**HubMed.** Alf Eaton; 416-340-4800 x6823; fax, 416-340-3595; alf@hubmed.org; http://hubmed.org/; free Website.

### Purpose and general description

HubMed (bearing the tagline ''PubMed rewired'') is an alternative interface to the PubMed database. Created by script-savvy programmer Alf Eaton, HubMed pulls information directly from PubMed via National Center for Biotechnology Information's (NCBI) Entrez Programming Utilities. In addition to serving as an excellent demonstration of the power of XML and the semantic Web, HubMed offers innovative ways to browse and explore the literature. In fact, this emphasis on new modes of exploration often makes HubMed feel more like a technology playground than a competing interface to PubMed.

### Contents

HubMed searches the PubMed database live, so running a search in HubMed with the default search options (make sure the Sort By dropdown menu below the search box reads ''date'' rather than ''relevance'') retrieves the same results as it would in PubMed. PubMed field codes, such as [ta] for journal title, work when using the default search options.

### Intended audience

This interface is designed for non-expert searchers who nonetheless know a bit about Web technologies. Think of them as the folks who might know what MeSH is but probably do not use it. Because it incorporates some, but not all of MEDLINE's indexing features, HubMed will likely frustrate many librarians who value and rely on those features to perform expert searches.

### Accessibility

HubMed is accessible to anyone with an Internet connection. While searching within HubMed, it is easy to limit to freely available full-text articles (simply click on the Free button at the top of the results screen). This may make HubMed an attractive database to those unaffiliated with a library.

### Searching

*Note: all searches were performed on August 17, 2006.* To search HubMed, you must type all of your concepts into one search box as one does when searching Google. There is not an advanced screen with multiple field or other search options, and there is no easy way to access a search history page to build a ''one concept at a time'' search strategy. (The History button on the results page may be misleading to those familiar with PubMed's History tab: instead of keeping track of your search history, this history button tracks recent full-text links you have followed.)

There are two options for searching: the default, using PubMed's search syntax (the Sort By dropdown menu should read ''date''), or using Apache Lucene's search syntax (change the Sort By dropdown menu to read ''relevance''—see http://lucene.apache.org/ for further information). If you search using the default option, your results will be the same as they would be had you conducted the search in PubMed. However, the Lucene relevance search uses an open-source search algorithm and does not employ any mapping to MeSH terms. The results are therefore quite different. For example, my sample search for *COPD* retrieved 28,576 results from the default search and 10,248 results from the relevance-based search. Interestingly, the top result in my relevance-based search was a 2002 foreign language article with no abstract (in fact, 10 out of the top 20 results were foreign language citations and none were from the current year). Why this particular citation was determined to be the most relevant is not clear. Results appeared to be more relevant, though many fewer (16 as opposed to 627 in the default search), for my second sample search, a multi-term search for *heart attack depression mortality.* It therefore seems advisable to search using the PubMed By Date default, especially if you are searching for only one term.

There are two basic ways to modify your strategy once you have run a search. From the top of the results page, you can click on the bolded terms themselves, which transforms them into a ''modifiable text box'' [1]. Or, you can scroll all the way down to the bottom of the results page to the Refine Search section. This section shows you what MeSH terms and text words PubMed mapped your search terms to (the same information as can be found on PubMed's Details tab), and allows you to pick and choose from those mapped terms while adding a new term into the search with the AND operator. This allows for beginning a search broadly and narrowing it one concept at a time; however, since there is no OR operator option for adding terms, this offers very limited functionality. Additionally, the database appears to get confused if you alter your strategy more than once. In a sample search on *COPD treatment,* I deselected a therapy term (therapeutics [MeSH]) and then again narrowed my search by adding the term *tiotropium.* This retrieved 0 results in HubMed while the same search retrieved 171 in PubMed proper, perhaps due to faulty nesting on the part of HubMed.

Three icons that appear next to your search terms, and that are unique to the database, allow for more innovative ways to enhance your search strategy: expand search terms, cluster search results, and show MeSH information. Hovering over each icon shows what clicking on the icon will do.

