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ABSTRACT

This project reports the publication of a variety of existing curricular resources for emergency medicine on the global Internet in a format that allows hypertext links between related material, timely updates, and end-user feedback. Curricular elements were converted to Hypertext Markup Language with extensive links between related content. The completed document contains instructions for curriculum development, specific curricula for subspecialty areas within a residency, reading lists for subspecialty curricula, banks of images, and board-type questions with answers. Users are provided with a mechanism to provide immediate feedback to section editors with suggestions for changes, including new references. Access to all or part of the document can be controlled via passwords, but is potentially available to anyone with an Internet connection and a World Wide Web browser. The document may be viewed on the World Wide Web at: http://www.brown.edu/Administration/Emergency_Medicine/curr.html

Key words: education; curriculum; hypertext; Internet; World Wide Web.


Educational processes are guided by the development of curricula that define and organize content, format, resources, media, implementation methods, and evaluation. The process of developing curricula is not new. The development of curricula for residency training, however, has been sporadic and only recently received increased attention through the requirement for written curricula by the various residency review committees of the Accreditation Council for Graduate Medical Education (ACGME). The Residency Review Committee for Emergency Medicine (RRC-EM) requires the submission of a written curriculum for all programs.1

In order to assist educators in emergency medicine (EM) with this process, SAEM published a document titled "Guidelines for Curriculum Development" in 1993.2 This document contains descriptive sections detailing the elements of curricula, as well as guidelines for the process of developing a curriculum. These sections are generic to the entire scope of medical education and can be applied to any specialty. The document also contains 23 sections detailing the goals and objectives for the specific subject areas that are normally present as block rotations in an EM residency. Subsequent to the publication of the original document, a reading list was developed for each of the block rotations and keyed to the specific objectives of the rotations.

In a parallel effort, the Council of Residency Directors in Emergency Medicine (CORD) began to develop and distribute 2 sets of educational materials that can be used to implement and evaluate residency programs. The image bank initially contained a set of approximately 200 slides of clinical photographs, ECGs, and radiographs, which are available as 35-mm slides. Subsequent editions have brought the number of images to >600 and the slide format has been...
complemented by the publication of a CD-ROM. Additionally, a set of questions with referenced narrative answers keyed to the subject areas of the SAEM curriculum document was developed and distributed. The initial set consists of about 700 questions and further additions are under active development.

The entire knowledge base for EM is published as a joint policy statement of SAEM, the American College of Emergency Physicians (ACEP), and the American Board of Emergency Medicine (ABEM), and is called the "core content." The core content is arranged as a large outline with 23 major sections and was updated in 1997.

These reference materials are ideologically connected, but physically distinct. To use these resources, an individual must take them off the shelf and digest them separately. A further limitation of these documents is their static nature. The knowledge basis of medicine and the medical literature are in constant evolution and change daily.

We anticipated that the World Wide Web (WWW) would provide an ideal medium for the distribution of the various educational and curriculum building tools developed by these organizations within EM. The use of Hypertext Markup Language (HTML) transforms many hundreds of pages of text, hundreds of images, and hundreds of questions and answers into a compilation of data that can be traversed quickly. Furthermore, the widely differing documents can all be linked together, using the core content as a backbone, so that a user could go from one document to another (Fig. 1).

The format allows for continuous updating and expansion of any of the elements with instant access to the users. The inclusion of electronic-mail (e-mail) links to the document allows users anywhere and at any time to propose updates, additions, references, and even images to central editors, who then alter the computer-based document for immediate access. The entire document could theoretically change several times each day, making it a truly dynamic resource for educators.

METHODS

The original documents were received in Microsoft Word format and converted to text files with HTML tags. HTML allows the logical structure of the document (e.g., title, headings, hypertext links, and references) to be specified by specially marked text interspersed within the document. This process was facilitated using PERL (Practical Extraction and Report Language) scripts to convert the implicit links contained in the documents to hypertext links.

The clinical images were digitally scanned from 35-mm slides and saved as stored as JPEG (Joint Photographic Experts Group) files. JPEG format is an image compression technique widely used to store photographs for transfer over computer networks.

