technology allows secure and timely case reporting, and also ensures an automated Quality Control process and a flexible access to data.

In our approach, quality control has been implemented in two levels. The first is automated based on classical data-entry controls and innovative statistical techniques mimicked from industrial quality control. An R engine is implemented to accomplish such tasks, interfacing with the MySQL database and the WEB server.

We choose to build our application using Java technology, the R engine and MySQL database server. Using open source technology (R and MySQL), combined with Java, gives us great flexibility and also gives us the insurance of a solution tested and analyzed by an entire community of professionals.

The second level is represented by dedicated medical doctors who check all cases with an insufficient quality score obtained in the first level control.

Discussion: Having a centralized data base and a Web access system, the QC process becomes more flexible, reducing both the number of the persons involved and the necessary time for accomplishing it. It also gives the physicians access to a large amount of data that otherwise is scattered through.

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Provider Use and Views of the Internet In Medical Practice

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Introduction: Internet based technology offers exciting new possibilities in medical practice capable of transforming healthcare delivery both from a patient and provider perspective. Faster and more accurate patient provider communication, data transmission, digital imaging, and remote patient monitoring are now all possible via the Internet. Current research confirms that patient's readily embrace and utilize the Internet in healthcare delivery when it is made available to them. Conversely, little data is available regarding provider utilization and views of Internet use as a means to deliver patient care. We hypothesized that major reasons for provider non use of the Internet in practice were lack of reimbursement and liability concerns. Increased patient demand for Internet use in healthcare coupled with the lack of information regarding provider perspectives for patient care justifies further inquiry.

Methods: A questionnaire was distributed to 52 physicians and nurse practitioners in Seattle, Washington to ascertain provider utilization and views about Internet use as a means to deliver patient care. Responses to nine questions regarding email, provider practice websites and websites for health information/patient education, and remote home monitoring were collected. Two open ended questions regarding perceived benefits and barriers of Internet and email use for patient care were also included. Responses were classified demographically (age, gender, practice location) and tabulated.

Results: All 52 physicians and nurse practitioners responded to the questionnaire. A t-Test was used for statistical correlation ($p = 0.001$). The majority of the providers were male (63.5%), between the ages of 40–49 (46.2%), and practiced fifteen years or less (73.1%) in an urban area (96.2%). 38.5% of the providers were in solo practice, 30.8% in group practice, and 28.8% were in hospital practice. The majority of the providers (96.2%) used the Internet. Younger providers age 30–39 were the most frequent users (57.1%). Providers in hospital settings (60%) were more apt to have practice websites than those in solo or group practices (30% and 43.8% respectively). Most providers, (94.3%) referred patients to a health website for healthcare information and or patient education. Hospital providers (53.3%) were more apt to use Internet technology for communication and patient care than solo practice physicians (40%) or those in group practice (12.6%). Few providers (30.8%) allowed patients to contact them via email. Of those providers that allowed patient email exchange, 76.9% allowed email communication for non urgent medical questions, and 69.2% allowed patients to email requests for prescription refills. If Internet access were available in a provider's office, 88.4% of those providers indicated they would use the Internet for patient care if they were reimbursed. Similarly, 78.8% would utilize the Internet for patient care, even if they were not reimbursed except for the barriers as listed below. Three-fourths of the providers (75%) replied that they would use web-connected patient home monitoring instruments for chronic diseases (HTN, DM, Asthma, or CHF) for their patients that would automatically email the provider the abnormal readings if they were reimbursed. The same number (75%) replied that they would use web-connected instruments if the abnormal readings were sent to a call center which would then contact their office. The study did not ask if they would do so if they were not reimbursed. Providers listed privacy and confidentiality concerns (28%), loss of face-to-face contact (18%), and lack of provider/patient computer knowledge (18%) as the main barriers to use of the Internet for patient care. Liability concerns were listed by only 6% of the respondents. On the other hand, providers listed patient education and information (20%), improved access to care (16%), improved patient communication

(12%), faster access to information (10%), less phone calls (10%) and documentation (8%) as the top benefits of use of the Internet for patient care.

Discussion: A surprising result of this study is that lack of reimbursement, which has long been thought to be the biggest barrier to Internet use for patient care, does not appear to be a significant deterrent. Rather, privacy and confidentiality top the providers' list of major concerns. This response may be influenced by fear and misunderstanding of HIPAA (Health Insurance Portability and Accountability Act) regulations recently implemented in the United States. Further research regarding provider perspectives on use of the Internet for patient care, with larger sample size, would be beneficial to medical educators and practice managers. Such knowledge would motivate provider technology training and address actual or perceived barriers to Internet use for patient care.