**Expand search terms:** Clicking on the expand search terms icon ''will look at the first 500 abstracts matching the search query and determine which words occur most frequently in those abstracts compared to all abstracts in the PubMed database'' [1]. The most closely related terms appear first and in a larger font. Terms can be added to the original search statement by selecting AND or OR from a dropdown menu and then click-

ing on the desired term. For an idea of what kinds of terms are retrieved, searching for *COPD* and clicking on the expand search terms icon brought up 81 terms, the first of which was ''obstructive'' and the last of which was ''george.'' Also included, and potentially relevant to the topic, were ''tiotropium,'' ''underdiagnosis,'' and ''guidelines.'' This feature appears to work best with simple searches: for my multiple term search, *heart attack depression mortality,* no expanded search terms were found.

**Cluster search results:** Similar to clustering search engines such as Vivisimo, clicking on the cluster search results icon will cluster the first 200 search results based on the Lingo algorithm. Once again, these range from the useful to the bizarre, including ''Management of patients'' to ''Billion for asthma'' from the resulting 15 clusters for my *COPD* search and only 3 basic clusters, ''cardiovascular disease,'' ''treatment,'' and ''ST segment depression,'' for my *heart attack depression mortality* search.

**Show MeSH information:** For librarians and others familiar with searching with MeSH, the presence of this icon is promising; however, its implementation remains dishearteningly clunky. Similar to the Details tab in PubMed, clicking on the icon displays the MeSH terms to which your search terms were automatically mapped (unlike Details, it leaves off the textwords and other [TIAB] mapping). A further click on a particular MeSH term will display its scope note and bring up a list of what are labeled as ''synonyms''—really the entry terms. Clicking on any of these runs a search in the MeSH database for the entry term . . . something of a circular path that drops you outside of HubMed without having modified your search strategy.

## Working with results

By default, results are displayed 20 per page in a format similar to PubMed's Summary display. Other options include displaying selected or all abstracts, or using the unique Show Extracts button to display only those sentences from the abstract that contain the search terms, which appear highlighted in green.

Each citation in the results list contains a number of options for working with that citation:

**Abstract:** Displays the abstract of the citation within the results page.

**Full text:** Uses PubMed's LinkOut service to try to connect you to the full text of the article online (if available). Users who do not subscribe to the journal may be asked to log in or to pay for access.

**SFX:** Another option for locating the full text of the article, this link takes you to the SFX Services page for the citation, which in turn can take you to the publisher's site for the full text article via the DOI link. Other options on the SFX Services page are available, including links to a variety of library catalogs to look for the journal title (a limited number of libraries are connected to this service) or to the Web to look for information on the article. One feature that looks particularly promising, request via your local document delivery service, does not appear to be fully set up or customized at the time this review was written.

**Clip:** Adds the citation to the Clipboard, which is accessible in the upper right-hand corner of the results page.

**Export:** Offers options for exporting the citation into bibliographic management software, including RIS (e.g., for EndNote), BibTeX, RDF, MODS, RefWorks, and UTF8.

**Related:** Runs the PubMed-related articles search for similar articles.

**Cites:** Runs a search for other articles that cite the article. This feature only draws from those articles in PubMed Central, so it does not represent an accurate count of how many times a given article has been cited. For example, checking to see how many times Reya, T. et al., ''Stem Cells, Cancer, and Cancer Stem Cells,'' Nature. 2001 Nov 1; 414 (6859):105–11, was cited, HubMed shows 45 citations and Web of Science shows 498 citations.

**Scopus** (shows only if a DOI is available for the citation): Should link you to the citation in Scopus, if you subscribe to Scopus. This feature was not working at the time this review was written.

**Tag:** Allows you to tag and store the article with a keyword of your choice (similar to del.icio.us, etc.). You must set up a free HubMed account to use this function.

