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Tutorials

Collecting and Calculating Medical Data via the Internet – Workshop Remote Data Entry (RDE): Designing and Implementing Solutions for Your Medical Business

M. Egbring, G. Hindricks, H. Kottkamp, Ch. Elsner

1. What is Remote-Data Entry (RDE) and how can You benefit from it? (Elsner/Egbring) Remote-Data-Entry is the method of collecting Data from different Sites remotely via an Interface emulation or in most cases a browser and writing it into a central database. This way of (Inter)net-based clinical data management is ideal for data entry from distributed locations that have little or no computer infrastructure. Internet-based RDE is seen as the most promising Datacollection and Datacalculation Standard. The reason is the little need of infrastructure (only need of an Internet-PC with a standard Browser), the central real-time calculation of the medical data input (which allows e.g. investigators of a clinical trial a real-time follow-up) and the easy check of the form input (e.g. via techniques like javascripting) which minimizes mistakes of Data input.

2. Applications & Tools: Collecting & Communicating Data via the Internet (Elsner) There are multiple applications and tools for RDE. RDE allows complex Communication and Datacollection e.g. for needs of Clinical Trial Coordination, Patient-Reservation-Systems, direct Periodical Collection of Data from Homepatients and every other kind of Clinical Data Collection Needs. The Tools for this collection can be multiple: Simple Solutions use eMailfunctionality to communicate information back and forward, more complex Solutions use Forms and Databases with automated Calculation and certain access restrictions. Further there are two mainly different methods of collecting data: online and offline. Offline data entry has been with the pharmaceutical industry for 10 or more years in the form of old fashioned (RDE) systems. Recently Internet-based solutions that mimic those RDE systems have emerged. In the "offline" store-and-forward model, case report forms are filled in offline on a local computer and periodically uploaded to a central server. The other way is the online data collection, which takes maximal advantage of the Internet. After entry, data is immediately available for automated and manual review. In an Online web-based system there is no local data or clinical software that can be damaged, stolen or corrupted. The remote site can use their computer for multiple tasks, including data entry, without security concerns. Security, back up, and data integrity issues apply primarily to the central server. System Design issues have also to be touched in means of using real web-based applications and using web-enabled toolkit solutions. For the future there are also multiple possibilities for mobile RDE: Techniques of Blutooth / WAP / WML / EPOC are useable and in evaluation at this time. These mobile solutions open up completely new possibilities e.g. in bedside datacapture or automated read-out from mobile medical equipment e.g. like pacemakers and blood-pressure meters.

How to Create Dynamic Interactive Medical Web Applications

A. Robert, M.D. Pretlow

This tutorial will cover the design of dynamic applications for consumer interaction with medical web sites, interaction with their health care providers, and interaction with other individuals with the

same condition. Applications will include: (1) interactive patient education, (2) disease monitoring and management, (3) message boards and chat room support groups, and (4) information gathering. Security, confidentiality, and legal issues will also be covered. Programming methods such as HTML, animated graphics, Dynamic HTML, CGI, JavaScript, JAVA, encryption, and multimedia technology will be explained as they relate to the design of such interactive applications. Examples of current medical web applications will be demonstrated, as well as exciting future possibilities.

Qualité de l'information médicale sur Internet

Marc Jamoulle

La langue de l'atelier est le français. English and Spanish people are welcome. *Prérequisites:* Séminaire destiné tant aux débutants qu'aux utilisateurs expérimentés désireux de partager leur connaissance ou leur expertise. De préférence avoir déjà tâté du clavier et connaître les rudiments pour manipuler Explorer ou Netscape. *Tuteur(s):* Marc Jamoulle, médecin de famille, chercheur en santé Publique, détail sur http://www.ulb.ac.be/esp/who/Marc_Jamoulle/index.html. *Buts du cours:* Initiation à l'Internet médical et analyse critique de l'information médicale sur Internet. *Public intéressé:* Médecins, étudiants en médecine, personnel de santé. *Contenu:* Internet est devenu un outil incontournable d'accès à l'information médicale. Devant la facilité apparente d'accès à de très nombreuses pages du monde entier, ainsi que la rapidité pour aller d'un site à un autre, il est très tentant de se servir de l'Internet pour l'essentiel de la recherche d'information dont peut avoir besoin un médecin en exercice et d'en faire sa nouvelle bibliothèque de référence. Mais dès qu'on s'y plonge un peu, on s'aperçoit que l'on peut s'y 'noyer', passer des heures dans l'accessoire, l'anodin, voire le médiocre, avant de trouver quelques textes utiles. La connaissance de l'origine du texte, de la validité des informations d'un site, de ses propriétaires et de ses animateurs, de son actualisation sont indispensables pour juger de la qualité de l'information lue sur l'écran. Il est donc nécessaire d'apprendre: comment et par qui sont construits les sites médicaux, et comment vérifier leur sérieux, comment surfer pour aller là où ce sera l'utile sans se perdre dans l'accessoire.