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MEDTEL – eHealth Promotion Network

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Non-profit non-state organization MEDTEL, promoting health telematics and e-health applications, including national and international networking established, together with 1st Medical School Charles University Prague, Institute of Informatics of Czech Academy of Science, Prague Economic Chamber and two IT SME's – IMA and APROKS, a project consortium preparing educational programmes, the training and consulting centre as well as other promoting actions in the field of health telematics and eHealth. The project is supported by the grant of the programme of JPD3 – Prague – European Social Fund. Main ideas, features, concrete contents of the project and the first lessons learnt will be presented and, the offer to participate in the e-health promotion network submitted and specified.

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Issues in the Implementation of Computer-based Medical Algorithms

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Introduction: A medical algorithm encodes one or more chunks of knowledge used to solve a clinical problem. Starting from simple rules-of-thumb increasingly sophisticated computational methods have been devised by biomedical researchers and published in the medical literature. Computer-based versions of these algorithms have a great potential to enhance medical care by supporting enhanced systematization and automation of diagnosis and treatment. These can help decrease medical errors, improve efficiency, and speed communication.

Discussion: A number of issues need to be addressed before there can be widespread use of medical algorithms. These include: content development, interface design, automation with enhanced functionality, and operations.

The number of medical algorithms available in published literature is large – probably in the order of 100,000 – and growing daily. Identification and encoding information of this magnitude requires ongoing cooperation between a large number of domain specialists. Delivery requires a content management

system with tools for search, retrieval, navigation and archival storage. Links back to the original literature are needed to validate the information. The ability to annotate the material and to include user comments can enhance the sharing of knowledge.

PDA's and wireless devices have made access of information at the point of patient care possible. The presentation of content must be able to adapt to the limitations imposed by small screens and constrained input devices. Integration of systems with the electronic health record (EHR) can significantly reduce input requirements and reduce data entry errors. However, there are a number of issues that make integration with electronic health records a challenging task. The system must be able to adapt to the needs of diverse users with different goals and knowledge sets. In addition, the system should be accessible by users with a variety of disabilities.

Software tools need to be developed to enhance functionality and automate tasks. These can provide feedback on algorithm selection and the evidence supporting its use. An algorithm can be automatically selected based its performance characteristics for a given patient or clinical situation. Tools can also be developed to simplify transportability of an algorithm to a practice environment different from the one in which it was developed.

A number of operational issues need to be addressed. The system needs to be validated for compliance with good manufacturing practices as specified by the US FDA or other regulatory agencies. User access needs to be tracked and confidentiality of patient records maintained. Systems must be in place to identify and respond to problems and to quickly notify users of failures. Finally, to serve as a global resource the system must be available in different languages and modified to the needs of different cultures.

Conclusion: The most efficient way to develop these algorithms and to develop the necessary software tools to utilize them is through a centralized bureau supporting the open-source model. This can utilize mass production techniques and economies of scale to develop a global resource. Local implementation would be performed by local health informatics professionals based on the needs and standards of care in the community.

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The On-line Czech Translation of MeSH

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The Medical Subject Headings (MeSH) have been produced by the National Library of Medicine (NLM), Bethesda, USA, since 1960. The MeSH thesaurus is NLM's controlled vocabulary for subject

indexing and searching of journal articles in MEDLINE, and other materials in NLM's catalogue. NML has developed and implemented an inter-lingual database of translations, the MeSH Translation Maintenance System (MTMS). This database allows continual updating of the translations, as well as facilitating tracking of the changes within MeSH from one year to another. The National Medical Library (NML), Prague, the Czech Republic, has used MeSH since 1997. The Czech translation of MeSH is used by indexers and cataloguers at Czech medical center's libraries. Our MeSH translators have encountered many difficulties as they maintained and updated their translation. Therefore, we appreciated the possibility of using the MTMS to manage our translation. The Czech translation of MeSH has been included in the UMLS and we started learning to use the MTMS module this year. We have converted our national version of MeSH from capital into mixed-case letters. We began to use the MTMS for the creation and updating of MeSH translation that is provided by our library.

