BRIEF COMMUNICATIONS

Case study: lessons learned through digitizing the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research Collection*†

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INTRODUCTION

The Indiana University Center for Bioethics (IUCB) and the Ruth Lilly Medical Library (RLML), Indiana University School of Medicine, joined forces in 2005 to augment online access to bioethics-related materials by developing the Bioethics Digital Library (BEDL) [1]. BEDL's goal is to acquire or borrow unique bioethics-related materials and special collections for digitization, to preserve the digitized materials, and to provide open access to these materials through a full-text indexed, Web-integrated database. To enhance discoverability of BEDL materials, content will be linked to citation records in the Kennedy Institute of Ethics National Reference Center for Bioethics Literature ETHX on the Web database [2] as well as other appropriate digital repositories, creating a network of bioethics resources with multiple access points.

Interest in providing open access to digital scholarship is increasing as evidenced by the National Institutes of Health's Public Access Policy [3] and the introduction of the Federal Research Public Access Act of 2006 (FRPAA, S.2695) [4]. One way to contribute to the open access initiative is to convert historical materials found in disparate locations to digital formats that are discoverable and freely accessible on the Internet. This paper presents a digitization case study that illustrates the challenges of transforming a historical collection to a digital collection while attempting to retain the look and feel of the original historical materials.

COLLECTION SCOPE

The first complete collection digitized for BEDL belonged to a member of the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research (the National Commission), convened in 1974. The collection—which contains committee reports, memos, documented deliberations, letters from human research subjects, and much more (see sample documents in the online figures)—was donated to the Truman G. Blocker History of Medicine Collections, Moody Medical Library, University of Texas Medical Branch. Based on the accepted digitizing plan, the Blocker History of Medicine Collections allowed RLML to borrow the materials and digitize the entire collection in return for archival-quality tagged image file format (TIFF) images produced during the scanning phase. The digital collection now exists in duplicate at separate geographic locations—a best practice for preservation in the digital age.

The collection provides a glimpse into the work of the commission as well as the many issues relating to the use of human subjects in research. Graduate, professional, doctoral, and post-doctoral students—as well as scholars involved in research policy, law, and bioethics—will likely be most interested in the contents of the collection. However, because the materials comprise a historical collection that informs current policy decisions and the conduct of ethical research involving human subjects, materials have general appeal as well.

BEDL's Digitizing Team, including three library science graduate students and the digital initiatives librarian, identified four broad categories of material types during the collection preparation phase. Table 1 describes the categories.

TECHNICAL PLATFORM

BEDL is a valuable, stand-alone resource available through the Indiana University Purdue University–Indianapolis (IUPUI) campus's digital repository, the IUPUI Digital Archive (IDeA) [5]. The IUPUI University Library has provided technology resources for IDeA, including hardware, storage, backup, and system and network administration. The IDeA team is committed to developing scholarly communities and collections in the virtual environment and to ensuring standard migration of digital content through technological developments, thus making the platform for BEDL both stable and scalable as the collections and content grow.

IDeA utilizes DSpace, the open source digital repository software developed by the Massachusetts Institute of Technology and Hewlett Packard [6]. DSpace platforms establish systems for academic-oriented digital repository and preservation that comply with the Open Archives Initiative Protocol for Metadata Harvesting, which leads to a plethora of networking and value chain opportunities.

A value chain strategy includes acquiring raw materials (e.g., hard or soft copy content), adding value to the raw materials (e.g., metadata, full-text indexing, online accessibility), and returning the value-added end product to consumer audiences. Once started, the value chain can continue to grow, making the raw materials increasingly valuable to broader or niche audi-

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Supplemental Figures 1, 2, and 3 are available with the online version of this journal.

Table 1
Collection materials

Category	Description
Background materials	Category includes materials such as relevant newspaper clippings, peer-reviewed publications, contracted reports, documented expert opinions, and letters written to the commission by concerned citizens and research subjects.
Transcripts	Category includes commission and public meetings transcripts.
Reports	Category includes published commission reports.
Miscellaneous	Category includes loose, official documents in accordion files, folders, and spiral binding; hand-edited draft reports; and handwritten notes—all relating to commission issues and business.

ences, depending on a collection's goals and the extent of the value added.

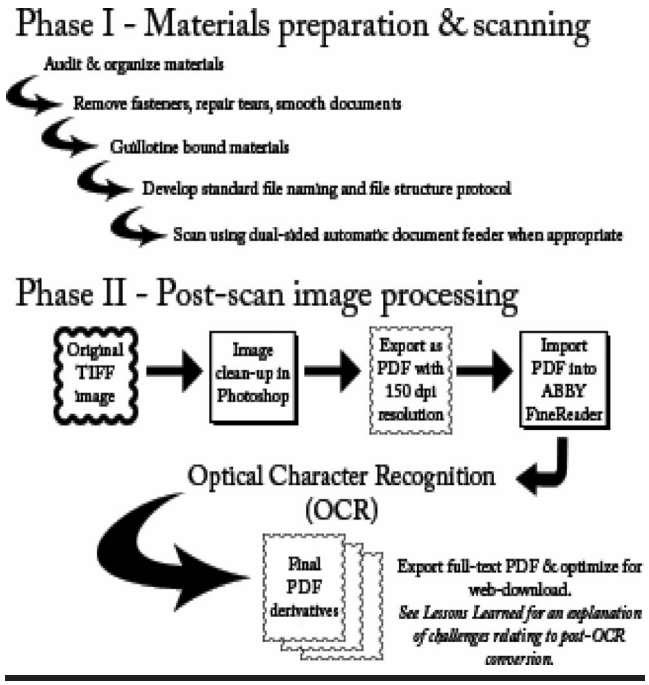
COLLECTION PROCESSING

Two implicit phases of a digitizing project encompass many steps and methods: (1) physical materials preparation and scanning and (2) scanned-image processing. Figure 1 depicts a summary view of the two phases in the BEDL workflow.

