

# BRIEF COMMUNICATIONS

## Toward a more informed patient: bridging health care information through an interactive communication portal\*

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### INTRODUCTION

Patient access to health information and personal health records is becoming increasingly important in today's healthcare society. With eight out of ten online users searching for medical information, patients seek to be informed in matters of health [1]. In parallel with this high demand, the Institute of Medicine's Crossing the Quality Chasm report further highlights the critical need for patient involvement in the healthcare process. One of six proposed aims for improving quality of care, the "patient-centered" approach of providing care that respects and incorporates patient preferences in clinical decision making, requires adequate information, communication and education [2, 3].

The National Library of Medicine spearheads several consumer health initiatives, such as MedlinePlus, NIH Senior Health, and ClinicalTrials.gov, designed to get medical information directly into the hands of patients [4–6]. These services present one mechanism for increasing patient access to information, but do not address directly the communication between patient and provider. Information technology systems such as electronic health records and patient-focused web portals offer another mechanism for facilitating increased patient-provider communication and information sharing. Their proliferation also presents information professionals opportunities to further extend support for evidence-based medicine, consumer health and health literacy efforts directly to patients via processes that are driven by patient-specific data [7–9]. This paper reports on the Eskind Biomedical Library's (EBL) collaboration with informatics and clinical teams to foster informed patient decision-making and participatory healthcare through an online patient portal.

### BACKGROUND

The Eskind Biomedical Library has a solid history of targeted, innovative provision of information services to the Vanderbilt University Medical Center (VUMC) community. The library's firm integration with the clinical and research arenas is evidenced by the success of the Informatics Consult Services; these services have brought librarianship expertise directly to the bedside and research bench since 1996 [10–12]. In 1997, with funding

received from the Medical Center, the EBL introduced an Informatics Consult Service specifically designed to provide patients with health information from carefully selected resources appropriate to their education and health literacy levels. The Patient Informatics Consult Service (PICS) was designed to allow patients and patient family members to request personalized health information based on their diseases and conditions by having a Prescription for Information form completed by their physician [13].

This approach requires that patients physically enter the library, adding an extra step for individuals who may already be experiencing a great deal of stress over a medical issue. The PICS service was, in addition, never set up to reach a large number of patients and is designed to inform the patient and the treating physician on specific medical questions that need further research and in some instances further explanation. To complement this approach EBL more recently collaborated with a physician champion in an outpatient clinic to determine optimal strategies to deliver best-evidence health information to patients on a larger scale [14]. Concurrently, clinicians and software developers of the Informatics Center were engaged in the creation and refinement of a secure, interactive website specifically designed for patients which would integrate with the institution's electronic medical record system. As a unit of the Informatics Center (IC), EBL has ample opportunity to collaborate and partner with informatics colleagues in research and development initiatives that call for library expertise. When the IC initiated the clinical patient portal project, the library saw an opportunity for partnering and correcting some of the shortcomings of the previous patient information approaches, i.e., scalability and ease of access for patients in need of information.

### THE LIBRARY'S ROLE

The MyHealthatVanderbilt (MHAV) portal encourages patients to become proactive partners in their care management and facilitates open communication with healthcare providers. Interactive features such as appointment scheduling, online bill payment, and secure electronic messaging to providers engage patients in various steps of the healthcare process [15–17]. Patient data is seamlessly extracted from StarPanel, the Medical Center's electronic health record system [18–20], and disclosed to the patient within the MHAV portal. From the beginning of the portal's extensive re-development process in 2005 (which added numerous enhancements), the library has played a key role in the provision of health information and evidence to foster increased patient health literacy. This effort uses several mechanisms: health topics; inclusion of journalist-written news stories; and patient-oriented information about lab tests.

### Health topics

Health topics included in MHAV may be disease-specific, such as diabetes or Crohn's disease, or may be

\* Preliminary version of this paper presented at MLA '06, the 106th annual meeting of the Medical Library Association, Phoenix, AZ, May 23, 2006.

**Figure 1**  
A library-provided health topic in MyHealthatVanderbilt

**MyHealth at Vanderbilt**

**Learn about Diabetes**

Understanding your disease is the first step in good diabetes care. The resources below provide basic information about diabetes, guidelines for diagnosis, the different types of diabetes, strategies for standards of care and more.

**What is Diabetes?**

- [Basics about Diabetes](#) (Centers for Disease Control and Prevention)
- [Diabetes \(for Seniors\)](#) (National Institutes of Health)
- [Diabetes Myths](#) (American Diabetes Association)

**Guidelines for the Diagnosis of Diabetes**

- [Diagnosis of Diabetes](#) (National Diabetes Information Clearinghouse)
- [Gestational Diabetes](#) (National Institute of Child Health & Development)
- [Impaired Fasting Glucose Tolerance](#) (American Academy of Family Physicians)

**Types of Diabetes**

- [All About Diabetes](#) (American Diabetes Association)
- [Diabetes Overview](#) (National Diabetes Information Clearinghouse)

**Your Health Care Team**

- [A Guide for You and Your Diabetes Care Team](#) (American Diabetes Association)
- [Who's on Your Healthcare Team?](#) (American Diabetes Association)
- [Your First Doctor's Visit](#) (American Diabetes Association)

**How Insulin Works**

- [About Insulin](#) (American Diabetes Association)
- [Why You Need Insulin and How to Use It](#) (American Academy of Family Physicians)

**National Institute of Diabetes and Digestive and Kidney Diseases**

**NIH SeniorHealth**

• [Main Menu](#) | • [Site Index](#)

**Diabetes**

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**Last reviewed:** 16 June 2005  
**First published:** 09 December 2004

National Institute on Aging, U.S. National Library of Medicine  
National Institutes of Health, U.S. Department of Health & Human Services  
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preventive health topics, such as colon cancer screening. To create customized links to information, the library works closely with healthcare teams in the outpatient clinics to select the most relevant topics given the clinic's specific patient population. After identifying the most relevant health topics for an outpatient clinic, trained EBL Health Information Analysts (HIAs) and junior librarians select the best online consumer sources. At EBL, the HIA job category was created in 1996 for non-librarians who completed a comprehensive individualized learning plan and verification of skills [21–22]. For the MHAV project, HIAs were handpicked based on their aptitude and overall interest in consumer health. Selection of consumer sources is based upon criteria such as currency, authority and accuracy; these criteria are modeled after MedlinePlus Quality Guidelines and the Medical Library Association's User's Guide to Finding and Evaluating Health Information Online [23–24]. The resources are organized into subcategories intended to be easily recognizable by patients.

As part of the library's mentoring process, a designated experienced EBL librarian then reviews the collection of links gathered by the HIAs and junior librarians and provides feedback and suggestions for improvement. The EBL team sends the vetted list of health topic websites back to the clinical team to solicit input on relevance and resource selection. After reach-

ing consensus on the website selections for a given topic, and after securing permission from hosting sites to link to their online materials, EBL team members enter the topics into an internally created MySQL database. The MHAV portal software extracts data from this database to present the selected sites for each topic into the portal. Creating a new health topic typically takes one month to complete. Ongoing maintenance for the EBL team includes regularly monitoring links for currency and appropriateness. Figure 1 shows an example health topic page in MyHealthatVanderbilt.