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Czech Internet Medical Resources in the Medical National Library, Prague

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At present, there is a large quantity of medical information in the Internet. These resources are unique and more up-to-date than their printed versions. We have considered that it is important and useful to put these resources on record properly and make them easy and friendly accessible to an end user. Initially, the Internet medical resources were collected in the form of alphabetic index of useful references in the Medical National Library. Since 2003, there has been running bibliographical processing of free accessible mainly Czech full text resources and tutorials.

The acquisition of resources is done through excerpting from professional articles, recommendation of professionals or searching already created www pages. Subsequently, there is our assessment of resources in cooperation with PORTAL CITMED's team (which gathers and evaluates foreign and domestic medical Internet resources). The bibliographic processing conforms to valid international standards. Filed resources of NML's database are subdivided according to subject field and form of documents, regularly updated and refer to primary document proper. Currently, there are included approximately 950 records of evaluated resources in the database.

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Building an Information System "From Scratch"

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Introduction: Emergency medical service of Capital Prague (EMSCP) has specific requirements for information system functionality because of relative big amount of patients.

The information system used currently by (EMSCP) has as primary purpose to prepare reports about health care provided for Insurance companies and has become insufficient in other above mentioned

areas. Because no other relevant information system vendor was found on local market, the decision to develop such system “from scratch” was taken.

Methods: The analysis objectives were the creation of EMSCP object model and functional requirements specification that will be implemented in final system. Object model was prepared in team cooperation with EMSCP representatives. The quantity of information kept by each model’s objects was specified. The final system is developed using object oriented programming during analysis results implementation into source code. This approach makes system modular and extensible. Basic principles of Extreme programming are used in project.

Results: After application of standards for Management of information to object oriented analysis results the final metaphor of system was fixed. The model supports following requirements:

Authorization of data access and data change by system user is based on Role & Permission model where permissions are grouped into roles that are then assigned to system user. This model provides possibility to assign different level of access authorization to different system users (physician, nurse, insurance report maker, system administrator, etc.).

Each data change by use is uniquely identified (who, when and from which client machine made data changed).

Audit of changes made by user during session (possibility to reconstruct exact user activities).

During each change the former data record is moved and kept into history (workflow analysis, change of data back to specific time in history).

Conclusion: Circa 65% of system analysis is currently implemented into source code, so it is still very soon for evaluation of general system and its contribution to EMSCP users. Anyway the experience with project shows that chosen methodology makes system dynamic, live and adaptive to change request.

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Continuous Mobile Services for Healthcare (HealthService24 project)

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Introduction: The availability of reliable and affordable information and communication technologies is prompting the redesign of provision of healthcare. A number of disease management strategies, notably those targeting chronic conditions, are to benefit from the application of remote monitoring facilities, data transmission and ubiquitous accessibility. Programmes supporting home hospitalisation, early discharge or preventing exacerbations are good examples.

Most of these new approaches to health care provision have the “Chronic Care Model” as a conceptual framework of reference. This model was originally proposed by Wagner et al and later adopted by the WHO working group “Innovative Care for Chronic Conditions”. Its main innovation lies, first, in the

consideration given to all the players, embracing health actors, community resources and patients and cares. Secondly, the model highlights the interrelations among all these players and their pivotal influence in determining better clinical outcomes. While the former relies more on the organisational strategy adopted, the latter is only operationally achieved through the use of information and communication technologies. This paper reports on the technical solution adopted in two specific clinical contexts: 1) prevention of exacerbations in chronic respiratory patients; and 2) remote rehabilitation programme in chronic cardio-respiratory patients. The solutions are being piloted in the context of the HealthService24 project (HS24).

Methods: The HS24 project focuses on the characteristics and deployment of an integrated mobile health service (initially developed in the previous Mobihealth project) supporting patients and health care professionals' mobility in different collaborative care scenarios. A patient using the HealthService24 is equipped with diverse vital constant sensors interconnected under a wireless Body Area Network (BAN). The main functionality of the BAN is to collect sensor data for continuous/intermittent monitoring of the patient vital signals and relay them to the health centre. The BAN is composed by the Sensor box and the Mobile Base Unit (MBU). The Sensor Box is connected by wire to all sensors (ECG 3 leads, pulse oximeter and accelerometer) and sends sensor data via Bluetooth to the MBU. The Mobile Base Unit (MBU) receives data from the Sensor Box, stores it temporarily and sends it to the hospital. The MBU is a PDA equipped with GPRS features. For UMTS communication, a mobile phone is used. The MBU provides a sensor viewer component, which allows the healthcare professional to review signals being received.

