

WEB-BASED TRAINING OF EUROPEAN HEMATOLOGISTS

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Abstract

The paper describes the preliminary results of a European research project to develop and evaluate an on-line integrated web-based educational platform for hematology. The goal of the system is to improve and harmonize professional skills and competences in this medical field. A classification of target users has been carried out together with main interaction scenarios. European institutions running certified programs in hematological education, training and accreditation have been involved in the project. Students, physicians, nurses and technical staff doing hematological education and training will be the potential users of this system together with expert hematologists who need continuing training and all physicians of linked specialties (as pathologists, laboratory physicians, geneticists, immunohematologists, pediatricians, oncologists) who may take advantage of these scientific contents. Starting from an analysis of user requirements, the main items of clinical cases to be accessible on the web site have been identified. A first version of the web site is now under development and testing; such a learning tool will be available to the medical community starting from the end of this year.

Key Words

Medical training, hematology, web-based platform, certification, evaluation, knowledge exchange, harmonization.

1. Introduction

E-learning service provision in the health care sector has a growing relevance during the last few years. For this reason, a remarkable effort has been done by national and international institutions to support the development of new services both for higher education (schools and universities) and for the professional training sector.

In particular the European Commission is currently supporting several projects aimed at improving and disseminating knowledge using web-based education in medicine not only in the European area but also in the Mediterranean Basin.

This paper describes the preliminary results of a pilot project (EUR/02/C/F/PP-84703, European Commission, Directorate-General for Education and Culture, "Leonardo da Vinci" Community Vocational Training Programme), named EETAH-on-line (European Education, Training and Accreditation in Hematology on-line), devoted to offer an accredited on-line trans-European platform to improve, harmonize and develop skills and competencies in the field of hematology.

The EETAH-on-line project is based on a cooperation in tele-medicine and tele-education started in 2002 [1,2]. Partners of the joint research team are: the European Hematology Association (EHA), project promoter, the European School of Hematology (ESH), the University La Sapienza of Rome (Department of Cellular Biotechnologies and Hematology), scientific coordinator, the Catholic University of Sacred Heart (Research Center for the Development of Automated Methods in Hematology), University of Barcelona (Institute of Hematology and Oncology), Nergal S.r.l, and Luiss "Guido Carli" University (Research Center on Information Systems).

2. Aims of the project

The EETAH-on-line project main goal is to develop and evaluate an on-line integrated web-based educational platform for hematology (named *EHT on-line system*). Additional targets are:

- Accountability and certification of the service provider.
- Content quality and certification.
- Usability in terms of interactivity, aesthetics and multimediality.

- Providing and testing an accreditation environment in the field of hematology.
- Encouraging the development of skills using ICT (Information and Communication Technology) for the old and new generations.
- Encouraging equal access to training.

3. Quality and certification

According to the goal of content quality, the EHT on-line system is expected to be conform to the certified Health On Line (HON) criteria, as well as to the private data security and treatment current rules.

The certification process consists in filling an on-line questionnaire and storing the URL in a database, then a review of the site is made on the basis of the given answers. If the site fulfills the certification criteria, a suitable HTML code is sent and inserted in the pages of the site [3,4].

The evaluation principles for medical and health Web sites are:

1. *Authority.* Any medical or health advice provided and hosted on this site will only be given by medically trained and qualified professionals unless a clear statement is made that a piece of advice offered is from a non-medically qualified individual or organization.
2. *Complementarity.* The information provided on this site is designed to support, not replace, the relationship that exists between a patient/site visitor and his/her existing physician.
3. *Confidentiality.* Confidentiality of data relating to individual patients and visitors to a medical/health Web site, including their identity, is respected by this Web site. The Web site owners undertake to honor or exceed the legal requirements of medical/health information privacy that apply in the country and state where the Web site and mirror sites are located.
4. *Attribution.* Where appropriate, information contained on this site will be supported by clear references to source data and, where possible, have specific HTML links to that data. The date when a clinical page was last modified will be clearly displayed (e.g. at the bottom of the page).
5. *Justifiability.* Any claims relating to the benefits/performance of a specific treatment, commercial product or service will be supported by appropriate, balanced evidence in the manner outlined above in Principle 4.
6. *Transparency of authorship.* The designers of this Web site will seek to provide information in the clearest possible manner and provide contact addresses for visitors that seek further information or support. The Webmaster will display his/her E-mail address clearly throughout the Web site.
7. *Transparency of sponsorship.* Support for this Web site will be clearly identified, including the identities

of commercial and non-commercial organizations that have contributed funding, services or material for the site.

8. *Honesty in advertising & editorial policy.* If advertising is a source of funding it will be clearly stated. A brief description of the advertising policy adopted by the Web site owners will be displayed on the site. Advertising and other promotional material will be presented to viewers in a manner and context that facilitates differentiation between it and the original material created by the institution operating the site.

They result to be compatible with the principles at the basis of "Leonardo da Vinci" Program. For instance, one of the principles foresees that every medical information is inserted on the site by qualified professionals.