Upon logging into the MHAV portal, patients are automatically presented with disease topics relevant to them, based on specific information from within their medical record. This information is derived from two primary sources within the record. The first source is the list of International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) diagnostic codes for each patient. The coded list facilitates easy mapping, but its utility is somewhat diminished by the fact that the codes result from the billing process, rather than being entered directly by clinicians. The second source is the free-text Problems section of the patient summary, which (unlike the ICD-9-CM codes) is actively and collectively maintained by VUMC care providers. Codes derived from the patient's problem list, combined with the ICD-9-CM codes from billing are automatically matched via computer algorithms to

**Figure 2**  
Screenshot of test patient lab display in MyHealthatVanderbilt

The screenshot shows the MyHealth at Vanderbilt website interface. At the top, there is a navigation bar with links like Home, Messaging, Labs, and Appointments. Below this, the 'Labs Page' is active, displaying a list of lab tests for a patient. One test, 'Creatinine Blood: 1.7\*', is highlighted. To the right, a detailed view of the 'Creatinine' test is shown, including its formal name, related tests (BUN, GFR, and EGFR), and a section titled 'The Test' which explains how it is used to assess kidney function. The interface also includes search boxes and navigation options for different test categories.

the ICD-9-CM codes assigned by library staff to each disease topic. When a match is made, the appropriate disease topic is displayed in the portal, allowing patients to see links to information directly relevant to their care. Preventive health topics are delivered to a specific patient based on demographic characteristics and matched according to U.S. Preventive Services Task Force recommendations [25]. They are also complemented by additional topics of significant public importance. For example, a 65-year old woman who logs into to MHAV will receive information on screening for breast cancer, osteoporosis and colorectal cancer.

### Journalist news stories

To accompany the library-provided content, the Medical Center employs a freelance journalist to write original articles about timely health information of seasonal importance, such as the flu or spring allergies, or recent newsworthy developments from the primary literature, such as aspirin's role as a safe and effective agent for the prevention of heart attack or stroke. Recognizing the library's expertise in information provision, the MHAV team—comprised of physicians, patient account representatives, medical center web team, marketing team, informatics center developers, and library members—solicited the library's collaboration with the journalist to supplement the news stories published within the portal with links to librarian-selected authoritative websites. Each news story contains, where appropriate, links to targeted information providing more detail on the subject.

### Links to lab information

The MHAV portal allows patients to view the results of selected lab tests and other diagnostic studies, exported directly from the patient's electronic medical record. Following extensive intra- and inter-institutional consultations, VUMC formulated a policy that allows patients to access electronically the results of medical tests conducted at the Medical Center. The policy is aimed at facilitating disclosure of test results to the patient, while encouraging health care providers to communicate those results—and their interpretation—to the patient in a timely manner. Results from most laboratory tests, radiological studies, and an increasing number of other diagnostic tests are now presented automatically to the patient after a delay that ranges from seven to fourteen days. However, in cases where the interpretation of the results may be difficult for a layperson, or which might cause unnecessary patient concern or anxiety, the results are not disclosed via the portal by policy. In those cases, an explicit action by the care provider is required to initiate electronic disclosure.

To provide patients with a greater understanding of their results, the library mapped over 300 of the most commonly requested lab tests in the Medical Center to Lab Tests Online, a consumer-oriented, peer-reviewed website developed by the American Association for Clinical Chemistry [26]. The link to Lab Tests Online is displayed by selecting the name of the lab test on the lab results display view; Figure 2 shows an example link.

Given that the display of lab results was not origi-

nally designed for the consumer, the library-provided links to Lab Tests Online are a particularly important feature, as they present lab test details through consumer-oriented explanations.

## FUTURE DIRECTIONS

As of July 2006, there were approximately twenty-five health topics linked to MHAV, with 15% of patients (2,700/18,000) using the portal having accessed the library-provided links. Since July 2005, an average of 850 new user accounts have been created each month. Anecdotal feedback on the integrated lab links—collected from reports of clinical team members, patient responses during MHAV focus groups, and comments from other MHAV team members—has thus far been highly positive; both patients and clinicians have expressed enthusiastic appreciation for the health information materials. The library plans to move forward with support for the portal by adding new health topics, and conducting further refinement and assessment of the content via patient focus groups and other feedback mechanisms to increase usage. The EBL aims to provide access to the highest caliber of health information in a manner that thoroughly considers patient information-seeking characteristics and engagement. With the growing emergence of online patient portals, medical librarians can leverage opportunities that exist within electronic health record systems to educate patients and provide them with relevant, evidence-based information. This strategy is key in further scaling up library services.

## ACKNOWLEDGMENTS

The authors would like to thank Dr. Jim Jirjis for his assistance in MHAV policy and development processes, Shannon Potter for her oversight of the health topics, and Annette Williams for her assistance with the manuscript preparation.

The authors also thank Dr. Gary Byrd for serving as guest editor and coordinating the editing, peer review and publication decision process, as two of the authors are current members for the *Journal of the Medical Library Association* Editorial Board.

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## Analysis of user messages to MedlinePlus.gov

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MedlinePlus, the National Library of Medicine's (NLM) consumer health web site, debuted in October, 1998. Providing information to consumers via a web site was a new direction for NLM, and MedlinePlus staff have continuously monitored email feedback from users to measure its effectiveness and user satisfaction [1]. When users select the "Contact Us" link from any page on MedlinePlus, they access a feedback form. Forms feed into the Siebel customer relations management software program [2]. Each message receives a unique identifying "ticket" number and flows into a queue for triage.

Feedback can be anonymous; if the user desires a reply, he or she must supply an email address. All feedback with a return email address receives an automatic response saying that NLM has received the communication and that a response will come within four working days, if one is required. NLM customer service staff respond to messages as needed, using a knowledge base that includes hundreds of standardized answers to frequently asked questions. They as-



Supplemental tables are available with the online version of this journal.

**Table 1**

Data from Siebel: Reference questions from MedlinePlus, March and July 2005

	March 2005	July 2005	Total
Total number of messages	1,800	1,261	3,061
Random sample	180	120	300
Exclusions from sample	27*	12*	39
Messages analyzed	153	108	261

\* Includes duplicates, miscategorizations in Siebel, and unintelligible communications.

sign tickets about MedlinePlus to a group of MedlinePlus staff, who reviews the responses and may provide additional responses to users if required.

This paper examines the feedback messages that NLM receives about MedlinePlus to explore what users tell NLM about the site and to compare their feedback with observations from published studies of health web site users.

## METHODS

All messages (N = 3,061) originating from the "Contact Us" link on MedlinePlus pages during March and July of 2005 were examined. These months were chosen because historically they have had high (March) and low (July) usage as determined by Internet log files. The messages generally consisted of two subsets:

1. General reference questions about diseases, conditions, or treatment, or how to use MedlinePlus to find information about them.
2. Compliments, complaints, questions, or suggestions relating directly to the content of specific MedlinePlus pages.