Prior to the National Commission project, the team experimented with digitizing a test collection: six volumes of the National Bioethics Advisory Committee (NBAC) Reports and Recommendations [7]. Based on the lessons learned during experimentation, best methods and workflow were applied to the National Commission digitization project. For example, the NBAC reports were not processed with optical character recognition (OCR) during post-scan processing. It was evident that the OCR step should be included to add value to the materials. By including the OCR step, full-text indexing and internal document search capability can be applied, making it easier for consumers to discover and use the materials. The National Commission collection workflow includes an OCR procedure, thus adding to the value chain of the content.

Phase I of the National Commission digitization project took approximately 180 scanning hours to produce 41,456 archival quality TIFF images. The TIFF images were saved to Dual Layer DVD storage media for backup during post-scan processing. The storage media will suffice for short-term backup until the archival TIFF images are uploaded to BEDL for long-term preservation and migration.

Figure 1
Digitizing workflow



DIGITAL FORMATS

The National Commission master archival images were scanned at 600 dots-per-inch resolution and saved as uncompressed TIFF files, the most widely adopted format for storing preservation-quality digital masters [8]. The masters must be high quality so that they can be used to create access derivatives or be migrated to new types of digital formats that may become available.

The final derivative format for the National Commission materials is Adobe portable document format (PDF), type PDF-A/RGB. This format is promoted as the most desirable for Internet access [9]. PDF is also recommended by the National Initiative for a Networked Cultural Heritage in their Guide to Good Practice [10].

METADATA

Beyond adding to the content value chain with OCR and full-text indexing, authoritative metadata is also applied to the record of each collection item. A qualified Dublin Core metadata set, based on the Dublin Core Libraries Working Group Application Profile (LAP), is the default DSpace metadata record structure. Because the team uploads items when processing is complete, the DSpace online submission process is used, item-by-item. During the submission process, appropriate metadata is assigned to the record, as are Library of Congress Subject Headings, Medical Subject Headings, and National Reference Center for Bioethics Literature Classification Scheme and Subject Terms. The field of bioethics is multidisciplinary, therefore all three authorities are used.

LESSONS LEARNED

As BEDL's Digitizing Team developed and moved through the workflow processes, inevitably challenges were encountered. One of the first was determining appropriate settings, standards, and efficient workflow steps. Once these were determined, documenting and communicating reproducible procedures became an additional challenge. The solution was to create a continually updated Digitizing Guide for use by the Digitizing Team.

Learning how to optimize conversion software such as Adobe Photoshop, ABBY FineReader, and Adobe Professional was another challenge. Employing team members who have the necessary skills or are not afraid to experiment with the software is advantageous. Sending team members to workshops and mini-training sessions is also helpful.

File formats and conversion methods quickly became a concern. In general, the project's workflow includes three major processes, each of which includes many individual steps: (1) image cleanup in Photoshop, (2) OCR in FineReader, and (3) PDF conversion and compression. The workflow required processed TIFF files from Photoshop to be converted into compressed PDF files before exporting to FineReader.

Because the team is committed to accurate and thorough OCR that maintains the original look of the materials, the OCR step is the most laborious and time consuming. FineReader is used to spell-check and identify characters not recognized by the software. The team then painstakingly corrects the inaccuracies. The OCR process essentially embeds a full-text file in the digital file, which increases the final file size substantially.

Determining a final derivative format for efficient Web-downloading may seem straightforward as PDF is documented as being the best Web-access format [11]. However, once OCR was applied in FineReader utilizing BEDL's preferred method of saving text under the image, the resulting PDF file sizes became too large for efficient Web downloading. The team has experimented with several OCR and compression techniques to find a combination that would meet its high-quality standards but has not yet identified a suitable solution.

While DSpace is functionally a good platform for BEDL, working within the organizational constraints of the DSpace system was restrictive. The DSpace concepts of community, sub-community, and collection were not always the best way to organize the digital materials in BEDL. In some cases, DSpace sub-communities were used extensively to provide the necessary organizational granularity. The display of community, sub-community, and collection hierarchy on the BEDL Web page can be difficult to understand and can potentially frustrate end users browsing the BEDL collections.

Finally, working with materials clearly under copyright as well as materials with unknown ownership required making decisions about how to best represent those materials as part of the whole collection while conforming to copyright law and orphan item guidelines. For example, many of the background materials are newspaper articles and peer-reviewed publications. One way to work around rights issues is to compile and post a bibliography of the published materials in the National Commission collection while the team pursues permissions to post the full-text items.

