Information Retrieval - Posters

## **Characteristics of Dental World Wide Web Resources**

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<u>Objective</u>: Dental professionals who use the World Wide Web consider it a very useful professional resource. Until now, no study has examined what information dental Web sites provide and how they provide it. The objective of this study was to determine characteristics of dental Web sites, such as provider, content, type of presentation, and structural parameters, such as size, currency, access, etc. <u>Methods</u>: A list of approximately 1,600 Web page addresses (URLs) was compiled from three major dental Web resource indices. 507 sites were extracted randomly and surveyed using a four-part Web form with 16 questions.

<u>Results</u>: A wide variety of entities, such as universities, colleges, vendors, practitioners, government organizations, and dental laboratories provide dental World Wide Web resources. 5% of sites contain exclusively clinical information, 59% non-clinical information, and 36% both. Content areas represent all dental specialties. The majority of sites provide between 1 and 10 screens of information. Most sites whose currency could be assessed have been updated within the last year. Very few sites restrict access to content by password. None of the sites provide indication of internal or external peer review.

<u>Conclusion</u>: To date, this is the first published study of a quantitative and qualitative analysis of World Wide Web resources in health care. While the dental industry and profession are embracing the Web as an information medium, several concerns, such as quality of information, peer review, and retrievability remain.

### Static, dynamic information and modelling in metabolic medicine

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Several computer models and dynamic parameters were used and realized to support our clinic which is oriented mostly to metabolic and endocrine diseases: computer model of haemoglobin glycation, computer model of protein glycation, minimal model of intravenous glucose tolerance tests, adaptive model based consultation system for insulin therapy, predicting the outcome of metabolic diseases.

In addition we compared static and dynamic parameters of obese patients with metabolic X syndrome.

From these experiences we conclude: Computer simulation is not a routine method for clinical practice but it can be useful in quantification of dynamic clinical findings. Dynamic patient description has specific importance in describing patients with metabolic diseases.

During the last 10 years the metabolic intensive care unit and internal clinic was supported by a group of physicians and programmers using self made or adapted computer programs. Some of these programs supported routine patient care, somewhere used to support research in the unit. The most important part of clinical support is clinical information system. Another part of our support of clinical research and practice is mentioned here: It is the problem of computer simulation and patient description with dynamic data.

# Information overload and 'just-in-time' knowledge

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Human knowledge expands more rapidly than our intellectual abilities. Consequently, we are faced with information overload which can only be overcome by efficient organisation of knowledge and by ensuring that the information we require is always available as it is needed. Explicit management of medical knowledge combined with electronic means of storage, retrieval and delivery of knowledge will become one of the main challenges of the 21<sup>st</sup> Century.

We all accept that specialisation is inevitable in the increasingly complex world we live in. The times of the polymath have past a few hundred years ago and we now regard as natural the fact that by necessity practically all medical specialities, not mentioning the non-medical walks of life, are now divided and sub-divided into many, sometimes rather narrow, subspecialities.

The number of professional medical journals published all over the world increases year upon year. Anyone who would attempt to be well informed and therefore spend an exceptional amount of time reading relevant publications, would do so without the slightest chance of ever keeping reliably up to date on the whole of his subject.

The human brain as a product of evolution is near to its capability limits and our future evolutionary potential is limited unless we learn to organise knowledge effectively and develop new and efficient methods for knowledge retrieval.

The human brain has reached the limits of its intellectual capabilities whilst the human knowledge continues to expand exponentially with a doubling time of about 30 years. Information technology has demonstrated over the years that it too is capable of exponential growth and furthermore has been achieving this whilst dramatically reducing its costs. Modern electronic tools offer hope but before they will become really useful we will have to develop new methods of accessing and acquiring knowledge. The Intenet's infinity of information has hardly any order to it and information retrieval, even with the help of the best search engines, is incomplete, time consuming and inflexible. New methodologies that will provide the requisite knowledge 'just-in-time' are likely to become essential tools of clinical practice at all levels in the 21<sup>st</sup> Century.

### **Precis-Based Navigation for Familiarization**

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A patient's medical record can be a complex, diverse, disorganized, and often geographically distributed collection of documents. Sorting through this collection to find needed information can be a formidable and time-consuming task. The electronic medical record (EMR) offers some hope of improving access to patient information, but may create new problems for the health professional who must navigate through digital information, where traditional document boundaries are not necessarily easy to discern.

We are focusing on the problem of *familiarization* where a physician or other healthcare professional is presented with the medical record for a new patient. How can the physician get a feeling for the overall medical condition of this patient? How can a physician locate the information relevant to the patient's current problem? More generally, how can a physician become familiar enough with the case and cross the threshold of uncertainty in order to feel comfortable making a decision regarding the patient?