Table 1 shows the number of reference questions submitted through MedlinePlus. Given the large number of reference questions, a random sample for each month was analyzed, with sample numbers generated by an online randomization program [3]. Each reference question received one of the following investigator-assigned categorization labels: directory assistance, general medical reference, purchase drugs or financial assistance, question about current condition requiring professional advice, reference question or drug/laboratory test, request for collaboration, and request for materials or homework assistance. Table 2 (online only) lists examples of each. Each comment received one of the following investigator-assigned categorization labels: collaboration, complaint about content, compliment, request for materials or license, link to me, correction or suggestion for improvement, technical or access, and other. The categories were defined prior to coding. Table 3 (online only) lists examples of each.

## RESULTS

As noted, messages broadly fell into two types: general reference questions and comments about MedlinePlus itself. There were 3,061 reference ques-

tions submitted to MedlinePlus during the study period. After randomization and excluding duplicate messages, mis-categorizations by the customer service staff and unintelligible communications, there were 261 messages appropriate for analysis (Table 1). With regards to the comments about MedlinePlus, after excluding duplicate messages, mis-categorizations by customer service staff, and uninterpretable communications, there were 284 queries in March and 207 in July for a total of 491 messages appropriate for analysis (Table 4; online only).

Figure 1 (online only) summarizes the content of the sample of the reference questions originating from MedlinePlus for both months. Over one-third (103/261, 39%) of reference questions originating from MedlinePlus concerned the current condition of the writer, family member or friend. An additional 13% (33/261) concerned drug or laboratory tests. Although these questions might have been about the user's health, the submitter did not specify that the question was personal. Thirty-two percent (83/261) were standard general medical reference questions: facts, statistics, and requests for sources of information.

Figure 2 (online only) shows the distribution by category of MedlinePlus comments for the study period. Nearly one quarter (22%, 111/491) of the feedback about MedlinePlus consisted of requests from organizations to add a link to their web sites. Most requests came from commercial companies or sites that did not meet MedlinePlus's quality guidelines [4]. Three requests from professional or voluntary organizations with quality consumer information resulted in the addition of links to MedlinePlus.

The next largest category of feedback was compliments (19%, 94/491). These came from both members of the public and health professionals. There were 32 complaints about MedlinePlus content, representing 7% (32/491) of messages. In the two months, there were two complaints about the reading level of the information, one that material was too simple, and the other that material was too difficult. There was one complaint about conflicting information (from general drug information page; specific sources not specified). Because MedlinePlus is a portal to information from other organizations and licensed content within MedlinePlus, many complaints related to links to specific web sites or to content MedlinePlus licenses.

There were 78 suggestions for improvement or corrections to MedlinePlus, accounting for 16% (78/491) of comments. Many suggestions for improvement related to licensed content, which NLM forwards to the appropriate licensed content providers. NLM also implements suggestions for additional features whenever feasible.

## DISCUSSION

Previous studies note that consumers seeking health information on the Internet are generally satisfied with what they find; however, Ybarra also found that substantial proportions of users wanted more information

but did not know where to find it or were concerned with the quality of the information [5]. Even when users are satisfied with the information they find, medical librarians and others are concerned on their behalf [6, 7]. Among the concerns mentioned in the literature are the trustworthiness of the information [8–10], completeness of the information [11], the reading level of the information [12–14], and the existence of conflicting information [12, 15].

It is probable that many of the reference questions originating from MedlinePlus pages stem from incompleteness of the information on these pages or information that is insufficient to fully address the question or information need of the user. However, it is also unlikely that a web site could provide answers to questions about individual cases, unless a health care professional provided that information. The "Contact Us" page on MedlinePlus states, "We cannot respond to questions about your individual medical case, provide second opinions or make specific recommendations regarding therapy. Address those issues directly with your healthcare provider" [16]. As librarians, MedlinePlus staff cannot provide this service.

MedlinePlus users who provide feedback about specific content are generally satisfied with what they find. They make suggestions for improvements and point out major and minor errors (broken links, typographical errors and misspellings) but many also provide feedback to thank NLM for the web site. The proportion of MedlinePlus users who actually contact NLM is small. In March 2005, 5.4 million unique users visited MedlinePlus; in July 2005, 4.9 million unique users visited the site [17]. The feedback from MedlinePlus during those months represents less than .001% of users.

## CONCLUSION

Overall, the communications that originate from MedlinePlus pages reflect the wide variety of users visiting the site. The majority of communications from users are from those who need reference assistance or advice from a health care professional to answer their specific health questions. The messages about specific MedlinePlus content are generally positive. Messages from MedlinePlus that are reference questions probably reflect the need for more information or explanation of the content. However, they also tend to be focused on a personal situation and are generally not of a nature that would be answerable by content on a general consumer health portal. Health information professionals can point consumers to good web sites and assist in their use, but even the best portals are not a substitute for medical advice.

## ACKNOWLEDGMENTS

The author would like to acknowledge Eve-Marie Lacroix, Joyce E. B. Backus, and Barbara Rapp, of the National Library of Medicine, for assistance with this article.

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## Continuing use of print-only information by researchers

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## INTRODUCTION

It has been widely reported that researchers are relying upon electronic journals more than print journals, as least in terms of use of library materials. Throughout the last decade, numerous studies have shown that among many different groups, journal readers are significantly more likely to seek out journal articles from the online environment than they are from print sources [1–6], regardless of the relevance of the online material to the research project [7]. More recent studies have shown that online availability may positively affect citations to a journal, particularly if online access is free of charge [8]. Health sciences researchers have also been eager adopters of online access to journals [9–10].

Despite these trends, which may be rooted in the fact that health sciences researchers rely more on directed searching than do researchers in other fields [11], a few studies have shown that some scholars persist in preferring print journals [12, 13]. However, these studies have focused on behavior of researchers within the library's collection, but have not addressed use of journals from other sources.

There is a related question that has not received as much attention: are researchers, despite a change in methods of use of the library's journal collection, still receiving and processing the information published in print-only journals?

One approach to this question is citation analysis. De Groote, Shultz and Doranski collected citations within articles written by faculty members in their institution. Analysis showed that over the years, the citations to print-only articles did not decrease in comparison to citations to online journals [14]. A parallel approach with a larger pool of citations is to study changes to impact factor over time. The calculation of impact factors takes into account the number of citations to a journal's content, which can be seen as a measure of journal use.

## METHODS

In order to study the question, "Are researchers still accessing and using material issued only in print?," a group of journals was selected, and the impact factor of each was tracked over the period 1993–2003.

## Journal selection

The journals were divided into seven cohorts. Three were subspecialties of internal medicine: cardiology



Supplemental content is available with the online version of this journal.