CONCLUSION

The National Commission digitization project provided a ''proof of concept'' opportunity in several areas: (1) the team confirmed the DSpace platform provides the necessary functionality for a digital library; (2) the team was able to successfully borrow and digitize a complete special collection; and (3) the team was able to develop process and workflow methodologies that met high-quality standards while maintaining productivity expectations.

Several issues in workflow and methods were identified through developing the National Commission digital collection. In most cases, the team worked through unexpected issues and documented best practices. However, two challenges have emerged that require further research: (1) OCR-PDF file size and (2) copyright and ownership with regard to a historical collection that includes publications. Solutions to these issues would benefit the many projects committed to producing high-quality, usable digital collections.

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Librarian-perceived barriers to the implementation of the informationist/information specialist in context role*

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BACKGROUND

Since first proposed in a 2000 *Annals of Internal Medicine* editorial [1], the informationist role has been well described in the health sciences library literature. Informationist now typically refers to an individual with a thorough understanding of both a health care domain and information seeking and appraisal, who employs that combination of expertise as part of a health care or research team. Authors have explored informationists' ability to select relevant evidence [2], lingering ambiguity of the role [3], training plans [4], integration of in-context practice with informatics applications [5], evaluation of a clinical informationist service [6, 7], and development of an informationist-staffed ''evidence based answering service'' [8]. Other papers about the role have investigated potential implementations [9–13] and education and practice models [14–20].

The concept of this new role also met with controversy in the field of librarianship. Some librarians have regarded the informationist role as simply a repackaging of current practice or as a way to discount the value of their contributions to an organization as information providers [21–23]. Clinician reactions have also been mixed, advocating, for example, drug information specialist pharmacists as the optimal information providers on clinical teams and the need for physicians to develop their own literature searching and appraisal skills rather than rely on another professional [24–26].

While typically discussed in the clinical or bioinformatics domains, the informationist role may also be useful in any information-intensive or information-driven environment [18, 27]. To emphasize this potential applicability of the informationist role to multiple domains, the Medical Library Association (MLA) began referring to the role as the information specialist in context (ISIC) in 2002/03 [28].

To further explore the role, MLA and MLA's Task Force on the Information Specialist in Context (Appendix A) sought a consultant in 2003 to report on, among other issues, the state of ISIC implementations, librarians' thinking on the concept, and potential ways to move forward with ISIC work. The Eskind Biomedical Library (EBL) at Vanderbilt University Medical Center (VUMC) was selected for the project and completed a comprehensive report in 2005 [28].

The EBL team employed a multifaceted approach combining a literature review, surveys of librarians and health care professionals, focus groups with librarians, and interviews with practicing ISICs to explore opinions of and work in the concept. This multifaceted method allowed the team both to raise awareness of the topic and to generate exploratory data about how the role was viewed.

The full Envisioning the Information Specialist in Context report includes detailed findings about librarians' and health care and research professionals' perceptions of the ISIC role, their views of the education needed for such a professional, and their views about the future of the role. The research results presented here highlight findings from librarian respondents to the survey regarding potential barriers to the widespread implementation of ISIC roles. The complete Envisioning the Information Specialist in Context report is available on the MLA member Website [29].

* This research (and the larger *Envisioning the Information Specialist in Context* report) is based on a Medical Library Association research project, and all data are the property of the association.

Supplemental Appendixes A and B; Tables 2, 3, and 4; and Figure 1 are available with the online version of this journal.

SURVEY METHODS

The team designed a Web-based survey to facilitate reaching a large national sample of librarians and health care professionals. The project was approved by the VUMC Institutional Review Board.

Development of survey instrument

The survey questions focused on exploring attitudes toward and perceptions regarding the ISIC role. The team developed a set of scenarios or practice models depicting ISICs in various settings to introduce respondents to potential ISIC roles and to solicit input on the skills and education needed (Figure 1 online).

Rating scales employed in the survey instrument included Likert scales for ordinal data (e.g., degree of agreement or disagreement, priority ratings), categorical answers (e.g., yes, no, not sure), and lists of items with multiple response options. The survey also included a number of open-ended questions to capture additional issues and commentary from respondents. The survey questions that related to barriers used lists of items and open-ended questions to allow respondents to add barriers not addressed in the response lists (Appendix B).

The investigators developed the questions around key concepts and issues surrounding the ISIC role gleaned from EBL's own ISIC experience [5, 14, 30] and the relevant literature. These concepts and issues included required skills and education, liability and authority concerns, implementation barriers, and likelihood that this role will be more widely implemented. With this set of scenarios and questions, the team sought to further establish content validity by submitting the survey to three panels of reviewers:

- EBL librarians, many of whom work with clinical and research teams in ISIC-type roles (n = 18)
- MLA's ISIC task force (n = 9; Appendix A)
- an external advisory board of experts in clinical medicine, informatics, biosciences research, and health sciences librarianship convened by EBL to provide input into the project (n = 10; Appendix A)

The project team further tested the survey for clarity and ease of response with a development sample drawn from EBL staff. This sample of twelve librarians completed the pilot version. The investigators incorporated comments from these reviewers and the pilot testers to address issues of content validity and to refine the clarity and readability of the survey items.