L'atelier est construit autour d'une page web http://www.ulb.ac.be/esp/gras/web-crit2.html divisée en quatre secteurs: (1) Méthodologie générale. (2) Exemples de la variétés de sites médicaux. (3) Ethique de l'information. (4) Qualité de l'information.

Des exercices sont proposés, 21 ordinateurs sont disponibles (un ordi pour deux participants). A l'issue de l'atelier, le participera aura une idée générale de l'information disponible sur Internet et pourra faire les premier pas pour mettre à jour une information et en apprécier la qualité. Le séminaire fera l'objet d'une evaluation.

Internet and Human Genetics

G. Bottu, V. Ledent (Belgian EMBnet Node)

With the sequencing of the human genome nearing completion, the knowledge of human genetics is increasing rapidly. This has direct implications for medical science, with for example the identification of genes playing some role in diseases or the prediction of potential targets for new pharmacological agents. In this perspective it appears indispensable for medical practitioners and researchers to have an efficient access to up-to-date information related to human genetics. This tutorial will provide an overview of the available databases together with the tools to access them over the Internet. We will describe more in particular: Sequence Retrieval System (SRS), a tool that allows to implement easily at one site a whole series of mirrors of databanks. There are a number of sites

which offer through SRS public user access to a collection of databanks with polymorphisms of particular genes. Entrez, a composite databank that integrates abstracts from the medical literature (MEDLINE) with genomic maps and with sequences and structures of nucleic acids and proteins. For consulting Entrez, there is besides the WWW also a special-purpose Internet tool called Nentrez. The Genome Data Base (GDB), which contains maps of the human chromosomes and a lot of related information (genes, polymorphisms, amplimers of genomic regions, links to related phenotypes and animal models,...). Online Mendelian Inheritance in Man (OMIM), which contains a literature review for each identified human gene and for each trait shown to be hereditary in man. The participants will have the opportunity to go directly into practice. They will have at their disposition a personal workstation and a leaflet with guided exercises. To follow this tutorial no specific knowledge is necessary.

Keywords: Internet and human genetics.

Tutorial RAMIT vzw:

1. Security, Electronic Signatures and Pseudonymisation Services

Filip De Meyer

Governmental and e-commerce decision have given the practical implementation of electronic signatures a strong boost. Belgian legislation is being adapted to cater for electronic signatures. The European and Belgian electronic signatures situation will be dealt with in a detailed manner. Since the Internet is being used more and more as a communication highway for communication of all sorts of data between different applications, security countermeasures to protect the integrity of the transmission have to be taken and privacy protection put in place. Moreover, the local infrastructure has to be shielded of in order to protect the availability of data and services. Trust Services are gaining importance; An overview of this type of services is given with special emphasis on pseudonymization services.

Curriculum vitae: After his study as an engineer in electronics, Filip De Meyer started working for the Department of Medical Informatics of the University Hospital in Gent as a network manager. He followed a postgraduate programme on datacommunications. For RAMIT vzw. he has been active in several national and European projects. He has been concentrating on security issues in health care and has been involved in Trusted Health Information Systems (THIS, Infosec 94 programme), two projects on digital signatures and user security requirements; in Trusthworthy Health Telematics (TRUSTHEALTH 1&2, Telematics Application Programme) concentrating on Trusted Third Party security services. He was the central European representative of the SIREN (Security in Regional Networks) project. He was project manager of SEMRIC (Security in Medical Records) and participant in MEDSEC. He has been an active member of the security workgroup of CEN TC251 and was assigned as expert to the SECCOM (secure communication in healthcare) project team. He teaches medical informatics: telematics and security subjects in postgraduate programmes at the university of Ghent. He is an external member and secretary of the ministerial working group on security in healthcare, which is part of the official telematics commission. Since 2 years he is carrying out the task of project manager for pseudonymisation projects that involve the implementation of privacy enhancing techniques for mainly pharmaceutical applications. He is regularly asked for in-house training and public presentations on security subjects both from a technical and non technical point of view.