To assist with the task of familiarization, we are developing precis-based navigation tools, where a precis is a concise summary of information and meta information from an individual document in the medical record. Precis are introduced for each document in a new layer of technology, superimposed over the various sources of medical records such as various EMRs and paper-based systems. Using the precis, a clinician or other user may search and sort through a complex document collection to find the information relevant to the problem at hand. In this paper we outline our user model, describe the features and functions of the precis technology at its present stage of development, and discuss the technical research questions that arise in this work.

## A Custom WWW Interface System for a Clinical Data Repository

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In response to pressure for timely information, many health facilities in the United States are developing large clinical data repositories. We have employed Sybase RDBMS to create a clinical data repository (CDR) at the University of Virginia (UVA). To enable hospital personnel to query the data in a timely and independent manner we have created a WWW Interface System (WIS). This software consists of a collection of Hypertext pages in which are embedded a series of JavaScript functions that in turn communicate with Common Gateway Interface (CGI) programs. Together with the WWW server, these code segments generate SQL to query our CDR system in an interactive fashion. The CGI programs are driven by the contents of the Sybase tables comprising the data dictionary to perform other tasks such as data "drill-down" capability, on-line help, and formatting of the SQL query results. We conclude that the time taken to create the interface has been well invested and that the concepts behind the system may be of general interest as increasing volumes of health data become available on the Information Superhighway.

In the United States, increasing fiscal pressures are forcing health care facilities to pay ever-closer attention to obtaining the best outcomes relative to institutional costs. Thus, there is increased demand for clinical information systems. Since traditional legacy hospital systems do not lend themselves to rapid searching, querying, or data retrieval, new systems employing modern software must be developed [1,2]. We have built a Clinical Data Repository (CDR) using the Sybase Relational Database Management System (RDBMS) [3].

## Medical Data Warehousing Analytical Processing of all Available Information

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Medical knowledge is increasing very fast. Large amounts of clinical and non-clinical (e.g. administrative) data are routinely collected into computer systems and are available for analysis under certain conditions. This growing infrastructure can improve the management of health care and the understanding of disease if adequate tools to extract relevant information are developed. To handle, extract, integrate, analyse and take advantage of the gathered information the concept of a data warehouse seems to be especially interesting in medicine.

The great value of analysing large quantity of medical information is to illuminate hidden problems and to point to their solutions. The interesting feature of data warehousing is its ability to provide the answers to questions not yet asked, by finding trends, patterns or anomalies in data. This feature could become very valuable in handling a growing amount of medical data. With its sensible use there are economic benefits for the society and an improvement of quality of medical care for patients

Medical data warehousing allows the physicians to take advantage of all the operational data they have been collecting over the years. These data are a valuable corporate asset, yet seem seldom to be used strategically.

## State-of-the art of the Slovenian Medical Informatics

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In this review paper we present the development of the Slovenian Medical Informatics. With the built the bridges of knowledge we wish to connect of scientific, professional and commercial activities in this field at the phenomena in concept of a global health networked society to approach for the Next Millennium.

First activities go back into the early eighties. The main characteristic of the period until the year 1980 was isolated introduction of information technology in individual institutions of the health care, according to technical possibilities of the that time and in accordance with the organisation structure of the national health care within the socialist system.

From 1980 to 1990 we were developing a uniform and centralised health care information system. Systems analysis during this period has provided us with the basic professional platform for common data structures to serve the needs of the state, financing of the health care sector and those employed in it. This »to-down« scheme of information systems development however overlooked the immediate interests of medical staff, patient data security, economic resources, and legal requirements.

Currently, our efforts are focused on designing and implementing the medical care insurance smart card and medical workers card, bringing the Slovenian information technology standards to comply with those of the European Union, and permanent education of the medical informatics professionals. Our objective is to provide proper legal protection and technical security of personal information data, quality improvement in information outcome.

## Evaluation of Biomedicina Slovenica Access on the World Wide Web

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Biomedicina Slovenica (BS), the Slovene biomedical bibliographic database, has been built for more than twenty years according to the standards of the American National Library of Medicine and adjusted to local needs. BS is used for the following tasks: information retrieval particularly for endemic topics, preparing individual and institutional bibliographies and recently serving as a base for a decision support system for biomedical research evaluation. Because of BS national importance wider and user friendly access for Slovene biomedical community was needed. World Wide Web (WWW), one of the most popular Internet tools was chosen for the implementation. Seven months after BS is available on WWW we conducted an evaluation study, which revealed a great interest among Slovene Internet users for BS. The greater part of 17.361 requests in observed period belonged to the Medical Faculty and research and health care organizations, 49,6% and 20,4% respectively. User evaluation estimated BS on the WWW access very important. The results were partially or fully relevant in 97,4%. MESH subject headings followed by authors were the preferred searching keys. Expanding searching tools by some additional options should be considered. BS on WWW tends to fulfil different users' information needs: researchers', faculty, health care professionals' and students'.