The measurements are transmitted wirelessly using GPRS/UMTS to a data centre, from where the data is transferred to the health care providers/ health care professionals through the Internet. The data centre is also collecting the data, sending SMS or other type of alarms when needed, providing technical support and the first level medical support for the service users. This way, healthcare professionals can remotely assess patient status and early detect a worsening condition or problems, diagnose and treat patients whilst the patients are free to continue with daily life activities.

Results: The pilots are currently under execution. In the case of "prevention of exacerbations in respiratory patients" patients discharged from the hospital are included in a specific interventional programme lead by a case manager nurse that incorporates regular checks through HS24 plus educational sessions. In the "remote rehabilitation" programme, a new strategy to provide distant supervision by a physiotherapist to several cardio-respiratory patients performing sessions at different locations is explored.

Discussion: It is expected that the model of care delivery supported by HS24 would be well accepted by patients and professionals. The sustainability of the approach will be assessed through clinical indicators and documenting consumption of resources during the duration of the pilots.

Funding: The HealthService24 project is partially funded by the European Commission under the eTen programme (Grant Agreement n° 517352). The HealthService24 solution was initially developed in the Mobihealth project and partially funded by the European Commission under the "Information Society Technologies" Programme (IST-2001-36006).

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The Changing Face of the Internet

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We are witness to a metamorphosis: from a source of random information the Internet has gradually become an integrated part of life, as important as the telephone or even more so. Most citizens in the West have access to the Internet and use it daily. But it is not the same everywhere and there still exists a digital divide.

Consumers use the Internet in many ways, from accessing information to booking holiday and theatre tickets, online banking, downloading music and home shopping. Not only do they buy books and CDs but they can also buy drugs online at lower prices than in their local pharmacy.

An Internet shift has also occurred in the field of health care: hospital information systems frequently use Web technologies to extract data from hospital databases. A middleware layer and a communication server are needed to extract patient data from different kinds of databases from different systems into one dedicated, personalised screen layout by a Web browser on the PC of the health care provider.

For consumers or patients, booking appointments via the Internet is becoming a reality. Providers tend to start with a service whereby the patient's message is a trigger for the hospital staff to call by telephone to confirm the date and time of the appointment. Ultimately the patient completes a secure form on the Web on which she can give her medical history, any allergies, and the names and dosages of the drugs she is currently using if this is not already known. Experiments show that one advantage of online form-filling is that the patient is more honest in answering questions on difficult topics such as sexuality, drug abuse or depression. Depending on her complaint or other reason for seeking contact, she can be put in contact with an appropriate doctor. If she has an abnormal Pap smear, a colposcopy and maybe a loop excision of the transformation zone can be planned for one visit. She can browse customised information and download it for further reading. Provision of information can help allay any fears or anxiousness. It reassures the patient, who, as shown in a recent Dutch study, values information from her own physician above that from other sources.

At the same time the patient's data are stored as preliminary information in the medical record, which the doctor can read before the patient enters the consulting room. The electronic form on the computer monitor follows the algorithm of the guideline appropriate for the patient's symptoms or complaints. If new questions arise after the patient has seen the doctor, contact by email can reduce the number of follow-up visits and thus save time for both patient and doctor. Subsequently the doctor can, if necessary, modify the patient's prescription online.

Telemedicine: On some health care forums doctors answer general questions asked by consumers who are not their personal patients. A growing number of doctors offer online consultation either via the Web or by email. Sometimes, as in the case of a GP consulting a dermatologist, a webcam can be used to show the skin eruption.

Evidence-based medicine and medical education: Internet technology makes evidence-based medicine a real option. Many of us have the experience of going to the library to look for a book or a journal for a

particular paper. Today we can have the paper, or at least the abstract, within seconds. It is impossible to cope with the overwhelming quantity of publications in the field of medicine. Medline adds more than 450,000 publications to its database each year, so even if we read five papers a day, after 1 year we will still be nearly 250 years behind. The Internet enables us to read selected, digested and integrated sources of information such as Cochrane or Up to Date.

The principle of evidence-based medicine replaces keeping up to date by random reading of papers and attending conferences and courses, with asking the questions that arise during daily practice. This of course has implications for the education of new doctors. The speciality of obstetrics and gynaecology has been an 'early adaptor' in this process of change, incorporating the efficiencies of Webbased learning into emerging educational paradigms.