Clicking on or viewing the abstract of a particular citation brings up additional options:

**InterDB:** Looks for links for the citation within the Entrez databases Gene, Protein, Nucleotide, and Unigene.

**Terms:** Creates links for phrases and words from within the abstract to Wikipedia, Gene Ontology and UniProt.

**Graph (of related articles):** Displays related articles visually using a TouchGraph Java applet. Requires a Java version 1.4+ and a Java plug-in on your browser.

Another option for viewing results is via the small graph icon located in the upper right-hand corner next to the results number. Clicking on this icon displays a graph of the number of citations containing your search terms per year, since 1975. Below the graph, a link to analyze the most frequent authors (from a selection of 200 of the articles) allows you to generate a list of the authors who publish most frequently on the topic. It is not clear if the selection of 200 citations represent the most current articles (which is possible, since the PubMed default sort is By Date), or not.

## Getting help

HubMed's documentation is written by creator Alf Eaton and is available via the Help button at the top of every screen. It is somewhat limited (a note at the top of the page dated 3/28/06 states it is in process), and more information about HubMed features can be found in Eaton's HubLog (http://hublog.hubmed.org). A simple way to learn more about a particular feature is to search Google with the strategy *hubmed (feature name),* for example, *hubmed interdb.*

## Bottom line

HubMed provides innovative ways to explore the biomedical literature,

but it also contains flaws that may result in poor retrieval. Until some of the bugs are fixed, it will be difficult to recommend HubMed for reliable search results. However, for anyone interested in exploring biomedical literature (in a nonsystematic way) or the technologies employed by HubMed, this is a valuable addition to the family of MEDLINE interfaces.

In the future, we can hope to see many of the more intriguing HubMed features, such as visually displaying or clustering search results and incorporating DOI links and ''cited-by'' links, built into other bibliographic databases. Already PubMed has added the ability to save search strategies as RSS feeds, a feature that HubMed had implemented early on. We might also hope to see more expert searching features and quality control work go into these individual- or community-designed projects. If we as librarians can partner with the informaticists and ''techies'' developing these projects, we could create resources of both style and substance.

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**BioCritique.** BioExpertise, 525 Del Rey Avenue, Suite B, Sunnyvale, CA 94085; kerry@bioexpertise.com; http://biocritique.com/; free Website.

Imagine being able to eavesdrop on or, better yet, take part in, a discussion of the latest groundbreaking articles with world-renowned researchers. Imagine debating experts from the comfort of home or office without having to buttonhole them at a distant, national conference. BioCritique, a Website designed to bring collaborative minds together, makes such dialogue possible.

BioCritique is a free, online biomedical research forum intended to aid in interpreting the latest research in mediated, peer-review style. It touts itself as an educational tool and expressive outlet for ''early adopter'' physicians—those who are first to implement new research findings into their practice.

In essence, BioCritique is an online, worldwide journal club, led by a panel of 157 leading scientists and clinicians in major therapeutic areas who discuss recent, high-impact publications. After simple registration, users can access ongoing discussions of research articles, which are collected, updated, and archived on the site. As of this writing, more than 2,300 articles have been reviewed and discussed on the site. Approximately half offer interactive assessments to facilitate understanding and solidify the important contributions to medical knowledge. The site also offers 1,354 free slides for use in PowerPoint presentations.

BioCritique is organized by topics: cardiovascular medicine, diabetes, growth hormone and insulin-like growth factors, nephrology, rheumatology, and primary care. Because not all specialty areas of medicine are represented, occasionally a specialized research article is assigned to primary care. Each article selected from within a topic is linked to a rich collection of related resources, including the PowerPoint slide presentations, interactive assessments, clinical trials, and related research literature. For each article that is discussed, the author, contributors to the discussion, and posting dates are clearly labeled.

Each article is reviewed by a prominent research figure in the field. (The impressive roster of doctors includes Christie Ballantyne, Christopher Cannon, Roger Blumenthal, Vivian Fonseca, Peter McCullough, and Peter Toth.) One of the site's greatest strengths is the efficiency with which articles are laid out for discussion. The researcher provides interesting insight into the implications, limitations, and applications of the study under discussion, highlighting relevant points in simple, conversational language. However, don't expect to find full-text articles, only article summaries and discussions are posted.