### **Facilitating Access to Radiology Practice Guidelines**

#### Nigel Longworth, Charles E. Kahn, Jr.

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Appropriateness criteria and practice guidelines are being developed and put to use in attempts to improve the quality and cost effectiveness of medical care. The authors sought to create a system whereby physicians can access a set of radiology appropriateness criteria in a useful and efficient manner. The system includes a semantic network of concepts that index the appropriateness criteria's imaging procedures and clinical conditions. Information is presented using a platform-independent, World Wide Web-based user interface

In this poster, we have introduced a tool that can be implemented easily and can make immediate contributions to the decision making aspect of diagnostic imaging. ISIS provides a system for efficient retrieval of ACR appropriateness criteria through the semantic network. The project provides an easy-to-use interactive WWW interface for the radiology environment. Developing the utilization of appropriateness criteria for requests of diagnostic radiology procedures plays an important role in the future of cost-effective medical practice. In the future, we will be conducting statistical analysis of ISIS usage and comparing our findings with procedure records.

## A Query System for a Medical Images Base

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We present a data model for archiving and consulting a medical documentary record. The multimedia documents handle various type of information: medical images (X-rays, MRI, tomography...), data on the patient's civil and clinic identity, and textual examination reports. The end-users are physicians who want to consult this documentary base mainly for case-based researches. The retrieval process answers to queries involving both the explicit alphanumeric data stored in the patient's dossier and information that are carried by the images. We propose a data model for describing the semantic content of a medical picture. The image is viewed as pairs of isosemantic regions and signs in respect with an anatomic and a pathological model. A graphical interface is provided for the users to index the images and formulate the queries. The regions are represented thanks to a polygonal tesselation process on the image and the signs are represented by icons. The icons are manually dragged and dropped on the image by the indexer. A set of automatically computed spatial relationships between regions and signs, and between the signs themselves enhances the semantic description. This description is used to index the pictorial part of the medical record. The end-users invoke the index server from the W3 client of their workstation.

## The Development of Multimedia Tele-Education System for Pharmacotherapy

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The rapid expansion of information super-highway through internet with the sophistication of computer science and its application has made tele-education in cyberspace possible. In Korea, the environment for communicating information has significantly improved due to the government's strong drive to form an informationized society. The Drug Information Research Institute at Sookmyung Women's University is leading the development of information database for drugs and pharmacy education, and is producing the user-friendly multimedia pharmacotherapy database which can be utilized as a tool for tele-education by the pharmacists who live at distant sites. All the contents were written by pharmacotherapy specialists and transmitted to the institute through internet e-mail system. The contents were then combined with multimedia data, which was created in the institute by using various commercially available one. The database includes full-texts, various images, and audio/video files, which can be viewed on the internet browsers anywhere from the world at any time. The system will be used as tele-education module for pharmaceutical care specialist program at the Graduate School of Clinical Pharmacy.

# M.O.V.E.: Medical Objects Visual Examiner, the Visual Query Language of CADMIO System

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This poster describes a visual query language designed to be used in conjunction with a Hospital Information System (HIS). Managing a database containing clinical data has already proved to be a difficult task. This type of data is actually multimedia based, logically linked to each other and consulted by a great variety of users, with a very different level of information background and domain specific knowledge. Our language adopts a particular visual representation of the underlying data, and attempts to fill in the gap between medical objects and their representation in the database, as well as to be suitable for every kind of user. The result is a very personalisable system (owing partly to the adoption of an object oriented data model that simplifies the modelling process), where the users can define the database pattern in a simple but powerful manner, building it in the manner most suitable to their needs. Moreover, queries are displayed on the screen in a very clean manner, avoiding the cluttering of the display area often caused by the use of a visual tool.

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# "Endemic Corridors". Simple Mathematic Models Using Spreadsheets

### **Marcelo Bortman**

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Even though the definition of epidemic is "an incidence of a disease clearly in excess", how much is excess is often indeterminate. The present study shows step by step how to develop a single mathematical model to estimate the expected number of cases of health related problems using spreadsheets. This is especially important for developing countries because spreadsheets are nowadays widely available in these countries.