Clinical trials and publication: towards open access: Next to patient care and teaching, the third pillar of academic medicine is research. Here we see another aspect of the integration of the Internet into daily life: mapping the human genome would have been impossible without the Internet. For carrying out a simple randomised clinical trial – to enable larger sample sizes, shorter sampling periods and lower costs – the Internet is also a useful tool. The World Wide Web can provide global access, fast interaction and automation, not forgetting its role in recruiting appropriate subjects and publishing the study results.

Discussion about open access publication is a topical one: the author pays for the process of the peer review and the publication but keeps the copyright. Reprints can be obtained free of charge. Other advantages are a very fast publishing time (often within a few weeks) and reaching a much larger audience: via the Internet everybody has access to a paper. The larger publishing companies and most medical societies are showing resistance to these developments, but researchers can play an important role by submitting their papers to journals which adopt the open access idea. For those who are interested in researching the use of the Internet in medicine, interesting papers on the subject can be found in our Journal of Medical Internet Research at www.jmir.org.

How can information be evaluated? There are many recognised criteria for assessing the quality of websites in general and for health information in particular. Amongst the most important criteria for quality are credibility and content. The source of medical information is usually regarded as the main criterion for its credibility. Currency is shown by websites that display the date of the original document or content posting on the Internet, as well as that of any updates. Hierarchy of evidence posted on each website is a reliable indicator of the validity of health research. The accuracy of the contents is usually best judged against rigorously developed, peer-reviewed and published guidelines for each of the topics concerned. Website quality can also be assessed by features such as disclosure, links, design, aesthetics, interactivity and ease of use, which are related more to presentation and usage.'

Integration and security: A major issue in the immediate future is how to provide security and how to guarantee privacy, not only the privacy of the patient but also that of the doctor. Integration of Web services with electronic medical records necessitates good coding and secure servers and connections. Some of our colleagues have expressed reservations about using the technology and tell us they are postponing implementation until it is 100% safe and secure. What they do not realise is that much of the technology already exists. Guidelines and even laws are emerging, some of which are very restrictive.

Hopefully we can face these challenges and take the next steps, with our patients, towards achieving a better quality of health care.

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E-learning in Medical Biochemistry: Disorders in Acid-Base Equilibrium

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Introduction: Acid-base equilibrium (ABE) and its disorders belong to difficult-to-understand topics in medical biochemistry. It is, however, very important for medical practice; nearly every physician has to indicate, evaluate, and interpret analysis of blood gases and acid base state. Moreover, these tests are extremely important in critical states and in intensive care, i.e. in situations when there is lack of time to consult rather complicated findings. Effective teaching of this topic is of high importance for medical education. To improve current lectures and seminars we introduced a short electronic course of disorders in acid-base equilibrium.

Methods: The novel course was prepared in Moodle, an open-source environment for distance learning. It is intended for medical students of the third year of study but can be useful even for senior students and physicians in clinical practice. The course is announced to the students of the third year and is freely available for them. Other applicants can obtain an entrance key upon request.

Results: The course starts with a review of physiologic processes involved in ABE and summarizes metabolic pathways producing or consuming protons. Physiologic buffering systems are discussed in details, especially the bicarbonate buffer. The major part of the course deals with clinical-biochemical examination of ABE. For every commonly used parameter, its clinical significance, exact meaning as well as the method of its estimation are explained. Metabolic disorders leading to acidosis or alkalosis are described in the next part. Relationship between disturbances in ABE and mineralogram are explained in detail as well. Finally, four case studies are attached as a test-like chapter. Questions lead the student step by step through evaluation of laboratory values. Detailed explanation for every answer is provided. Every case study is closed with an overview and deeper information about the patient and disorders leading to impairment of ABE.

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Assessing Knowledge Underlying Medical Algorithms

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Implementation of medical algorithms in software products, be they in the form of web-based calculators, specialized computer-aided decision support tools, or modules to be included in more complex packages, brings a number of questions associated not only with correct representation of the algorithms in software, but also with validity of the algorithms themselves. Analyzing available evidence behind published medical algorithms often comes to surprising results: a large number of algorithms are based on observations and their relations e.g. to some measurable outcome of care are either missing, questionable, or being added after the construction of the algorithm (cf. e.g. Apgar score). Algorithms based on unambiguous analyses of relevant data (Apache scores, e.g.) are much less frequent. It is the task of software makers to assess the knowledge behind medical algorithms, and to decide if and how can this background knowledge be represented in their software. This task can be more difficult than implementation of the algorithm itself, and can also result in dropping the algorithm as unsuitable for

implementation in the desired software product. This task, however, is a necessary step in the process of transformation of a published medical algorithm into a piece of software.