**Table 1**  
Impact factor and percentage change in impact factor for selected journals, 1993–2003

	1993	1994		1995		1996		1997	
<b>Cardiology</b>									
J Mol Cell Cardiol	3.49	3.01	-13.69%	2.78	-7.58%	2.74	-1.37%	3.26	18.71%
J Thorac Cardio Sur	2.33	<b>2.39</b>	2.62%	2.61	9.29%	2.87	10.07%	3.07	6.75%
Am J Cardiol	2.16	2.25	4.11%	<b>2.24</b>	-0.67%	2.37	6.03%	2.40	1.22%
Cardiovasc Res	2.09	2.89	38.48%	<b>3.49</b>	20.90%	3.26	-6.61%	2.89	-11.58%
Circ Res	5.84	6.97	19.28%	<b>8.00</b>	14.79%	7.62	-4.81%	8.44	10.78%
Circulation	8.99	8.63	-4.00%	<b>8.82</b>	2.18%	9.09	3.08%	9.76	7.35%
J Am Coll Cardiol	6.34	8.01	26.37%	<b>5.79</b>	-27.70%	5.95	2.68%	6.70	12.71%
Trends Cardiovas Med	2.10	3.61	72.05%	<b>4.34</b>	20.07%	3.47	-19.94%	3.58	3.11%
Am Heart J	1.54	1.45	-5.77%	1.29	-11.22%	1.86	43.95%	<b>2.40</b>	29.35%
Eur Heart J	1.43	1.43	0.14%	1.68	17.87%	1.68	0.00%	2.14	27.05%
J Heart Lung Transpl	1.72	1.43	-16.72%	2.00	39.65%	2.46	23.03%	2.65	7.94%
Prog Cardiovasc Dis	2.16	1.54	-28.80%	1.60	3.77%	2.40	50.13%	3.19	32.93%
J Cardiovasc Electr		1.55		2.10	35.20%	1.96	-6.85%	1.78	-8.99%
<b>Gastroenterology</b>									
Gastrointest Endosc	2.44	<b>3.56</b>	46.01%	2.30	-35.61%	4.49	95.82%	2.77	-38.36%
J Hepatol	2.59	3.15	22.01%	<b>2.78</b>	-11.98%	3.24	16.53%	3.41	5.38%
Aliment Pharm Therap	1.68	2.11	25.30%	2.04	-3.51%	<b>3.09</b>	51.96%	3.00	-2.91%
Gastroenterology	5.86	7.25	23.82%	8.20	13.13%	<b>9.33</b>	13.73%	10.25	9.87%
J Pediatr Gastr Nutr	0.93	1.08	16.97%	1.24	14.88%	<b>1.52</b>	22.53%	1.29	-15.04%
Hepatology	5.07	5.57	9.80%	5.39	-3.18%	<b>6.04</b>	12.02%	5.85	-3.16%
Gut	2.86	2.95	3.22%	3.02	2.47%	4.59	51.84%	<b>4.55</b>	-0.96%
Neurogastro Motil				1.36		1.50	10.70%	<b>1.72</b>	14.73%
Scand J Gastroentero	1.36	1.48	9.12%	1.53	3.23%	1.72	12.08%	<b>1.64</b>	-4.43%
Am J Gastroenterol	1.52	1.86	22.51%	2.18	17.62%	3.18	45.58%	2.34	-26.24%
Liver	1.01	1.27	25.57%	1.94	53.12%	1.70	-12.42%	1.35	-20.54%
Semin Liver Dis	2.44	2.35	-3.64%	2.39	1.70%	4.15	73.43%	5.67	36.49%
Dis Colon Rectum	1.38	1.74	26.47%	1.45	-16.62%	2.10	44.83%	1.73	-17.71%
Gastroenterol Clin N	1.88	2.29	22.07%	2.68	16.94%	1.58	-41.08%	1.27	-19.77%
<b>Rheumatology</b>									
Ann Rheum Dis	1.63	1.92	18.04%	2.64	36.95%	2.12	-19.51%	<b>1.98</b>	-6.46%
Rheumatol Int	1.06	1.34	26.61%	1.19	-11.37%	1.09	-7.76%	<b>0.82</b>	-24.89%
Lupus	1.46	1.29	-11.32%	1.49	15.24%	1.75	17.65%	1.61	-8.10%
Scand J Rheumatol	0.76	1.40	85.07%	1.21	-13.70%	1.27	5.05%	0.86	-32.68%
Z Rheumatol	0.24	0.30	24.69%	0.52	71.29%	0.84	62.24%	0.89	5.94%
Arthritis Rheum	5.50	6.30	14.47%	7.23	14.83%	6.54	-9.62%	6.17	-5.65%
Bailliere Clin Rheum/Best Pract	1.38	0.89	-35.84%	0.52	-41.65%	1.10	113.54%	1.04	-5.43%
British J Rheum/Rheumatology	2.33	2.01	-13.99%	2.22	10.57%	2.07	-6.59%	2.31	11.49%
Clin Rheumatol	0.63	0.54	-14.67%	0.56	3.33%	0.48	-13.42%	0.64	31.82%
Bull Rheum Dis	0.50	0.61	21.00%	0.63	3.80%	0.63	-0.48%	0.34	-45.12%
Clin Exp Rheumatol	1.59	1.34	-15.60%	0.99	-26.45%	0.93	-6.28%	1.15	24.54%
Semin Arthritis Rheum	2.16	1.90	-12.14%	1.71	-9.76%	2.20	28.40%	2.62	19.34%
J Rheumatol	1.87	2.28	21.78%	2.24	-1.63%	2.22	-0.98%	2.17	-2.03%
Rheum Dis Clin N Am	1.33	2.23	67.17%	2.44	9.84%	2.30	-6.10%	1.99	-13.29%
<b>Immunology</b>									
J Allergy Clin Immun	3.58	<b>3.57</b>	-0.39%	3.51	-1.65%	3.76	7.04%	3.77	0.37%
Curr Opin Immunol	4.64	6.70	44.55%	<b>8.79</b>	31.22%	10.12	15.07%	9.08	-10.28%
Immunity				<b>15.35</b>		19.94	29.85%	20.82	4.43%
Immunol Today/Trends In Immunol	19.59	22.05	12.54%	<b>25.23</b>	14.43%	21.94	-13.03%	16.47	-24.96%
J Exp Med	13.69	13.86	1.28%	15.13	9.12%	<b>15.57</b>	2.95%	14.38	-7.63%
Aids	5.73	5.29	-7.56%	4.88	-7.86%	5.98	22.65%	<b>5.05</b>	-15.59%
Annu Rev Immunol	37.04	39.43	6.45%	49.51	25.57%	47.72	-3.62%	<b>37.80</b>	-20.79%
J Immunol	7.07	7.38	4.50%	7.41	0.39%	7.30	-1.57%	6.94	-4.92%
Eur J Immunol	5.58	5.66	1.56%	6.02	6.20%	5.70	-5.22%	5.26	-7.81%
Adv Immunol	15.52	15.29	-1.50%	19.00	24.30%	19.21	1.08%	11.58	-39.70%
Immunol Rev	10.09	9.05	-10.27%	5.95	-34.31%	8.02	34.95%	5.95	-25.87%
J Leukocyte Biol	2.68	2.92	9.10%	3.64	24.45%	4.35	19.48%	3.91	-10.17%
<b>Psychology</b>									
Psychol Rev	<b>6.50</b>	7.19	10.57%	5.06	-29.62%	5.21	3.01%	7.06	35.51%
Psychol Bull	<b>5.20</b>	6.70	28.86%	6.97	4.02%	6.59	-5.38%	6.04	-8.39%
Annu Rev Psychol	5.55	6.88	23.98%	<b>6.82</b>	-0.87%	5.44	-20.26%	4.84	-10.99%
J Stud Alcohol	1.52	1.35	-11.14%	1.54	14.09%	<b>1.47</b>	-4.68%	1.71	16.37%
Psychol Med	2.66	2.43	-8.64%	2.72	11.59%	2.82	3.68%	<b>3.02</b>	7.18%
Psychosomatics	1.07	1.17	9.15%	1.32	13.00%	2.13	61.39%	1.71	-19.93%
Psychother Psychosom	0.75	1.06	40.82%	1.05	-1.13%	1.58	50.72%	1.81	14.39%
Psychophysiology	2.35	2.66	13.20%	2.95	10.87%	2.83	-4.10%	2.77	-1.87%
Psychosom Med	2.31	2.81	21.51%	2.91	3.70%	3.03	4.09%	3.09	1.91%