Tutorial RAMIT vzw:

2. Hospital Intranet Development

Tom Fiers

Due to the inherent advantage of security, healthcare institutions are very keen on development of intranet solutions, in addition to Internet access. Current Internet technology easily allows development of hospital wide intranets with limited initial investments, both in respect to human resources or hard and software costs. Careful planning and standard procedures are essential in intranet development, in order to handle compatibility, uniformity and updating issues, as to keep these costs in check. It is of paramount importance to clearly define intranet project goals in advance and to ensure cooperation from all parties involved. It is equally important not to get carried away with each new wave of technology, but to opt for tools and solutions which work best in the complex hospital world. Transparent data access, integration and distribution are key words in hospital intranet development and should therefore define appropriate choice of technologies to use. The intranet of the University Hospital of Gent is regularly consulted from over 500 pc's. Applications span most medical, paramedical and technical services in the hospital and the intranet servers are transparently connected to all major hospital servers. In addition to the logical document management and general service tasks (such as phonebook, drug repository, guard duty rosters etc), the intranet forms an addition to the Electronic Patient Record system in our hospital by providing additional services and overviews utilizing and combining data stored in the EPR and satellite systems. In the last few years, the intranet has become an increasingly important tool in our hospital providing up to date information and integrated data access to all healthcare workers.

Curriculum vitae: Dr. Tom Fiers is coordinator for the implementation of an Electronic Patient Record system in the University Hospital of Gent since 1996. He is also responsible for the creation of the hospital Intranet and the development of new intranet applications.

How to Use Pretty Good Privacy (PGP)

T. Putzeys, M. Michaux

Introduction: PGP is based on a widely accepted encryption technology known as public key-cryptography in which two complementary keys, called a key pair, are used to maintain secure communications. One of the keys is designated as a private key to which only you have access and the other is a public key, which you freely exchange with other PGP users. Both your private and your public keys are stored in keyring files, which are accessible from the PGPkeys window. It is from this window that you perform all your key management functions. This tutorial takes a quick look at the procedures you normally follow in the course of installing and using PGP. For details concerning any of these (and more advanced) procedures, refer to www.pgpi.com, and download your appropriate pgp version and documentation.

Materials and methods: First download and install the appropriate version on your computer. Find out about a *passphrase*, make your keypair and learn about the use of it. With PGP for Freeware, you can easily and securely protect the privacy of your email messages and file attachments by encrypting them so that only the intended recipients can read them. You can also digitally sign messages and files, which ensures their authenticity. Learn how to encrypt/decrypt, sign/verify messages, text, maps and files, and about wipe disk and freespace wipe.

Results: With PGP for Freeware, you can easily and securely protect the privacy of your email messages and file attachments by encrypting them so that only the intended recipients can read them. You can also digitally sign messages and files, which ensures their authenticity.

Discussion: After the tutorial you will have no more excuse for not using encryption in the current exchange of medical data.

Keywords: Encryption.

Curriculum vitae: Dr. Theo Putzeys studied at the University of Leuven (1971), and works as a GP near Antwerp (Belgium). He was one of the first physicians to introduce the PC in his practice, and also one of the first to start the exchange of medical data by computer-telecommunication. Dr. Theo Putzeys is the chairman of "Medisch Discussie Forum", a discussion platform about the use of Internet in medical practice, standing for the idea of the use of international, widely spread software for medical records and the exchange of data. Trustworthy and reliable encryption is a must.

Health Information Europortal Tutorial

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Introduction: Information is needed by patients, professionals and citizens concerning the detection, treatment and prevention of disease. It has to be accurate, relevant, up-to-date and quick and easy to access. An electronic network is capable of supporting these requirements. Currently there are increasing numbers of health information sites on the Internet. Few if any measure up to the specified requirements. The main failings appear to be the lack of involvement of average users in the design, coupled with the absence of any useful evaluation mechanism. These flaws could be overcome by a European consortium with the necessary capabilities.