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Developing Tools for Grid-based Processing of Biomedical Data

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The emerging power of grid-based computing makes the grid a most promising environment for tasks associated with complex handling of biomedical data. Non-trivial ways of data handling are gaining importance as the vast volumes of data kept in today's information repositories are growing beyond simple comprehension by human users. Tasks e.g. of appropriate processing with methods suitable for specific data, of data mining, of appropriate visualisation have been developed in decision support systems/expert systems. High-profile grid computing now opens the possibility to apply these methods more widely on large volumes of data. Massive deployment of computer-based tools to handle biomedical data, however, requires a sound base for matching of data and tools. Mature terminologies and classification systems are useful for data descriptions; ontologies and regional ontologies are being developed to represent more complex relations between data. MediGrid, a project funded by the Czech National Science and Research Programme, aims to create a grid-based testbed environment for processing of biomedical data, with the use of a pragmatic, open ontology constructed to describe domain knowledge in application areas corresponding to specific segments of medical knowledge.

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Remote Usability Testing for Paediatric Web Sites

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Introduction: Several studies have investigated problems and needs related to the usability of information available on the web [1,2] in many different sectors [3,4]. This paper describes the web-based application – ValuPed – developed to conduct remote usability tests for paediatric web sites dedicated to parents.

The remote testing technique is used when testers are separated in space and/or time from participants and they cannot directly observe the testing process [5,6].

The web site ValuPED is software realized with the objective of simulating the usability test carried out in remote method through the use of certain technologies, among which DBMS and scripting languages. A web environment has been created for the collection of data related to the behaviour of parents during the navigation of paediatric web sites, whilst researching information on health.

The system moreover, thanks to the technology adopted, allows the recreation of all the routes followed during the navigation of the user through the creation of a log file.

Methods: The site has been created in respects to the W3C requirements for accessibility. Data have been stored in a MYSQL database; the dynamic part of the site has been written and implemented thanks to the PHP language.

To enter in the test area a procedure is forecast for registration. Its objective is to collect a little information about the user so that, without revealing his identity, it can be used for the interpretation of results obtained and for the statistic elaborations.

The test starts with the request made to the user to carry out certain tasks. For example, to find certain types of information in the interior of the site selected for test.

The Valuped application saves all the information about the user movement in the tested site.

After having carried out the requested activity the user can exit from the site to test and return to the ValuPED home-page. At this point, the user will be asked to answer a questionnaire about the problems found in the execution of the task, by completing a form.

Results: The Valuped web site has been used to assess three different paediatric web sites for the spreading of medical information addressed to parents. This first test phase has taken place thanks to the collaboration of a group of 8 parents who have young children and will continue during the following months. It has so far provided encouraging results.

The platform presents a high level of usability and in very few cases the parents involved in the test are required to resort to demands of help and clarification via the web.

The system has succeeded in outlining the totality of the moves carried out by the user for the execution of the tasks. Only in a few cases where particular web technologies have been adopted has it not been possible to follow certain movements.

Conclusion: Despite the first test seems to confirm the validity and the functioning of the assessment system, in the next few months such a test phase will continue with a bigger scale of users in such a way that it will obtain data that is statistically more relevant. Also other modifications to the software code will be carried out with the intention to simplify the configuration of the system and to allow a more efficient monitoring action for the navigation of users.

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Using Teleconsultation in Mass Schoolchildren Examination Aimed at Detecting Carriage Abnormalities

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Scientific associates of the Donetsk traumatologic and orthopaedic research institute (Ukraine) developed and introduced the mass examination method aimed at detecting carriage abnormalities. The task for the group was sampling facts and arranging them in centralized database for the subsequent scientific associates' analysis. Digital photos (up to 170 Mb per workday) and text files (up to 8–10 Mb per workday) made up the core of the sampled data. The task for the mobile group in 76% was examining children in the distant villages and settlements of the Donetsk region (from 80 to 150 km away from

the main database). A wide spread of examinees determined the necessity for using remote stations to send data to the traumatologic and orthopaedic research institute analytical centre. Using mobile task groups allows examining up to 200 children and adolescents a day (by one task group). We believe the examination method and information swap, data encoding will provide quick high-quality examination with minimum expenses and will also give the possibility to conduct periodic comparative physical examinations for schoolchildren and this will definitely promote the detailed detection of the idiopathic scoliosis aetiology and pathogenesis.