Table 1  
Extended

1998		1999		2000		2001		2002		2003	
2.72	-16.44%	2.92	7.46%	3.38	15.74%	3.40	0.38%	4.09	20.47%	4.95	21.10%
2.95	-3.72%	2.99	1.08%	3.06	2.38%	2.82	-7.82%	2.84	0.85%	3.32	16.78%
2.14	-11.03%	2.36	10.48%	2.76	16.98%	2.64	-4.53%	2.33	-11.76%	3.06	31.46%
3.00	3.85%	3.09	3.20%	3.78	22.35%	4.55	20.33%	4.69	3.08%	5.16	10.06%
7.99	-5.33%	8.28	3.67%	9.19	11.01%	9.21	0.22%	9.69	5.22%	10.12	4.36%
9.17	-6.03%	9.90	7.96%	10.89	10.00%	10.52	-3.45%	10.26	-2.49%	11.16	8.86%
7.28	8.62%	7.37	1.18%	7.08	-3.88%	6.37	-10.00%	6.28	-1.51%	7.60	21.04%
2.60	-27.39%	2.33	-10.38%	2.88	23.56%	1.67	-41.99%	3.40	103.41%	4.52	32.97%
1.85	-22.98%	2.02	9.24%	2.42	19.69%	2.87	18.64%	2.77	-3.66%	3.30	19.35%
<b>3.63</b>	<b>69.91%</b>	<b>3.21</b>	<b>-11.59%</b>	<b>3.84</b>	<b>19.63%</b>	<b>5.15</b>	<b>34.19%</b>	<b>6.13</b>	<b>18.98%</b>	<b>6.00</b>	<b>-2.19%</b>
2.85	7.62%	<b>2.44</b>	<b>-14.58%</b>	2.53	3.61%	2.18	-13.74%	1.95	-10.65%	2.84	46.02%
2.13	-33.12%	<b>3.23</b>	51.78%	2.38	-26.54%	2.08	-12.63%	1.82	-12.24%	2.18	19.82%
2.08	16.56%	2.11	1.73%	<b>2.79</b>	32.05%	2.98	6.70%	3.11	4.37%	2.69	-13.46%
3.53	27.47%	3.23	-8.67%	2.82	-12.56%	2.78	-1.56%	3.04	9.40%	3.33	9.58%
3.19	-6.45%	3.71	16.18%	3.76	1.51%	4.75	26.30%	4.97	4.72%	5.28	6.21%
3.00	-0.23%	3.06	2.00%	3.49	14.13%	3.90	11.78%	2.98	-23.59%	3.53	18.42%
10.33	0.78%	12.18	17.93%	12.25	0.53%	13.02	6.32%	13.44	3.23%	12.72	-5.37%
1.32	1.93%	1.49	12.66%	1.58	6.33%	2.08	31.46%	2.08	0.05%	1.40	-32.53%
5.62	-3.90%	7.34	30.65%	7.30	-0.54%	8.10	10.84%	9.83	21.36%	9.50	-3.28%
5.11	12.43%	5.75	12.46%	5.39	-6.30%	6.17	14.56%	6.32	2.48%	5.88	-6.96%
1.69	-1.69%	1.94	14.42%	2.08	7.49%	2.50	20.13%	2.08	-16.68%	2.50	20.02%
2.36	43.81%	2.34	-1.02%	1.84	-21.15%	1.83	-0.87%	1.85	1.15%	2.14	15.86%
<b>2.61</b>	<b>11.39%</b>	2.95	12.79%	2.83	-3.77%	3.55	25.23%	3.95	11.38%	4.17	5.54%
1.25	-7.56%	1.70	36.46%	<b>1.74</b>	2.11%	1.79	3.16%	2.40	33.95%	2.08	-13.61%
5.00	-11.77%	3.07	-38.56%	<b>6.01</b>	95.70%	6.40	6.49%	5.95	-7.00%	6.52	9.57%
2.14	23.73%	1.93	-9.92%	1.69	-12.25%	2.14	26.75%	<b>2.31</b>	7.75%	2.34	1.52%
1.80	42.50%	1.59	-12.14%	1.77	11.92%	3.21	80.83%	<b>1.54</b>	-52.12%	1.68	9.64%
2.04	2.97%	1.97	-3.67%	2.44	24.19%	3.19	30.44%	3.59	12.70%	3.83	6.51%
0.80	-2.56%	1.11	38.50%	1.16	4.87%	0.89	-23.15%	1.00	11.98%	1.01	1.30%
<b>1.88</b>	<b>16.57%</b>	1.46	-22.04%	2.51	71.72%	1.88	-25.42%	1.77	-5.39%	1.81	1.92%
<b>1.11</b>	<b>29.59%</b>	1.17	5.51%	1.40	19.42%	1.48	6.23%	2.00	34.86%	1.82	-8.95%
<b>0.91</b>	<b>2.24%</b>	0.46	-49.12%	0.73	57.33%	0.77	4.79%	0.96	26.01%	0.53	-44.92%
6.77	9.71%	<b>7.05</b>	4.26%	6.84	-3.02%	7.39	8.01%	7.38	-0.14%	7.19	-2.56%
1.48	41.86%	<b>1.22</b>	-17.96%	1.44	18.19%	0.79	-45.06%	0.65	-18.12%	1.36	109.91%
2.35	1.95%	<b>2.85</b>	20.86%	3.95	38.80%	3.06	-22.46%	3.25	6.17%	3.76	15.66%
0.63	-0.78%	<b>0.62</b>	-2.84%	0.72	17.72%	0.84	15.75%	0.98	16.47%	0.85	-12.91%
0.30	-13.41%	0.66	121.21%	<b>1.12</b>	69.71%	0.95	-14.62%	0.52	-45.17%	0.46	-11.49%
1.27	10.24%	1.35	6.14%	1.64	21.51%	<b>1.61</b>	-1.47%	1.28	-20.45%	1.92	49.45%
2.20	-16.17%	2.58	17.20%	3.07	19.02%	<b>3.07</b>	0.00%	2.75	-10.31%	2.60	-5.53%
2.21	1.80%	2.88	30.21%	2.91	1.08%	<b>2.59</b>	-10.96%	2.99	15.28%	2.67	-10.48%
2.18	9.30%	2.06	-5.29%	2.26	9.56%	2.16	-4.47%	<b>3.31</b>	53.71%	2.78	-16.23%
4.51	19.63%	4.64	2.84%	4.18	-9.88%	5.51	31.75%	6.28	14.09%	6.83	8.74%
11.03	21.47%	11.89	7.81%	12.55	5.57%	13.72	9.36%	12.92	-5.87%	12.12	-6.19%
20.52	-1.45%	20.56	0.22%	21.08	2.53%	18.87	-10.52%	17.47	-7.41%	16.02	-8.31%
15.44	-6.23%	17.13	10.98%	14.95	-12.72%	12.16	-18.70%	15.51	27.56%	18.15	17.06%
15.88	10.41%	15.65	-1.45%	15.24	-2.65%	15.34	0.68%	15.84	3.24%	15.30	-3.38%
6.11	20.97%	6.93	13.46%	8.02	15.68%	6.88	-14.18%	5.98	-13.05%	5.52	-7.72%
42.93	13.58%	47.56	10.80%	50.34	5.84%	46.23	-8.16%	54.46	17.78%	52.28	-3.99%
<b>7.17</b>	<b>3.30%</b>	7.15	-0.29%	6.83	-4.35%	7.07	3.38%	7.01	-0.72%	6.70	-4.45%
<b>5.44</b>	<b>3.46%</b>	5.64	3.62%	5.24	-7.01%	4.99	-4.77%	4.83	-3.17%	4.54	-6.13%
<b>10.71</b>	<b>-7.49%</b>	9.25	-13.66%	<b>13.80</b>	49.19%	23.08	67.27%	10.49	-54.57%	7.42	-29.20%
7.46	25.35%	7.27	-2.49%	<b>5.96</b>	-18.01%	7.00	17.43%	7.41	5.84%	7.05	-4.82%
4.26	9.11%	4.28	0.49%	<b>4.34</b>	1.38%	4.52	4.01%	4.13	-8.50%	4.18	1.16%
8.24	16.70%	6.80	-17.43%	6.07	-10.79%	5.76	-5.16%	6.75	17.27%	8.36	23.81%
6.35	5.10%	7.79	22.75%	6.91	-11.26%	6.81	-1.53%	7.01	3.00%	8.41	19.88%
6.40	32.10%	7.55	17.98%	5.85	-22.45%	5.98	2.19%	7.90	32.10%	9.90	25.30%
1.89	10.79%	2.77	46.51%	2.01	-27.59%	1.74	-13.37%	1.74	0.35%	2.10	20.71%
3.12	3.55%	3.39	8.48%	3.41	0.68%	3.12	-8.59%	2.78	-10.74%	3.13	12.54%
<b>1.54</b>	<b>-9.72%</b>	1.17	-23.82%	1.56	32.45%	1.93	23.86%	1.84	-4.31%	1.99	8.08%
<b>2.10</b>	<b>16.51%</b>	2.26	7.42%	2.37	5.00%	3.43	44.56%	3.19	-7.03%	3.95	23.87%
<b>2.43</b>	<b>-12.33%</b>	3.01	23.60%	3.11	3.33%	3.04	-2.29%	2.67	-11.89%	2.07	-22.74%
3.05	-1.39%	<b>2.62</b>	-13.85%	3.25	23.70%	2.82	-13.28%	3.22	14.32%	3.69	14.57%