Sample selection

No formal sampling methods were used to select the national sample of survey recipients; the team used convenience sampling of information professionals in the health sciences. The Web-based survey was targeted primarily at biomedical librarians in the United States. Librarians were invited to participate in the survey via health sciences–related mailing lists such as MEDLIB-L and regional MLA chapter mailing lists, during focus groups conducted as part of the study, and through word of mouth and MLA communication vehicles such as MLA-FOCUS and the *MLA News.* While no concerted efforts were made to reach non-US librarians, the survey invitation distribution did include mailing lists such as the Aliahealth list for health librarians in Australia and New Zealand. The survey remained open for approximately four months, and multiple reminders were sent to potential respondents via these mechanisms.

The survey software counted each time the survey was opened, thus the team was able to track accesses to the survey as well as actual responses. Respondents were free to leave the survey at any time, and not all respondents completed all questions. The investigators analyzed data for all respondents up to the point that they elected to discontinue the survey.

Fisher's exact test with Bonferroni correction for multiple comparisons [31] was employed to examine potential differences in the barriers selected among the different subgroups of respondents (by institution type, librarian years of experience, library position). A corrected $\alpha < 0.05$ was used as the threshold for statistical significance.

RESULTS

Though hit counts (n = 321) provided by the survey software indicated that more individuals accessed the survey and perhaps read the scenarios or other sections, only 274 librarians responded to portions of the survey. Table 1 provides a summary of demographic data for the librarians who responded to the survey. The survey did not require participants to include their country of origin, but based on findings such as British spellings in some of the comments, the team believes that only a small number of these responses came from librarians outside the United States.

When queried regarding the likelihood of widespread ISIC implementation over the next 10 years (n = 128), librarian respondents assigned a mean likelihood rating of 3.0 (SD 1.0) on a scale ranging from 1 (not likely) to 5 (highly likely). The 132 librarians responding to the question about 9 potential barriers to widespread implementation of the ISIC role selected a median of 4 items (range 1–9).

A high number of respondents felt funding was a significant barrier to widespread implementation of ISIC practice (89%; n = 117). High percentages of librarian respondents also selected the challenge of acceptance on the health care or research team (67%; n = 89), lack of formal training or education programs (56%; n = 74), health care professionals' lack of interest (55%; n = 73), and lack of qualified candidates (52%; n = 69) as barriers to the concept's spread (Table 2).

Despite some apparent superficial differences between the academic and hospital subgroups in the selection of barriers (Table 3), there were no statistically significant differences in barrier selection among librarians from various institution types, with varying years of experience, or with different levels of library responsibility.

Table 2
Librarian-perceived barriers to widespread implementation of information specialist in context (ISIC) practice

	n = 132 (%)
Funding	117 (89)
Acceptance on health care or research team	89 (67)
Health care professionals' lack of interest	73 (55)
Lack of formal training/education programs	74 (56)
Lack of qualified candidates	69 (52)
Alteration in normal practice routines	59 (45)
Liability issues	52 (39)
Librarians' lack of interest	33 (25)
Supervision concerns	30 (23)

Note: Percentages do not total 100%, as participants were able to make multiple selections.

Respondents were also free to describe additional barriers. These comments generally dealt with organizational support, financial and time constraints, cultural change in the library and institution, and lack of skilled candidates for the role. Table 4 includes representative additional barriers listed by librarian respondents.

DISCUSSION AND FUTURE DIRECTIONS

This brief report has focused on librarian responses regarding perceived barriers to ISIC implementation. The small number of responses from health care professionals (n = 39) precluded a statistical analysis of their portion of the data. Though a much smaller number of health care and research practitioners completed the survey, the study was an important step toward raising awareness among librarians and health care professionals of the potential of the ISIC role. The study also provided a snapshot of librarians' views of the ISIC role several years after the initial discussion about the idea had subsided. The mean rating of 3.0 and standard deviation of 1.0 regarding the likelihood of widespread ISIC implementation in the next 10 years indicated both a general lack of strong feeling and a range of librarian opinions on the issue. This ambivalence might be partly explained by the large number of librarian-perceived barriers to implementation.

Librarians who responded to the survey saw multiple barriers to the spread of the role, among which funding and the challenge of integration in a health care team were selected most frequently. These respondents also noted barriers such as the lack of organizational support, defined models, and demonstrated outcomes. While proof of concept and model programs are undoubtedly necessary, it is important to keep in mind that ISIC implementations will vary from organization to organization and what works in one setting may not apply in others. Future research is needed to investigate which factors constitute success for an ISIC program as well as which parameters, such as top level buy-in and influential champions, may be critical for success [32, 33].

A number of the additional barriers suggested by librarians also dealt with the idea of cost, including training costs, salaries, and opportunity costs given other library duties. The primacy of these funding-related issues, coupled with comments regarding a need for demonstrated models and outcomes, seems to indicate that overcoming these proof of concept barriers will be critical for further ISIC implementations. Of course, this can put libraries in a ''catch 22'' situation: how can the benefits of an ISIC be demonstrated without first putting some resources toward developing an ISIC? There may be no easy solution, but the team's recommendations in the full report include demonstration models such as training centers. Several funded training sites could be a step toward standardizing a curriculum and expectations for the ISIC role. Moreover, the financial support for any new ISIC service could potentially come from avenues beyond typical extramural sources, including, for example, new library program funding combined with funding from a specific department or unit such as a health department or clinical department in an academic medical center.