The site is easy to navigate with useful features. Users can easily find a desired article through the simple search function and can browse articles and discussions by title, date, or topic. Advanced search settings allow sorting by date, user rating, and subcategories within specialties. Other practical features include links to related articles, the means to suggest article summaries and discussions with colleagues via email, dropdown menus to jump between topics, and email notifications of newly posted articles and discussions. Users can earn free continuing medical education credits simply by accessing the site's content.

BioCritique is supported by an unrestricted educational grant from several commercial entities, including Roche Diagnostics, Sanofi Aventis, diaDexus, CV Therapeutics, Bristol-Myers Squibb, AstraZeneca, and Takeda. A disclaimer states that the sponsors do not control or influence forum content, and the site does not contain advertisements. Each expert panelist also discloses his or her conflicts of interest. Whether the panelists are compensated for their contributions is not mentioned. Also, one wonders whether the commercial sponsors collect user data from the site to track, mark, or influence high-prescribing physicians.

There are a few drawbacks to

BioCritique, in addition to the limited medical-specialty topics already mentioned. Although BioCritique is peer-reviewed, and opposing viewpoints can deepen understanding of complex studies, discussions sometimes evolve into heated debates, in which obscure details about irrelevant outcomes predominate. Furthermore, despite the sponsors' disclaimer of influence on the content, bias may exist among the discussants owing to industry sponsorship of their research and relationships with the study authors or editors; unambiguous disclosure for each article would clarify this issue. Also, most reviews do not provide financial disclosure of funding for the original study, which is another potential source of bias.

Another drawback is the difficulty in accessing some features. For example, to download slides and access some of the extra interactive content, users must first submit a permission request. Finally, because the research forum is mediated, user comments are filtered and must be deemed worthwhile and relevant by a mediator to be posted in a discussion. However, this may be a necessary step to prevent unprofessional activity and unwarranted attacks against discussants or articles.

In summary, BioCritique is useful for anyone interested in staying current with the latest high-impact research developments. The conversational tone and well−thought-out synopses by leading researchers offer valuable insight into the articles discussed. It is easy to look over, register—and join the discussion.

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**EndNote X.** Thomson ISI ResearchSoft, 3501 Market Street, Philadelphia, PA 19104; 800.336.4474; fax, 215.386.9211; info@isiresearchsoft.com; http://www.endnote.com; individual subscription with guide, $199.95; contact for institutional site license and student pricing; free trial available via the Web.

EndNote is a bibliographic file management system predominantly used by researchers, clinicians, librarians, and students. Its purpose is to save users time in the creation, management, and storage of bibliographic references for easy access and sharing [1]. EndNote X has recently been released and has several useful features that save time, increase opportunities for collaboration, and the potential to improve the scholarly communication process.

There are other well-known bibliographic file management programs available such as Reference Manager, WriteNote and ProCite; however, EndNote is unique in the fact that not only does it have a greater amount of output styles available for use, but it also contains the ability to store and cite images and objects, and contains Microsoft Word templates which enables one to use predefined templates for specific publications [2]. In addition, the EndNote Website has a tremendous amount of usability tip sheets provided by libraries around the world that can be downloaded with ease for thorough examination. The library tip sheets available include PowerPoint guides to using EndNote, Word documents providing screen shots and step-by-step instructions and online tutorials on the use of EndNote using the popular, multimedia-based software program Camtasia. EndNote is easy to use and easy to teach, which provides an excellent opportunity for librarians to add to existing educational programming by offering instruction on both the use of the program and how it can be applied as a time-saver in the scholarly communication process.