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Web-based Process-Optimization from Hospital Standard-data: A study on therapeutic and economic impact of the use of (NT-pro)BNP

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Introduction: With the introduction of DRGs hospitals receive another incentive to code and perform diagnostic and therapeutic options correct. Laboratory testing can play an important role here (Hoffmann et al. in Clin. Lab.). To prove this for an example scenario, we put up a simulation which prompts suggestions for process improvements from hospital standard data.

Methods: We used a PHP/mysql environment and chose the setting of (NT-pro)BNP and follow-up ultrasound investigation for the diagnosis of heart failure NYHA I-II testing as example improvement scenario. The tool reads from hospital §301 data and benchmarks against standard epidemiology and hospital populations. For these benchmarks we investigated the InEK database and hospital populations (Baum et al in Clin Chem Lab Med).

Results: The simulation revealed the potential (health) economic value for the suggested process implementation for the chosen case at 12.9 Mill. Euro per year (Mid-Case Scenario, interpolated for all German hospitals). In the concrete retrospective clinical study the software proved these effects positive. A relevant diagnostic/therapeutic effect and in terms of business thinking a contribution margin ranging from negative values up to +150 Euro per patient was found. The effect was dependent on age and primary diagnoses of the patients.

Discussion: Overall the approach seems to be quite significant for the shown scenario. Discussion sure derives from questions of adequate DRG coding in the populations and the InEK data. Due to the quite big variance of the effects for the single subpopulations, the relevance for practical implementation of the found rules must be discussed. Only simple and at the time of patient admission available rules can be implemented easily. Due to the framework-nature of the simulation, other scenarios can be investigated easily and the work has potential for the investigation of other laboratory testing processes in context of DRG coding.

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Telematics in Ophthalmic Imaging: A low cost solution for the transfer of image data

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Introduction: A variety of imaging techniques has been developed over the last decades. Due to advancements in computer technology medical images are digitally processed and stored in high quality. All disciplines of medicine profit enormously from state-of-the-art imaging (for ophthalmology [1–3]). Nevertheless for maximum benefit there are a number of prerequisites for a digital image archive:

- Ease of use (intuitive operation without special training).
- Scalability and flexibility (accommodation of various needs and demands).
- Extendibility (integration of different imaging techniques).
- Telemedical application (data transfer to external locations).
- Cost efficiency (limited budgets for health services).

Methods: The goal was to implement a network based image archive which should integrate various imaging techniques and provide data export to ophthalmologists in private practice. Imaging systems include laser scanning retina tomography and angiography, fundus camera, photo slit lamp, sonography, optical coherence tomography, microperimetry, and visual field analysis.

As an image archive the Heidelberg Eye Explorer (HEE, Heidelberg Engineering) is operational since 1998. Its visual presentation of the patient database resembles the Windows Explorer and a preview mode gives direct access to every single examination. Therefore it can be intuitively operated without additional training. The HEE software runs even on older Pentium class PCs and has a modular design separating database functionality from image viewing and acquisition. The HEE communicates with the hospital's general patient database and radiological PACS. Database and images are stored on a RAID5 array. Besides eight image acquisition systems, over 40 standard PCs are equipped with the HEE throughout the department.

For external access via modem or ISDN a dedicated infrastructure is employed consisting of file server, RAS and firewall. Each external partner has a unique identifier and a password for authentication and retrieves the image data via a web server from the individual user's directory.

Results: As for August 2005 the archive comprises over 1,5 million images from 16,000 patients. The system is highly accepted and appreciated by the department's medical professionals. Together with its various modules, the software proved to be suitable for the control of cameras and other devices and the acquisition of images. Retrieval of images is performed within seconds from every work-place of the department.

Ophthalmologists in private practice, who want to access their patients' data, hand out informational literature about the telematic data transfer prior to the patients' visit at the university hospital. If the patients agree, they pass a signed form of consent to the hospital doctor. Consequently, the doctor exports the patients' image data to the external doctor's directory on the transfer server. For the next visit the doctor in private practice connects to the transfer server, retrieves the exported file(s) and imports it to the own HEE installation. Currently 14 doctors participate as external partners and request about fifty data sets per month on an average.