One limitation of the survey is that the list of potential barriers (Appendix B) was developed largely from discussions in the literature and the experience of the EBL team. Other barriers likely exist. Similarly, the additional perceived barriers noted by respondents also may not accurately reflect actual barriers to implementation. Further research is needed to understand what actual barriers are faced across institution types or how accurately individual perceptions of barriers reflect the true state of practice. Further research should also investigate potential methods to overcome the identified barriers.

In addition, the low number of responses from both librarians and health care or research professionals may indicate a lack of interest in or awareness of the role, another potential barrier. Though the generalizability of the survey is limited by factors such as the low response rate, nonresponse bias, convenience sampling, and limitations of email delivery, the survey was a useful tool for continuing to assess the health sciences library community's perceptions of the ISIC. While ISICs were not widespread at the time of the survey and the role does not appear anecdotally to be more widely implemented at present, it may be that ISIC-type work is beginning to penetrate the practice of health sciences information provision in more subtle ways. The researchers believe that this type of permeation is critical to the continuing relevance of health sciences librarians.

With other important shifts in the biomedical information environment—such as the move toward ubiquitous computing and ubiquitously available electronic resources, intuitive search interfaces, increasingly technologically savvy user base, and growing number of point-of-care tools providing synthesized information for more common conditions—the researchers believe that traditional roles for librarians, and even the role of the librarian as expert searcher, must evolve. ISIC-type work has the potential to become the norm rather than the exception as technology absorbs more day-to-day work that can be automated. Human intelligence,

however, remains critical for assessing information and recognizing patterns and connections in information that lead to knowledge. Librarians can contribute this intelligence and can help ensure that the profession continues to be a vital force for informing high-quality health care and biomedical research, education, and policy.

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The need for a multidisciplinary team approach to life science workflows*†

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INTRODUCTION

Information retrieval for life science research (a broad rubric encompassing many traditional disciplines such as biochemistry, botany, cell biology, and molecular biology [1]) often involves the use of combinations of multiple information resources. Such combinations have been called ''workflows'' [2, 3] and may include factual databases such as Genbank [4], literature databases such as Entrez-PubMed [5], and analysis tools such as the Basic Local Alignment Search Tool (BLAST) [6]. Information resources can be combined in different ways toward the same goal; varying combinations may produce different results for the same research question. Combinations that produce different results may appear equivalent to a scientifically sophisticated user who lacks knowledge of metadata about the resources that may indicate the possibility of varying results. In addition, a user who pursues only a single combination of resources may not even realize that another combination might produce different results.

This study's objective was to compare the results of three intuitively plausible and seemingly similar workflows for retrieving gene function information, with the goal of illustrating the importance of library science in bioinformatics and the need for a multidisciplinary team approach to authoring, vetting, and using life science workflows.

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Supplemental Figures 1, 2, 3, and 4 are available with the online version of this journal.

METHODS

Microarray analysis is a high-throughput experimental technique that engenders significant information retrieval requirements [7]. One use of microarrays is analyzing gene expression: raw data from the microarray are statistically analyzed to determine which genes show significant changes in expression, with one or more lists of genes as the final result. Interpreting the biological meaning of this result often necessitates retrieving information from other sources about the function of the listed genes. Microarray analysis, therefore, is one example of a domain in which information from the biological literature must be integrated with information contained in sequence and other databases.

For some microarray analyses, each gene has a related representative DNA sequence. The identifier of that DNA sequence (its nucleotide sequence accession number, hereafter, ''accession number'') may be used to search for information about the function of the associated gene. This study compared three workflows that used accession numbers as starting points and utilized linkages among PubMed and other Entrez databases [8]. Although using accession numbers to search for gene function information has problems [9], the workflows compared here have been selected as simple, intuitively plausible strategies similar to some of those the authors have seen used in practice. Other workflows, using other starting points or information resources, are also possible and potentially useful.

This study used a list of 251 accession numbers representing genes determined to be of interest in a microarray experiment related to muscle recovery after immobilization (NIH grant AG18881) [10–12]. The genes on the list represented an example of real-world microarray results for which researchers might need to retrieve gene function information. The list of accession numbers was used as the test-set against which workflows were executed and their results compared.

Description of the three workflows

The three workflows are depicted in Figure 1 (available online). Each starts with an accession number (e.g., *M29293*), denoted as ''*xxxxxx*.''

Workflow 1: PubMed only. The Entrez-PubMed ''Secondary Source'' or SI field (which identifies secondary data sources and associated accession numbers discussed in MEDLINE articles) [13] was searched using a query of the form *genbank/xxxxxx[si].* The result was a set of PubMed records, represented here as a set of PubMed IDs (PMIDs). For example, the query ''*genbank/ M29293[si]*'' retrieved PMID *2532363.*

Workflow 2: Nucleotide-PubMed. Entrez-Nucleotide [14] was searched using a query of the form ''*xxxxxx*'' and retrieved nucleotide sequence records that might provide links to other resources. Two types of links, *PubMed links* and *PubMed Central links,* were pursued. *PubMed links* led to Entrez-PubMed and a set of