A validation test of the system will be carried out by a suitable sample of users belonging to EHA and the ESH. Quality of validation is guaranteed by the presence of a trans-national Steering Committee composed of ten leading hematologists of broad international reputation belonging to important Universities and Institution all over Europe and coordinated by a Chairman (partner of the project).

The Steering Committee is composed by: Prof. G. Castoldi (Italy), Prof. G. Flandrin (France), Prof. A. Gratwohl (Switzerland), Prof. E. Hellstrom-Lindberg (Sweden), Prof. D. Hoelzer (Germany), Prof. K. Lechner (Austria), Prof. D. Loukopoulos (Greece), Prof. B. Lowenberg (The Netherlands), Prof. E. Matutes (United Kingdom) and Prof. A. Polliack (Israel).

EHA and ESH will take care of the guidelines for the management of the Intellectual Property Rights (IPR).

Moreover, the exploitation and the diffusion of this long-distance education, training and accreditation project will allow single hematological institution to monitor their co-workers' training and lifelong skills and competencies acquisition quality.

4. Evaluation of site usability

Evaluation of the friendliness of the system takes into account various usability aspects. The test has been effected with heuristic techniques of evaluation defined by Jakob Nielsen, one of the most greater experts of web sites usability.

For a better monitoring of evolution of the quality, especially once running in its final version, a scoring method that allows to give a score for each of the following aspects will be used [5]:

- Visibility of system state.
- Correspondence among system and real world.
- Control and liberty of use.
- Consistence.
- Error prevention.
- Recognition more than memory.
- Flexibility and efficiency.

- Aesthetics and minimalist planning.
- Help the consumers to recognize, diagnose and overcome the situations of error.
- Helping and documentation.

5. The prototype

At present, hematology training is mainly based on traditional courses and meetings that allow the participation of a restricted number of individuals. This approach is time and resource consuming [6].

Websites and many very expensive CD-ROMs, done on the basis of private enterprises, are now available. The more common way of accessing to learning contents is the traditional one, i.e. library and scientific papers consulting. This approach is, clearly, not institutionalized and nor verifiable [7,8].

The EHT on-line system fully fits with the needs of professional, long distance, lifelong acquisition, indiscriminate, certified and standardized education, training and accreditation.



EHT on-line homepage

The web site will be available in different languages. The current (English) version of the prototype includes three separate sections.

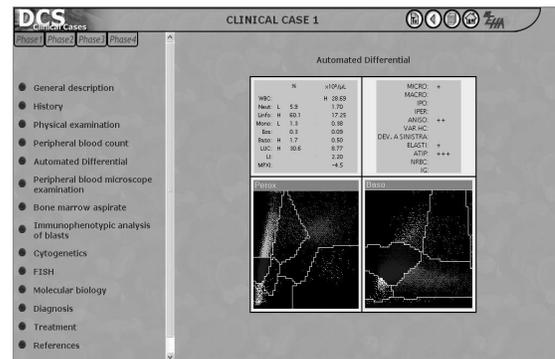
Education. This section is mainly devoted to self education tools and includes:

- *Morphology database*, containing medical and hematological morphological items.
- *Glossary*, i.e. medical definitions such as anemia, leukocytosis, Philadelphia chromosome, etc..
- *Guidelines*, i.e. systematically developed statements to assist practitioner and experts decisions about appropriate health care for specific clinical circumstances.
- *Journals on-line*, i.e. a list of specialized on line journals.
- Other kinds of relevant *documents*.

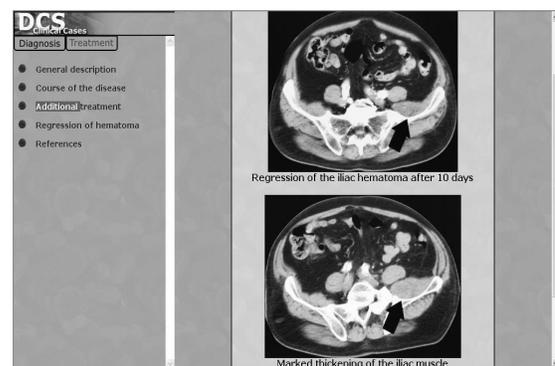
Training. This section includes selected and updated documents related to:

- Clinical cases.
- Guidelines.
- Protocols.

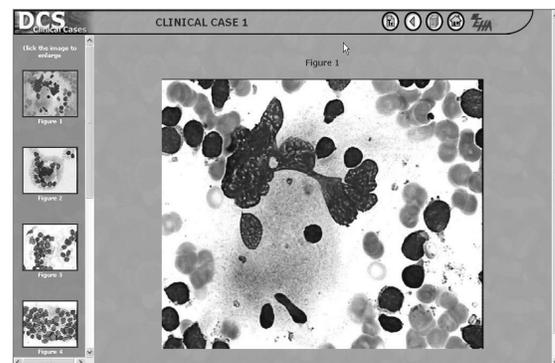
- Therapeutic and experimental trials.
- New diagnostic technologies and other innovative issues concerning this scientific discipline.