**Table 1**  
Continued

	1993	1994		1995		1996		1997	
<b>Biology</b>									
Plant J	<b>5.39</b>	5.95	10.35%	6.46	8.59%	5.67	-12.26%	5.80	2.44%
Life Sci	2.38	2.50	5.00%	<b>2.35</b>	-6.20%	2.35	0.30%	2.28	-3.27%
Mol Biochem Parasit	3.04	3.06	0.69%	<b>2.80</b>	-8.49%	2.64	-5.85%	2.12	-19.55%
Biol Rev	2.66	3.13	17.85%	2.43	-22.37%	3.24	33.51%	<b>3.81</b>	17.51%
P Roy Soc Lond B Bio	3.14	2.79	-11.06%	2.59	-7.20%	2.87	10.74%	<b>2.87</b>	0.21%
Philos T Roy Soc B	1.77	2.19	23.87%	2.28	4.16%	2.83	24.16%	<b>2.51</b>	-11.30%
Bioessays	5.04	6.02	19.46%	5.58	-7.33%	6.23	11.68%	7.05	13.26%
Faseb J	16.63	15.12	-9.13%	13.40	-11.32%	13.77	2.74%	14.63	6.23%
J Biol Rhythm	2.47	1.98	-19.74%	2.03	2.47%	1.96	-3.54%	1.98	1.12%
Bioscience	1.81	2.04	13.07%	2.07	1.27%	2.07	0.10%	2.09	1.01%
J Exp Biol	1.59	1.82	14.68%	1.62	-11.15%	1.83	13.11%	1.95	6.51%
Q Rev Biol	3.42	3.63	6.32%	2.08	-42.83%	2.57	23.50%	3.75	46.20%
<b>High Impact Journals</b>									
<b>Nat Genet</b>	19.84	22.57	13.73%	28.54	26.48%	31.47	10.27%	38.85	23.45%
New Engl J Med	<b>23.73</b>	22.67	-4.44%	22.41	-1.15%	24.83	10.81%	27.77	11.81%
Cell	37.19	39.19	5.37%	<b>40.48</b>	3.29%	41.00	1.27%	37.30	-9.03%
Annu Rev Biochem	37.89	42.17	11.31%	44.41	5.32%	38.97	-12.27%	<b>40.78</b>	4.66%
Annu Rev Cell Dev Bi	22.33	27.61	23.61%	30.55	10.66%	20.35	-33.37%	<b>19.00</b>	-6.65%
Annu Rev Immunol	37.04	39.43	6.45%	49.51	25.57%	47.72	-3.62%	<b>37.80</b>	-20.79%
Annu Rev Neurosci	27.63	17.95	-35.02%	29.08	62.00%	33.63	15.62%	<b>21.95</b>	-34.72%
Nature	22.33	25.47	14.06%	27.07	6.31%	28.42	4.96%	<b>27.37</b>	-3.69%
Physiol Rev	14.02	16.29	16.20%	20.55	26.15%	19.39	-5.63%	19.26	-0.67%
Science	21.07	22.07	4.71%	21.91	-0.71%	23.61	7.73%	24.68	4.54%

Under each year, the first column indicates the impact factor for the journal, and the second column indicates the percentage change from the previous year. Each boldfaced entry indicates the year the journal title became available online, with the exception of Nature Genetics, which was available online at the start of the study period.

(represented by 13 journals), gastroenterology (14 journals), and rheumatology (14 journals), and a fourth was a subspecialty of interest to rheumatology: immunology (12 journals). The field of internal medicine is one in which researchers across subspecialties share the same basic training and often collaborate among disciplines. It was of interest to examine citation trends within a fairly similar group of researchers and to compare them with researchers in other fields who do not generally share the training or research approaches that internists do. All the journals studied had originally been published in print versions, and later became available online.