Table 1
Workflow results and comparisons

	Comparison 1: nucleotide accession numbers associated with one or more PubMed IDs	Comparison 2: PubMed IDs retrieved	Comparison 3: nucleotide sequence accession number–PubMed ID pairs retrieved
Number retrieved by:			
Workflow 1	49	72	73
Workflow 2	126	101	192
Workflow 3	45	267	301
Total retrieved	127	338	464
Number retrieved by workflows:			
1 only	0	18	18
2 only	72	38	129
3 only	1	219	254
1 AND 2 (but NOT 3)	10	15	16
1 AND 3 (but NOT 2)	0	0	0
2 AND 3 (but NOT 1)	5	9	8
1 AND 2 AND 3	39	39	39

PMIDs. *PubMed Central links* led to PubMed Central (the Entrez full-text repository) [15] and a set of PubMed Central records. These records had a *PubMed links* option, which provided a set of PMIDs corresponding to the PubMed Central records. For example, the query ''*M29293*'' led, via the *PubMed links,* to PMID *2532363* and via the *PubMed Central links,* to PMIDs *15644144* and *2532363.*

Workflow 3: Gene-PubMed. Entrez-Gene [16] was searched using a query of the form ''*xxxxxxx[NACC]*'' ([*NACC*] was used to unambiguously declare *xxxxxxx* an accession number). The result was the record for a gene that might provide links to other resources. As before, only *PubMed links* and *PubMed Central links* were pursued. For example, the query ''*M29293 [NACC]*'' retrieved an entry for the gene *Snrpn*. That gene entry included both *PubMed links* and *PubMed Central links.* In this example, both the *PubMed links* and the *PubMed Central links* led to PMIDs *12477932* and *2532363.*

Workflow comparison procedures

Previously, the 251 accession numbers were searched using Java implementations of the 3 workflows, and results were partially reported [17]. Between July 14 and 24, 2006, the search results were manually verified and updated. For each workflow, the PMIDs retrieved by each accession number were recorded. For workflows 2 and 3, whether the PMIDs could be retrieved via the *PubMed links* or *PubMed Central links* was also recorded.

Three aspects of the workflows were compared: which and how many accession numbers successfully retrieved one or more PMIDs, which and how many PMIDs were retrieved, and which and how many unique pairings between a particular accession number and a particular PMID (hereafter, ''accession number–PMID pairings'') were produced. The overall output of each of the three workflows was compared. In addition, for workflows 2 and 3, the results of following the *PubMed links* and *PubMed Central links* paths were compared. Because workflow 1 involved direct search of PubMed, this workflow had no alternative paths to the literature.

Statistical analysis

Agreement between pairs of workflows was assessed using Cohen's kappa [18] (denoted K). Statistical calculations were performed using SPSS [19]. The P value for each individual comparison was multiplied by nine to adjust for multiple comparisons [20]; adjusted P values < 0.05 were considered significant. Significant comparisons were interpreted as suggested by Byrt [18].

RESULTS

Tables 1, 2, and 3 present the aggregate study results. Figures 2, 3, and 4 present the results of comparisons 1, 2, and 3, respectively.

Comparison 1: Which and how many accession numbers were successfully used to retrieve one or more PubMed IDs (PMIDs) using the different workflows?

Overall results. PMIDs were associated with 127 accession numbers: 49 by workflow 1, 126 by workflow 2, and 45 by workflow 3. In terms of overlap, 39 accession numbers were associated with PMIDs by all 3 workflows.

***PubMed links* and *PubMed Central links* paths.** In workflow 2, 83 accession numbers were associated with PMIDs via *PubMed links* only, 7 via *PubMed Central links* only, and 36 via both. In workflow 3, 15 accession numbers were associated with PMIDs via *PubMed links* only, none via *PubMed Central links* only, and 30 via both.

Agreement between workflows. Agreement between workflows was assessed regarding the accession numbers for which they retrieved PMIDs. The agreement between workflows 1 and 2 ($K = 0.388$, $P < 0.001$) and between 2 and 3 ($K = 0.340$, $P < 0.001$) was slight. Workflows 2 and 3 showed good agreement ($K = 0.791$, $P < 0.001$).

Table 2
Assessment of agreement between workflows

	Comparison 1: nucleotide accession numbers associated with one or more PubMed IDs	Comparison 2: PubMed IDs retrieved	Comparison 3: nucleotide sequence accession number–PubMed ID pairs retrieved
1 and 2: Cohen's *kappa*	0.388*	0.500*	0.242*
Level of agreement	Slight	Fair	Slight
1 and 3: Cohen's *kappa*	0.791*	−0.159*	−0.060
Level of agreement	Good	No agreement	
2 and 3: Cohen's *kappa*	0.340*	−0.305*	−0.636*
Level of agreement	Slight	No agreement	No agreement

* Indicates P value < 0.001. Cohen's kappa statistics calculated using SPSS 11.5.0. [19]; significance levels reported after application of the Bonferroni correction for multiple significance tests [20]. Interpretation of kappa statistic, per Byrt [18]: ≤ 0 = No agreement; 0.01 to 0.20 = Poor agreement; 0.21 to 0.40 = Slight agreement; 0.41 to 0.60 = Fair agreement; 0.61 to 0.80 = Good agreement; 0.81 to 0.92 = Very good agreement; 0.93 to 1.00 = Excellent agreement.

Comparison 2: Which and how many PMIDs were retrieved using the different workflows?

Overall results. A total of 338 PMIDs were retrieved: 72 by workflow 1, 101 by workflow 2, and 267 by workflow 3. Thirty-nine PMIDs were retrieved by all 3 workflows.