## Key features

When identifying the key features of the EndNote program, some that come to mind include:

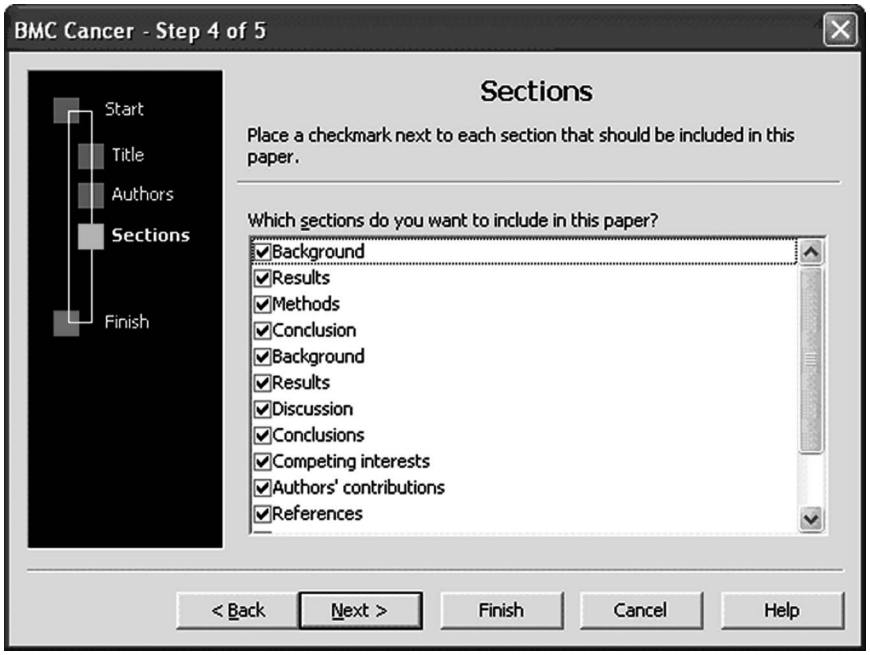
1. Output Styles
2. Manuscript Templates
3. Cite While You Write (CWYW)
4. Storing portable document format (PDF) files
5. The Traveling Library

The features mentioned above are highlights of the EndNote application, but by no means are they the only features of EndNote worth exploring. EndNote has many other features such as the inclusion of import filters, connection files, and the Remove Field Code option that are also integral to the functionality of the software.

The inclusion of output styles is one key feature of the EndNote program. Output styles consist of specific punctuation and formatting that is required for both in-text citations and bibliographies based upon publisher guidelines. EndNote creates all output styles listed on their Website, which includes over 2,000 styles for download. In the event that an output style does not exist, there is an option to suggest for EndNote to create a new output style using their online suggestion form. The amount of time it takes for EndNote to create an output style depends on a variety of factors, which are not within the user's control. If an output style needs to be generated immediately, there is an option to manually create a new output style within the EndNote program. Instructions on how to generate a new output style are provided within the EndNote program help menu.

Manuscript templates are another unique feature of EndNote. These templates are exceptional as they provide a detailed visual description (using the Manuscript Wizard) of the various components that are required for a particular journal based upon the publisher's guidelines. Figure 1 is a visual representation of the manuscript wizard that appears for the journal BMC Cancer. Notice that on the left-hand side, a Start to Finish guide is present and depending on

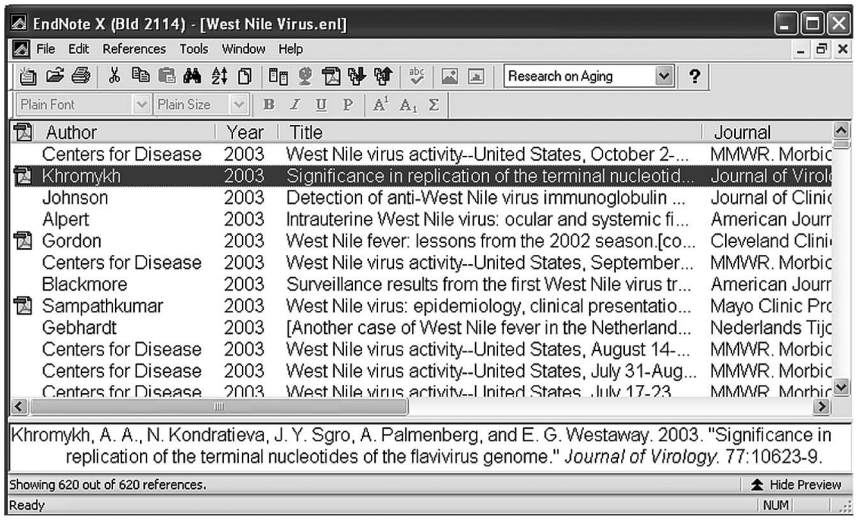
**Figure 1**
The Manuscript Template Wizard shows the various sections that are available to use for BMC Cancer