For purposes of comparison between internal medicine journals and non-health science journals, the fields of psychology (9 journals) and biology (12 journals) were chosen. These disciplines represent the academic fields (aside from business) in which the largest number of faculty have appointments at colleges and universities in the United States [15], providing a large group of potential readers and researchers whose information-seeking behavior can be studied. The third and final comparative cohort consisted of those science journals which registered the highest impact factors out of the entire group of science journals surveyed by the Institute for Scientific Information (ISI) (16 journals).

#### Time-frame selection

Within each cohort, the group consisted of those journals that were registered within the top twenty journals (as ranked by impact factor) in each year between 1993 and 2003; 1993 was chosen as a terminus because

that is the year that Internet browsers were introduced, ushering in widespread use of online resources [16], and 2003 was the most recent year for which ISI had calculated impact factors at the time the research was completed.

It should be noted, however, that the academic community has not had universal access to electronic resources throughout this period. Rather, the number of journals available in online versions, and the number of libraries providing access to them, has been rising over time. Between 1997 and 2001, libraries overall exhibited dramatic improvements in the number of full-text journals available and ease of access to them [17, 18].

#### Impact factor

Impact factors were obtained from *Journal Citation Reports (Science Edition) (JCR)*, prepared by ISI [19]. Early editions were published on microfiche, then on CD-ROM. Reports since 1997 are available online [20].

#### RESULTS

Table 1 includes the complete data set, showing the impact factor for each journal surveyed during each year of the study, along with the percentage change in impact factor from the previous year. The boldface number indicates the date a journal became available online. Descriptive analysis of Table 1 reveals no obvious trends of increase or decrease of impact factor in the years after a journal became available online.

Another issue of interest is whether the year in which a journal first became available online influ-

**Table 1**  
Continued Extended

1998		1999		2000		2001		2002		2003	
5.77	-0.67%	5.09	-11.71%	5.63	10.59%	5.79	2.90%	5.85	1.00%	5.91	1.09%
1.94	-14.86%	1.77	-8.42%	1.81	1.92%	1.76	-2.77%	1.82	3.75%	1.94	6.58%
2.41	13.57%	2.71	12.36%	2.62	-3.21%	1.76	-32.95%	2.91	65.59%	2.88	-1.00%
3.94	3.41%	5.00	26.87%	6.43	28.66%	5.30	-17.57%	5.73	8.05%	4.93	-14.05%
3.03	5.57%	2.76	-9.17%	3.04	10.24%	3.19	5.10%	3.40	6.39%	3.54	4.36%
2.89	14.89%	2.65	-8.18%	3.52	32.68%	3.07	-12.80%	3.41	11.22%	3.59	5.16%
<b>7.58</b>	7.47%	7.65	0.91%	7.91	3.36%	8.31	5.16%	7.89	-5.12%	6.49	-17.71%
<b>13.86</b>	-5.25%	11.88	-14.29%	9.25	-22.15%	8.82	-4.67%	7.25	-17.75%	7.17	-1.10%
<b>2.37</b>	19.52%	3.70	56.16%	2.87	-22.53%	2.70	-6.00%	3.29	22.15%	4.06	23.36%
2.98	42.73%	<b>3.08</b>	3.29%	3.95	28.27%	3.30	-16.62%	3.20	-3.03%	3.27	2.22%
2.28	17.25%	2.35	3.06%	1.99	-15.51%	<b>2.48</b>	24.59%	2.42	-2.42%	2.27	-6.08%
4.38	16.83%	3.80	-13.26%	3.50	-7.89%	5.59	59.66%	<b>5.20</b>	-6.94%	4.14	-20.33%
40.36	3.88%	30.69	-23.95%	30.91	0.71%	29.60	-4.24%	26.71	-9.76%	26.49	-0.81%
28.66	3.22%	28.86	0.69%	29.51	2.27%	29.07	-1.51%	31.74	9.19%	34.83	9.76%
38.69	3.72%	36.24	-6.32%	32.44	-10.49%	29.22	-9.93%	27.25	-6.73%	26.63	-2.30%
39.00	-4.37%	37.11	-4.84%	43.43	17.02%	31.64	-27.15%	36.28	14.66%	37.65	3.77%
21.39	12.56%	26.26	22.80%	26.30	0.14%	27.11	3.06%	22.87	-15.63%	22.64	-1.01%
42.93	13.58%	47.56	10.80%	50.34	5.84%	46.23	-8.16%	54.46	17.78%	52.28	-3.99%
23.02	4.88%	22.61	-1.82%	26.68	18.01%	27.15	1.78%	24.09	-11.27%	30.17	25.22%
28.83	5.35%	29.49	2.28%	25.81	-12.47%	27.96	8.29%	30.43	8.86%	30.98	1.80%
<b>23.69</b>	22.99%	23.95	1.12%	27.68	15.55%	30.06	8.61%	26.53	-11.74%	36.83	38.82%
<b>24.39</b>	-1.18%	24.60	0.86%	23.87	-2.94%	23.33	-2.27%	28.96	24.12%	29.78	2.85%

enced impact factor. While 1993 saw the first Internet browser, 1998 saw the release of Microsoft's integrated browser [16], as well as the first library portal systems, which integrate the catalog and databases [21]. Because of journal users' typical reliance on known entities, it is possible that journals that were online when these technologies were introduced would fare better than those that remained print-only until later.

Table 2 (online only) shows the average percentage of impact factor change for the group of journals from all cohorts that became available online in each year of the study. The percentage change in impact factor is shown for the three years before going online, and the three years following. This information is represented graphically in Figure 1 (online only).

Again, the desultory nature of the figure is most noticeable. The percentage change in impact factor shows no trend. This analysis of changes in impact factor did not discern an association between availability of a journal online and its impact factor.

The lack of association was noticed both within and across the various scientific disciplines studied. Neither the non-health sciences cohorts, nor the high-impact journal cohort, displayed trends that were notably different than those shown, or not shown, by the other cohorts.

## LIMITATIONS

This study was intended to explore the question of whether researchers are still using material published only in print based on the assumption that continuing print use would yield changes in journal impact factors. Although impact factor has the advantage of positive correlation to journal use [22], it is not a perfect measure of journal use. For example, Garfield [23] and Sen [24] have separately shown ways in which impact

factor is influenced by factors other than the scientific value of the material in the journal.

Furthermore, impact factor is calculated using all citations; it does not distinguish between citations made by researchers who read the journal online and citations made by researchers who read the paper edition of the journal. The availability of a journal online does not always mean the paper version has been discontinued, and the impact factor for years during which an online version is available does not reflect only online readership.

As well, this study relied on high-impact titles; one caveat about choosing high-impact journals is the fact that not all journals are indexed by ISI. While ISI maintains that its criteria for inclusion in *JCR* provide "the highest quality, most relevant materials" [25], other researchers consider that journals excluded from *JCR* may have as much value as included journals [26-27]. A larger sample of journal titles, including those with a lower impact factor, would be more reflective of journal use.