***PubMed links* and *PubMed Central links* paths.** Workflow 2 retrieved 56 PMIDs via *PubMed links* only, 36 via *PubMed Central links* only, and 9 via both. In workflow 3, 250 PMIDs were retrieved via *PubMed links* only, none via *PubMed Central links* only, and 17 via both.

Agreement between the workflows. Agreement between workflows was assessed regarding which PMIDs they retrieved. The agreement between workflows 1 and 2 was fair ($K = 0.500$, $P < 0.001$). There was no agreement between workflows 1 and 3 ($K = -0.159$, $P < 0.001$) or between workflows 2 and 3 ($K = -0.305$, $P < 0.001$).

Comparison 3: Which and how many accession number–PMID pairs were produced using the different workflows?

A workflow results in an accession number–PMID pairing when inputting the accession number to the workflow retrieves the PMID. The purpose of the workflows here was to retrieve literature on the function of the genes associated with each of the accession numbers; therefore, the accession number–PMID pairings were of particular interest.

Overall results. A total of 464 distinct accession number–PMID pairs were retrieved: 73 from workflow 1, 192 from workflow 2, and 301 from workflow 3. Overlap between the 3 workflows was fairly low, including 39 pairs resulting from all 3 workflows.

***PubMed links* and *PubMed Central links* paths.** In workflow 2, 117 accession number–PMID pairs resulted from the *PubMed links* only, 65 resulted from the *PubMed Central links* only, and 10 pairs resulted from both paths. In workflow 3, 254 pairs resulted from the *PubMed links* only, none resulted from the *PubMed Central links* only, and 47 resulted from both paths.

Agreement between the workflows. Agreement between workflows was assessed regarding which accession number–PMID pairings they produced. The agreement between workflows 1 and 2 was slight ($K = 0.242$, $P < 0.001$). There was no agreement between workflows 2 and 3 ($K = -0.636$, $P < 0.001$), and the comparison between workflows 1 and 3 was not statistically significant.

DISCUSSION

The results show the three workflows are neither strictly equivalent nor even nearly equivalent in the sense of strong agreement or overlapping of results. The significant differences among the workflows

Table 3
Comparison of alternate paths within workflows

	Comparison 1: nucleotide accession numbers associated with one or more PubMed IDs	Comparison 2: PubMed IDs retrieved	Comparison 3: nucleotide sequence accession number–PubMed ID pairs retrieved
In workflow 2, number retrieved by:			
PubMed links path only	83	56	117
PubMed Central links path only	7	36	65
Both paths	36	9	10
In workflow 3, number retrieved by:			
PubMed links path only	15	250	254
PubMed Central links path only	0	0	0
Both paths	30	17	47

might surprise an otherwise scientifically sophisticated user who is not an expert in the use of these information resources.

In this case, the existing Help documentation for the information resources can account for differences in the workflow output. The PubMed Secondary Source or SI field documentation accounts for differences between workflows 1 and 2. According to PubMed's Help information [13], the SI field and the PubMed links to GenBank are generated differently and are themselves not linked. The SI field identifies GenBank accession numbers discussed in MEDLINE articles, while the GenBank reference field (which for a given record includes citations that discuss the associated sequence) is used to create the PubMed links to GenBank. The Entrez Gene documentation accounts for differences between workflow 3 and workflows 1 and 2. The Entrez Gene PubMed Links documentation indicates that some Entrez Gene PubMed links are generated from GeneRIFs, as indicated by the PubMed (GeneRIF) option [21], and that the GeneRIF mechanism is a way to let scientists themselves add to the functional annotation of genes [22].

Although such documentation is available, the biologist using or designing workflows may not know about it. It is no more reasonable to expect biologists to be experts in the metadata of biological information resources than it is to expect librarians to be experts in biology. Thus, because even simple, apparently similar information retrieval workflows may produce different results, a multidisciplinary team approach to authoring, vetting, and using life science workflows is needed. Such teams must include experts in the primary science and experts in the metadata characterizing the information resources.

The importance of librarians as metadata experts in life science research was recognized by the Human Genome Project in 1997 [23]. Unfortunately, almost a decade later, the library remains largely excluded from the mainstream of life science research: very few universities offer bioinformatics end-user support services through the library [24]; demand is generally not great for such services when offered [25]; and molecular biology students in particular do not choose the library as their preferred source of information about bioinformatics databases [26].

The life science information space is growing extremely rapidly, largely facilitated by ''the breakdown of the traditional barriers between academic disciplines and the application of technologies across these disciplines'' [27]. Similarly, breaking down the barriers between ''scientist'' and ''librarian'' and fostering the interdisciplinary and synergistic combination of their respective expertise in the development and use of life science workflows are crucial to achieving full and optimal exploitation of the life science information space.