The doctors in private practice report that they appreciate very much the possibility to build up an image archive of their patients over time. They declare that with additional images they feel better informed than with just a doctor's letter from the hospital. Many of them explain the examination results

to the patients using the image series. All of the doctors assess the possibility to retrieve images as beneficial for monitoring and treatment of the patients.

Discussion: Crucial aspects of acceptance and success of telematic applications involving doctors in private practice are cost-efficiency and ease of use. This implies that standard computer equipment should be used in order to avoid the need for expensive additional equipment. Any software involved should be designed to be operated intuitively as any special training would discourage potential partners. Standard Internet technology for data transfer ensures robust operation with minimal maintenance.

All persons involved should be sensitised for data security. It must be avoided that the same hardware is used for patient data and Internet connection. For legal reasons, external partners should sign a document informing about technical and legal aspects of data transfer, correct handling of data and potential threats and failures. Taking into consideration these points, low-cost telematic applications can be implemented and successfully operated for medical imaging in a variety of disciplines.

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A Web Service for Automated Biometric Data Communication: A model and economic impact study for a retina scanning service

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Introduction: Computer-assisted systematic Retina Scanning or Retina screening at an ophthalmologist's site can have huge economic impact for different illnesses. In this aspect we set up technical prototype software with web service interface and an economic calculation, which can be adapted to different scenarios.

Methods: We chose the diabetic retinopathy (DRP) as calculating example. A common Markov simulation model with meta data from different studies was setup to simulate the relevance of an intensified ophthalmologic screening for 4 populations with different diabetes onset ages (15, 35, 50 and 65 years). Furthermore we developed a functioning prototype of a retina scan web service, where scans are segmented and a report with risk classification is resent.

Results: The business simulation example revealed the economic value to care for a mixed DRP population. For the different screening scenarios our data suggests, that a service in Germany would bring a p.a. value of between 21,5 and 1,9 Million € with a per Patient yearly budget between 4,28 and 1,62€ – set the fact, that the service efficiency is at 85% or above.

Discussion: The simulation allows an analysis for a proposed business plan for a screening service only for DRP or for combined illnesses and can be adapted to different scenarios. Set the existent economic value and the architecture, the application could be ideal as extra ophthalmologist service embedded in the framework of the proposed German Health Card. Next steps should include the feasibility analysis with the prototype, if a service can be set up with the proposed efficiency under the set economic constraints.

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Internet in Continuous Shared Health Care

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Introduction: Healthcare documentation contains both the information related to the physical or mental health of the patients and the information related to the provision of health care by healthcare professionals or institutions. The data are entered not only by physicians taking care of the patient, but also by other persons providing additional examinations. This diversity of sources brings a lot of problems concerning the security of the information. The electronic health record offers the possibility to formalize the structure of the classical health record, which can bring a more transparent way of recording of healthcare procedures and an immediate access to the health data of the patient.

Methods: The EuroMISE Centre, represented by the Institute of Computer Science ASCR is the main contractor of the project “Information technologies for development of continuous shared health care” of the Academy of Sciences of the Czech Republic. The research is based on development of methods and techniques of remote access to the information in form of data and knowledge in relationship with electronic health documentation. One of the main research tasks is the design, implementation and usability verification of a shared electronic health record as a tool for electronic health documentation and continuous shared health care. The key part of the proposed solution will be the analysis and implementation of different methods of access control and data protection in the shared electronic health record, possibilities of keeping the encrypted information by third party or server without possibility of non-authorized access to this information, etc.

Results: The previous research in the field of electronic health record resulted in the pilot EHR application called “MULTimedia Distributed Record” (MUDR) using internet technologies for communication between individual parts of the system. Its main advantage is the dynamically extensible and modifiable structure of collected data allowing reorganization without change of database structure. For information storage we use two main structures described by the graph theory expressions [1,2]. The interface for connecting the decision support tool implementing the medical guidelines formalized in the form of dynamic libraries was also defined. To be able to create communication structure, realizing the life-long shared electronic health record, the clinical content was synchronized and reduced to the field of cardiology.

Discussion: The above-mentioned project of development of ICT infrastructure supporting continuous shared health care in Czech Republic is in its starting phase. The methods and techniques of remote data access to electronic health record were studied, the clinical terminology was analyzed and tools for free text analysis were developed. As a communication standard between participating systems the HL7 version 3 was chosen and modelling process creating the R-MIM models has already started. The

most important results were presented during the seminar “Information technologies in healthcare” in December 2004 [4].

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