## CONCLUSIONS

Although the body of research shows that journal users are definitely relying more upon electronic journals and less upon paper journals in the library's collection, this preference does not seem to be influencing impact factor. The lack of association between changes in impact factor and the format of journals over the years 1993-2003 may demonstrate that researchers are making decisions about which journals to cite based on reasons other than format. However, given the many other competing influences on impact factor, it is unclear whether these findings reflect continued strong use of print journals. They do indicate, however, that the online status of a journal is not sufficient to over-

ride all other considerations by researchers when they choose which material to cite.

## NOTE

An expanded version of this study, including more background on user behavior and the impact factor, is available online at <http://www.freewebs.com/stevenknowlton/index.htm>.

## ACKNOWLEDGMENTS

The author is grateful to David A. Williams, PhD, Pinaki Biswas, M.Stat., and Daniel J. Clauw, MD, for their assistance in designing this study, and to Dr. Williams for his critique of the manuscript.

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## The median age technique for assessing currency of consumer health information monographic collections in public libraries

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### INTRODUCTION

To provide the highest-quality information to library users with health-related queries, consumer health information (CHI) collections in public libraries should be current. As one author notes, "medical information is constantly changing. What was an accepted therapy last month may not be the best therapy this month" [1]. However, efficiencies in CHI collection currency may not be readily apparent to library users; for example, some users may not look at the copyright date and to decide if a title is useable [2].

Studies show that consumer health information (CHI) ranks high in topics of interests to the public [3]. People seek consumer health information from various sources and public libraries are an important place for them to get this information [4]. Public libraries have monographic CHI collections available for use by library patrons and also employ rich health-related online resources such as MedlinePlus [5] to provide up-to-date information to such users.

The literature shows many library collection evaluation methods, such as checking lists of standard bibliographies and use studies [6]; however, measuring currency is key in the evaluation of CHI collections. Baker and Manbeck asserted that the first purpose for the evaluation of CHI books is to "ensure the library has most up-to-date books on a topic" and that "for medical, nursing, or lay-oriented books dealing with diagnosis, therapies and drugs, the copyright date must not be older than two years" [1]. Beyond this type of broad commentary, the literature seems to be lacking other benchmarks or recommendations for the currency of the CHI collections in public libraries.

The age of library collections is influenced by a number of factors including funding, acquisitions policies, and weeding practices. The acquisition of new materials and weeding of older titles can improve the collection currency. Weeding practices in public libraries vary [7], but for each library, the well-planned replacement of library materials can help to improve the currency of collections; the Public Library of Des Moines, for example, reported a median age target of five years and found that this goal required replacing approximately ten per cent of the collection annually [8].

The literature shows examining median age of library collections by using the library system's electronic records as one strategy for evaluating collection currency and identifying items for potential weeding or replacement [9]. Truck noted that measuring by median age instead of average age could reduce the influence of older important titles in the collection on

the overall age measurement of the collection [8]. This study explored the utility of the median age measurement methodology for evaluating the currency of the CHI monographic collections in a county public library system.

### METHODOLOGY

For this study, the median age of a library collection is defined as the point at which half of the items in a collection are newer and half are older. Data was extracted in 2005 from the OPAC of the Suffolk Cooperative Library System (Suffolk County, New York) composed of 56 member libraries [10]; the libraries founded within three years of the study date were excluded from the current analysis because their collections are relatively new. The formats of the online catalog records were consistent throughout the member libraries. The Dewey Decimal Classification number "616" (division of Disease) was chosen as the representative of CHI collections; a search by subject "Disease" was not chosen because it would retrieve cross-reference records that do not belong to CHI collections, such as titles describing animal ailments or fictional works with a prominent focus on a disease.

For purposes of subset analysis by individual libraries' CHI collection size, this study categorized these collections with call number 616 as large (>900 items), medium (600–900 items), or small (<600 items). Simple random sampling was used to select 10 libraries from each group for analysis in the current work. The author searched by call number "616" in each of these 30 libraries' catalogs. The retrievals of items from each sampled library were sorted by publication year; the age of the midpoint item in this date-sorted retrieval was recorded as the median age. The standard deviation of median age was also calculated for each of the three library groups. Furthermore, titles from 1995 to 2005 and from 2000 to 2005 as a percentage of each library's total CHI collection were also calculated.

### RESULTS

Overall, the median age of CHI collections in the sampled libraries was seven years previous to the study date; approximately 42% of all analyzed CHI titles were less than or equal to five years old at the time of study. The Table summarizes the results for the included libraries by collection size. Among the libraries with large CHI collections (>900 items), the average median age of CHI collections is 6 years from the study date; this figure was 8 years for the medium libraries (600–900 items) and 7 years for the small libraries (<600 items). The median age of CHI items in the individual libraries ranged from 5 years to 12 years; this data was similar between the groups within the sample, evidenced further by comparable standard deviations among the large, medium, and small CHI collection categories. Forty-seven per cent of the items in the large library group were published from 2000

**Table 1**

Currency of consumer health materials in a county library system

Libraries by CHI collection size (call number 616)	Mean median age (related to date of study)	Standard deviation of median age	Records from 2000–2005 as a percentage of total records	Records from 1995–2005 as a percentage of total records
Large (>900 items)	6 years	1.95	47%	77%
Medium (600–900 items)	8 years	1.93	37%	69%
Small (<600 items)	7 years	2.45	41%	75%
Average of all groups	7 years	2.11	42%	74%

to 2005, while 77% of items were published between 1995 and 2005; the proportion of items for these two time periods were similar among the other two library groups. Thus, the author observed that there is no apparent relationship between the currency and the size of CHI collections.

## DISCUSSION AND CONCLUSIONS

This study examined the median age measurement methodology as a general measure for evaluating the currency of CHI collections in a public library system. In identifying the age distribution of titles within CHI collections, such a technique may be useful in identifying items for weeding or replacement, key strategies for maintaining collection currency. On the other hand, currency is only one aspect of the quality of CHI collections and it should not be the sole measurement of collection quality; other factors such as comprehensiveness and quality of content (e.g., accuracy, coverage) of titles in library collections are other important issues worth considering during evaluating library CHI collections. Furthermore, to offset the currency issue, librarians may develop library instruction programs to help patrons learn to find current materials and also develop electronic information and services to provide current information resources.

This study has some limitations. The methodology used sampling to evaluate CHI titles in one county library system, but the representative of this sample likely varies among public libraries because of differences in library collection development policies, funding for purchase of print materials, and classification practices. Use of this technique also may be not be possible in all settings as some library automation systems may not support this median-age measurement. To complement this methodology, further studies may include use studies and user surveys on library CHI collections, as well as comparison of print and electronic CHI resources and services.

One author recommends that academic libraries should serve as “an essential resource for public librarians concerned with collection deficiencies and training inadequacies” [11]. As some health science libraries provide services directly to the public, and oth-

ers help public libraries by using interlibrary loans, or referrals initiated at public libraries [5], health sciences libraries and public libraries may be able to cooperate to share CHI resources and services to assist library users with identifying current, high-quality information for their health-related information needs.

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