The source files are stored on the UNIX server at Brown University, which is connected to the Internet. The documents are available on the WWW. The WWW server program—National Center for Supercomputing Applications Hypertext Transfer Protocol (NCSA HTTP)—supplies the documents to remote computers on request. The Common Gateway Interface (CGI) capabilities of the server allow the UNIX machine to generate output on-the-fly via PERL scripts. For example, the subset of references for a single objective is generated dynamically by such a script each time reference links are activated. Another script allows users to enter comments into a form for forwarding to the section editors via e-mail. The server program also allows password-restricted access to specific sections and maintains a log of visits to the document.

The development of software with "groupware" editing capabilities will allow multiple widely dispersed editors to update the document remotely.

IMPLEMENTATION EXPERIENCE

In the first year of publication, there have been approximately 3,000 visits to the document. A counter on the initial page indicates the current usage. Since its inception, the editing features have permitted the addition of 2 new sections to the Guidelines for Curriculum Development outlining the goals and objectives of an experience in ultrasound and a curriculum on physician wellness. Neither of these additions has become available in other formats. Suggestions for changes in references have been received and implemented. Individuals
have been recruited to serve as section editors for the various subject areas. These individuals will serve as the recipients of e-mail sent by users of the document. They will review suggestions and forward final changes to the authors, who then alter the document.

The site has attracted interest from commercial interests and other groups of physicians on a worldwide basis. Links to the unprotected portion of the document now exist from several other sites.

DISCUSSION

The publication of these 4 curricular tools on the WWW has achieved several objectives. Use of the Internet makes these documents instantly available to all with Internet access throughout the world. The document brings together text and images into a single, editable, user-friendly format. The incorporation of hypertext links allows all of these documents to be viewed together so that the user can navigate from relevant portions of one document to the related portions of the other documents. E-mail links within the document allow users the ability to suggest changes, updates of references, additions, or deletions to central editors. These modifications can be made to the conglomerate document instantly making the document "live," and allows for constant updating, expansion, and revision without the need for republication in conventional format.

A primary focus of CORD is to collect and disseminate resources for educators in EM. The organization has chosen to use this web site as the initial locus for distribution of these resources. A current project is to produce a comprehensive ECG bank including tracings, case scenarios, and a question set that will be added to the web site when complete. Since all aspects may be downloaded for use by individuals, they can be converted to hard copy, slides, etc., for teaching purposes within residency programs. We have used these resources repeatedly to prepare both lectures and examinations for our program.

As the speed of Internet connections increases, other media, including sound files, video, and perhaps 3-D graphics, can easily be integrated into this curriculum document. Potential uses of this or similar platforms are multiple. Visual images for procedures or ultrasound can be included as videoclips. Course material for either residents or medical students could be distributed in this fashion, and nationally centralized examinations could be given and scored through a web site. In the single year since implementation, technology in this arena has greatly advanced.

LIMITATIONS

Though the Internet and the WWW are common media, not all within medicine are facile in their use. In many ways, medicine has lagged behind the population at large in embracing this technology. These resources are available only to those with appropriate skills and equipment. Technical reasons have prevented several program directors from accessing the site. Modern-based transfer may be slow, particularly for image files. A potential limitation of the site is the need for central programming and editing. Minor additions to the content are easily accomplished; however, major revisions require temporal and financial commitment. In order to use the features of the document that allow for updating, there is a need for both an active usership and a committed editorial board. The need to limit access to portions of the document (images and question sets) has resulted in a group of disenfranchised users outside the community of EM program directors.

CONCLUSIONS

A hypertext-based EM curriculum has been developed and implemented on the WWW. Access statistics and the adoption of the technology by CORD suggest that the format can achieve the objective of information transfer effectively for EM educators. Though the effort was technologically feasible, we will need to formally assess the impact and use of this project on EM education in the future.

The format demonstrates a novel use of the WWW for medical education. This document is only as complete as the individual elements that comprise it and as such is primarily a new and effective format for presenting information. It is hoped that this format will not only allow for increased ease and volume of use, but encourage the further refinement of the data that serve as its basis.