Automated Differential



Regression of hematoma



Bone marrow fluid microscope examination

Accreditation. This section (under development) will access to a suitable set of functionality to test the learning level, that users have to carry out according to clearly predefined criteria to obtain credits for validation of the professional competence.

6. System configuration and specifications

The prototype uses dynamic web technologies and its final version will adopt the most advanced provisioning and security solutions [9]. In particular, the server side of the web application is implemented through the use of java technology [10]. The client side of the application takes advantage of java script controls in order to help

the user to type in the correct information [11]. Data on tests and users will be maintained in a database. Personal data about users will be encrypted in order to fulfill the standard privacy requirements [12]. Data exchange in Internet will use https secure protocol.

The web server uses the Linux operating system, that offers tried and tested stability and the speed necessary for operating web server applications [13]. It is generally more reliable in a multi-user (shared) environment, i.e. web servers crash less often than Windows-based ones, hence it generally guarantees a greater amount of uptime for the website. Linux total cost of ownership is very low [14], it is an open source platform, many developers have already created a wide variety of CGI scripts, PHP scripts, and MySQL applications that work on nearly any Linux system. Besides, it includes a very robust packet filtering firewall system and many intrusion detection tools.

The web server uses an HDSL line for the high speed access and low cost of installation. HDSL is symmetrical, so that an equal amount of bandwidth is available for data transferring to or from the server. This technology provides a maximum bandwidth of 1.5 Mbps per second in each direction. It supports voice, video, broadcast and receives streaming video/audio, flash animations and allows users to download huge amounts of multimedia contents and to store and update quickly on the server large amounts of documents and training materials.

It is important to consider the necessary scalability of the system to allow increasing of features and of computing power to manage in a suitable way several tasks.

The server uses Intel® Xeon™ MP (Multi Processing) processors specifically designed for high performance scalable and reliable servers.

The system expects to serve, from the beginning, up to 200 simultaneous connections.

A user administration subsystem will identify users pathways, by means of personal IDs and passwords, as well as computing statistical data to deliver individual credit grants [16].

Several views on the system, based on a password authentication, will allow customized accesses to documents by different users such as:

- Hematologists, who require continuing training at each level in their professional pathway.
- Under- and post-graduate students in medicine.
- Physicians, involved in hematology-linked specialties, such as pathologists, laboratory physicians, genetists, immuno-hematologists, pediatricians, oncologists, who will take advantage of such a harmonized scientific platform.
- Nurses and technicians needing an hematological education and/or training.

The access will also be customized according to the organization running the service as provider (or as user), e.g.:

- European associations.

- Universities.
- Hospitals.
- Institutions involved in trans-European certified programs in hematological education, training and accreditation.

7. System functionality and advantages

The system will include functionality and tools to manage automatically, quickly, and efficiently the user needs:

- An *uploading* service for the submission of new cases or other contributions to the web site.
- First contact and possible pre-selection of authors.
- An environment for anonymous scientific *peer review* of submitted documents.
- *Warning* messages to inform users on new cases submission.
- Tools to allow the *cooperation* among users (forum, mailing list, chat, videoconference one to one or one to many).
- An *administration* environment to manage contributions, authors, permission, statistical data and credit grants.

This system will also guarantee:

- *Universality*. As it is web-enabled, it takes advantage of the universal Internet protocols and browsers. Concern over differences in platforms and operating systems is rapidly fading [17]. Everyone on the web can access the materials anywhere and anytime.
- Programs *customization* can be use for different learning needs or different groups of specialists.
- *Reduction of travel expenses*, for the time it takes to train people and the need for a classroom infrastructure.
- Since it is web-enabled, the contents can be *updated* easily and quickly, making the information more accurate and useful for a longer period of time [18].
- Methods' and results' *transparency*.
- *Equal access* to training for all individuals.
- A clearly defined *editorial policy*.
- Building enduring communities of practices where they can come together to *share knowledge* and insight long after a training program ends
- *Privacy* and *data protection*. The system will have a data protection policy for processing personal data in accordance with European Union data protection legislation.
- *Training harmonization* with a realistic improvement of new generation mobility and knowledge exchange [19].

Conclusions

The current version of the prototype is under development and its preliminary testing will be done

during the pilot phase of system validation by the final users. The validation will verify its friendliness and the completeness and correctness of the functionality with respect to an efficient and effective support to learning and certification processes [20].

The EETAH-on-line project wishes to introduce an innovative kind of vocational training, by exploiting the potential of ICT in trans-European hematology education, training and accreditation. In fact, a complete, certified and harmonized web-based learning system in hematology does not exist. The multi-language on-line interactive platform will facilitate knowledge exchange among European trans-national hematological institutions, universities, hospitals and research centers and provide a new kind of web service [21].

The project will complete its activities in 2004 delivering the EHT on-line system to the European hematology community. An exploitation plan of the results will provide possible scenarios for the long time operational management of the learning service after the end of the project.

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