which component one is accessing, that component will be highlighted in green. In this example, the component highlighted is Sections. These are the sections that are allowed for inclusion in a manuscript submitted for publication to BMC Cancer. From this point, a user can select the appropriate sections that are applicable to his or her manuscript. If the author has no competing interests to include, that particular section could be unchecked and would not be included in the generation of the manuscript template.

Another feature of the EndNote program is Cite While You Write (CWYW), which enables you to insert selected citations from an EndNote library into a Microsoft Word document using a specified output style. CWYW works well and can be accomplished within two to three mouse clicks. In addition to the CWYW feature, EndNote has improved the ability to store PDF files within the EndNote library. This allows for easy transfer of information due to the file compression features EndNote now contains. The PDF storage feature has been improved by the inclusion of a folder allocated to the storage of all PDF files attributed to specific EndNote libraries. The PDF folder for a particular EndNote library can be accessed via your EndNote Library.Data folder. For example, if the name of the EndNote library is Test_Library, one would need to locate the folder titled Test_Library.Data to find the appropriate PDF folder. Figure 2 provides an example of how PDF files are available to view in the reference window within an EndNote library.

**Figure 2**
PDF storage within an EndNote library




Taking into consideration the vast amount of references that can accumulate within a library and the numerous PDF files one can incorporate, it is essential to have a mechanism available that will compress the size of a library (and its associated data and PDF folders) to enhance the transfer of information. In this regard, EndNote has created a file compression feature that is easy to use and compresses a library's file size, which makes it easier to attach via email. In relation to the transfer of information, EndNote has also created the Traveling Library, which is of interest to those who wish to share both their manuscript and associated references with colleagues. For example, if multiple people are working on a grant or research project, this feature would be ideal. The Traveling Library allows one to receive a manuscript from a colleague (which has been created using EndNote) and import those references to either an existing or new EndNote library. This feature greatly reduces the time spent on locating and importing references to an EndNote library, which in turn, enhances user performance and time management.

EndNote is easy to install and

the application is relatively easy to use. An EndNote toolbar is available in Microsoft Word, which enables users to access the various EndNote features necessary to format one's paper directly from within a Word document. Importing citations can be done seamlessly using a variety of online databases and import filters, which enhances the usability of the program. In regard to EndNote support and services, EndNote technical support has been fairly consistent in terms of providing useful information via phone and email; however, it would be beneficial for users to have access to an online chat service to answer any questions that arise regarding the program or its basic functionality.

An area for improvement would be the continual updating of manuscript templates. EndNote has updated output styles, import filters, and connection files regularly; however, the company has neglected to update manuscript templates since mid-2004 [3]. Another aspect of the EndNote program that would be ideal to include would be the ability to make edits to the Show Preview section of the EndNote reference window as it would enable one to make edits to a reference while viewing complete reference details in one glance.

EndNote can be of use to those working on collating a manuscript, curriculum vitae, or simply a bibliography of books and articles of interest. Upon use of the EndNote program, it is clear why this application is so useful and is often referred to as a ''true time-saver.'' The application is affordable, easy to use, provides an enormous amount of timesaving features, and has great capability for fostering collaboration, which makes it a viable choice for inclusion in acquisitions at various institutions and organizations. An EndNote trial is available for users from the Website and potential users are encouraged to use this option to review the program.

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