TECHNICAL NOTE

The document can be found on the WWW at: http://www.brown.edu/Administration/Emergency_Medicine/curr.html

The images and question sets are password-protected for access only by program directors in EM. During the month of publication of this article, the login name is set at: "A_Medicine" and the password is set at: "educate." Thereafter, SAEM will control password distribution and can be contacted at: (517) 485–5484. Password protection is designed to protect the integrity of the didactic elements of the document for program directors.

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REFERENCES

First Annual New England Regional SAEM Conference—Scientific Presentation Titles

1001 ED SUBSTANCE ABUSE INTERVENTION REDUCES OVERALL HOSPITAL CHARGES AND UTILIZATION

Edward Bernstein, Judith A. Bernstein, Vincent D. Hayes, Kurt T. Whitaker, Boston University School of Medicine, Boston Medical Center.

1002 ACETAMINOPHEN OVERDOSES: HOW OFTEN IS THERAPY APPROPRIATE?

K. Sophia Dyer, Frederick N. Jones, Susan S. Fish, Boston University School of Medicine, Boston Medical Center.

1003 ELDER BIAS IN THE USE OF NEUROMUSCULAR BLOCKADE IN EMERGENCY INTUBATION


1005 RADIOLOGY EDUCATION IN AN EMERGENCY MEDICINE RESIDENCY: A PILOT STUDY


1006 COMPLICATION RATE OF ED INTUBATIONS: FIRST REPORT OF THE NATIONAL EMERGENCY AIRWAY REGISTRY (NEAR)

Ron M. Walls, Robert Vissers, Vincent Chiang, Susan B. Promes, Charles Pollack, Jr., Steven Bernstein, John C. Sakles, Steven J. White, Richard E. Wolfe, Brigham & Women's Hospital, Harvard School of Medicine.

1007 INTERHOSPITAL TRANSPORT OF CRITICALLY ILL CHILDREN: A COMPARISON OF GROUND AND AIR

Gina Quinn-Skillings, Reed Brozen, Dartmouth–Hitchcock Medical Center, Lebanon, NH.

1008 ASSESSMENT OF AN ED RHOGAM PROTOCOL

Joan M. Meunier-Sham, Susan S. Fish, Benjamin J. Kerman, Boston University School of Medicine, Boston Medical Center.

1009 OUT-OF-HOSPITAL Triage of AMI PATIENTS: POTENTIAL IMPACT ON HOSPITAL ADMISSION PATTERNS


Marc J. Shapiro, MD, and Gregory D. Jay, MD, PhD, were the coordinators of the scientific presentations.

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Boston University School of Medicine, Boston Medical Center.

1010 THE DEVELOPMENT OF A FELLOWSHIP TRAINING PROGRAM IN OCCUPATIONAL AND ENVIRONMENTAL EMERGENCY MEDICINE

Michael I. Greenberg, Allegheny University Hospitals, East Falls, Philadelphia, PA.

1012 DRINKING AS A PREDICTOR OF ALCOHOL-RELATED EXPECTANCIES AMONG INJURED ED PATIENTS

Susan E. Ramsey, Aruna Gogineni, Francis Sparadeo, Ted Nirenberg, Richard Longabaugh, Robert Woolard, Brace Becker, Patrick Clifford, P. Allison Minugh, Center for Alcohol and Addiction Studies, Brown University School of Medicine, Rhode Island Hospital.

1014 THE EFFECT OF "MILKING" ON FINGERSTICK CAPILLARY LACTATE SAMPLES IN RESTING VOLUNTEERS

Moed Azam, Edwin Emayado, Robert F. Lavery, Anthony Ciccone, Bartholomew J. Tortella, John H. Siegel, University of Medicine and Dentistry of New Jersey, Newark, NJ.

1015 PREDICTING POTASSIUM ABNORMALITIES IN THE ED SETTING

Jill Griffin, Howard Smithline, Baystate Medical Center, Tufts University School of Medicine.

1017 CRANIAL CT SCANS IN PATIENTS PRESENTING 24 HOURS OR GREATER AFTER BLUNT HEAD TRAUMA

Pierre Boreczuk, James Ostrander, Josh Dienstag, Harvard Medical School, Massachusetts General Hospital.