Materials and methods: Continuing consultation with professional and patient representative groups. Development designed with integrated evaluation. A simple user interface providing access to: (1) structured data such as guidelines and useful addresses; (2) search engine for complex or ill-defined requests. Editorial Board for content selection and accreditation. Translation into several languages to obtain feedback from different populations. Effective network support. Public relations to ensure widespread adequate usage. Cycles of evaluation and development.

Results: A pilot portal available to several language groups in a number of European countries. Feedback from the users concerning ease of use as well as clinical usefulness. Information from different user groups available to each other.

Discussion: Business case to be established to ensure continued viability. Possibility of expansion to countries beyond Europe.

Keywords: Health, Portal site, Medical Informatics.

WEB PACS Application of Web Technology for Distrubuting Digital Images in and Outside a Hospital.

Jan Schillebeeckx, Erik Ranschaert

Introduction to PACS: There is an over 100-year history of conventional film to capture, store, move and display radiographic images. Today most of the modalities directly obtain images in a digital format. This is certainly true for the newer modalities such as Magnetic Resonance Imaging (MRI), Computed Tomography (CT), ultrasound, digital angiography and fluoroscopy. But also

conventional radiography can be acquired in a digital format by the introduction of Computed Radiography (CR), Digital Radiography (DR) and film digitization. PACS stands for Picture Archiving and Communication System. It is a computer system which provides the opportunity to break free from the century-old constraints of film with regard to the acquisition, communication, storage and display of images. An overview will be given of the current and future trends of image acquisition, PACS interfaces, PACS archival technology, PACS image display and PACS networks. By explaining the advantages of PACS it must become clear that PACS will be the inevitable future.

Intranet web-based image distribution: Originally PACS was conceived as a system within the medical imaging department. With filmless radiology, however, PACS could not be confined to the medical imaging department because clinicians need images too. Images are distributed electronically and in principle can be viewed on any PC in our outside the hospital. One solution is the distribution of the images using web-based technology. Within the hospital the hospital intranet can be used. The images can be viewed at a reasonable speed and a reasonable cost with a medium range PC (200 to 300 MHz) and a large amount of inexpensive RAM, at least 64MB. With a high range PC (400 MHz and more) and mid to high range RAM (128-256Mb) there is even a very fast access to the images. The average time to display 16 CT images on the web-based intranet is 7 to 8 seconds. A normal 17-inch monitor delivers enough image quality for clinical viewing of the images. Access from remote sites using the Internet is also acceptable if there is a fast modem connection. With a cable modem the average time to display 16 CT images is 16 seconds over the Internet. Data security is provided by SSL (Secure Socket Layer) encryption. Connection security can be provided by a proxyserver or a firewall. User access is only granted true user ID and password.

Teleradiology: There are three models of teleradiology: telediagnosis, teleconsultation and telemanagment. For telediagnosis, the patient examination results and images are transmitted to a remote expert center for primary diagnosis or second opinion. The urgency of this service is nominal and the turn around can take between several hours to a day. For teleconsultation, the patient may still wait at the examination site, while the referring doctor referring request a diagnosis or second opinion from the expert at a remote site within minutes to half an hour. For telemanagment, the patient may still be in the examination room and the expert at the remote site provides immediate management care to the patient in situ. The two last models require fast connections, which will be possible once there is enough bandwidth available. Today s technology makes already possible the first model of telediagnosis. This model will be discussed.

Image Web Server: Hands-on: Login, Manual query, Wizard query, Thumbnails, Image display, Screen layout, Multiple studies comparison, Modality related display tools, Window/Level, Measurements, Zoom, Rotation, Cine, Conference mode, Report, Image export, Work in progress: Cardio application.

Curricula vitae: Erik R. Ranschaert: Radiologist; Full-time radiologist at the AZ Heilig Hart in Ninove, Belgium. His special interests are in medical Internet applications. Created the first Belgian radiologic web site called “The Belgian Radiology Link” [URL: http://www.belgianradiology.com]. Moreover, founder and manager of “EUFORA”, the European Forum for Radiologists. Jan Schillebeeckx: Radiologist; Imelda-Hospital; Bonheiden Consultant: 1978–1983, Chairman of Department of Radiology since 1983; Board Certifications: KBVR – Belgian society of Radiology, RSNA – Radiological Society of North America, NUR-UNR – Belgian Professional Union of Radio-Diagnostics (Board member, President 1996–1999), Europacs (Board member), SCAR – Society of computer assisted radiology, EUFORA (Co-owner of mailing list).