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Evaluating your nursing collection: a quick way to preserve nursing history in a working collection*

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INTRODUCTION

Florence Nightingale's *Notes on Nursing* in 1859 [1] heralded the beginning of modern nursing. Nurses in the nineteenth century had not yet achieved professional credibility, therefore, many of the early texts were written by physicians. When nurses began to publish books, librarians and nurses did not always recognize their value, and many were discarded. For example, of the historical items mentioned by Allen [2], only one copy of both *Makers of Nursing History* (1928) by Pennock and *Nursing Ethics* (1900) by Isabel Hampton Robb can be found in Ohio. It is vital that libraries now recognize and preserve the important works of nurses so that nursing students of the future have them available, both as historical background and as a basis for comparison with current nursing issues. Many books of value to the history of nursing often exist in small nursing collections and should not be discarded without much thought. The significance of many publications can be determined only in retrospect, after their full impact has been appreciated. Meanwhile, it falls to librarians who manage nursing collections to make the best decisions about what to keep, both for current and future users of the collection. On the other hand, shelf space is a problem for many academic libraries, and weeding is necessary to maintain a workable and usable nursing collection that contains up-to-date clinical information.

While the collection development policies and space limitations of each library will determine how much historical material librarians will acquire and which books they will withdraw, this article proposes some basic criteria for deciding which history-related materials to keep in nursing collections and what to withdraw and offers a bit of guidance on what to purchase.

BACKGROUND FOR DEVELOPMENT OF THE CHECKLIST

The Ralph M. Besse Library serves the student body of Ursuline College, a small private institution that has about 450 undergraduate nursing students and 100 graduate nursing students. Recent years have seen initiatives to recruit and retain minority students to the college and have resulted in an increasingly diverse student body. The nursing collection, which supports the teaching and research needs of the students and

* Based on a presentation accepted for the annual meeting of the Midwest Chapter of the Medical Library Association in Louisville, KY; October 7–11, 2006. The presentation was not given because travel funds were not available for this conference.

faculty at the undergraduate level and the master's level, has evolved over sixty years and had not been weeded since 1998. The collection emphasizes US twentieth-century scholarly materials in English, with the exception of materials on the historical development of nursing. Special interests also include nursing theory and nursing research. Because Ursuline is historically a religious institution, materials on the spirituality of nursing and values or ethics in nursing are also collected.

The author weeded the library's nursing and medical collections, consisting of approximately 10,000 books, over a period of 6 months in 2004. The weeding was undertaken in an effort to free up shelf space for new acquisitions and to eliminate clinical information that was out of date and no longer useful. Obvious candidates for weeding included worn out or damaged books, duplicates, older editions, older textbooks, and materials not used in the last ten years. Nursing collections should also be weeded of books that contain dated or even harmful clinical information or information that has been superseded by new developments.

During the weeding process, the author attempted to identify and label those items that should not be discarded because of their age, content, or association with an important person in nursing history and identified many books, articles, and bibliographies about important historical items in nursing history [2–11]. Few materials, however, seem to help evaluate an item that is not included in one of these books. The following brief checklist should help librarians of nursing collections decide which books to keep and which to withdraw. The checklist does not contain substantive advice for weeding clinical textbooks or other practice-focused materials. See Tobia for more detailed information on weeding clinical textbooks [12] and Slote on weeding library collections for broader and more extensive guidelines for weeding collections [13].

WEEDING CHECKLIST FOR NURSING HISTORY MATERIALS

The following eleven questions may help librarians managing small, working nursing collections before they discard an item. These questions may serve to prevent the loss of materials valuable to the history of nursing. Table 1 provides a list of resources that may be useful in addressing the questions.

1. Is this material clearly a work by or about a nursing pioneer, that is, an individual who helped develop nursing as a profession and prepared the way for others?

This designation can surely apply to nurses from the latter part of the nineteenth and early twentieth century. Because the nursing profession is, in many ways, still evolving, it can also apply to nurses who led the way in the second half of the twentieth century. Nursing pioneers include many well-known nurses and those who appear in many of the reference works about nurses. The designation ''pioneer'' also includes some who are not so well known. See Table 1 for suggested resources.

2. Was this material published before 1960?

Nineteenth century books are usually recognizable as historically important, but materials from 1900 to 1960 often have historic value as well. Those nurses who lived through this period in the profession become fewer each year, and a clear sense of what nurses were thinking then is important to understanding nursing history. The 1940s and 1950s saw the growth of nursing education in four-year baccalaureate programs and witnessed the development of doctoral programs in nursing. Nurses with these degrees often wrote enthusiastically about nursing and its theories. Many of these graduates (e.g., Virgina Henderson, Hildegard Peplau, Faye Abdellah, and Esther Lucile Brown) went on to become leaders in the profession, and their earlier works are valuable as a window into the profession as it evolved. At Ursuline, nursing faculty often request books by authors from this period and assign readings from them, so use is high. One copy is usually sufficient.

3. Is this material about minorities in nursing?

Mary Elizabeth Carnegie notes in her work, *The Path We Tread: Blacks in Nursing Worldwide, 1854–1994,* that African Americans have often been excluded from nursing histories or given very brief mentions and have, thus, been deprived of their heritage [54]. Books by and about minority women in nursing are few and far between. Minority students, who constitute a significant portion of Ursuline's student body, often request books about African Americans in nursing. Such materials are useful to Ursuline's student body, but libraries in other areas of the country may need books about Hispanics or Asians in nursing. Check the index of one or more of the publications in Table 1 before discarding any materials. Items by or about the nurses mentioned in these works should be kept in the collection, if possible.

4. Is this material about men in nursing?

Since the days of Florence Nightingale, men have not had a significant role in nursing, until recently. In 1960, only 1% of nurses were men [22], yet, in 2000, men were 5.4% of the total registered nurse population [55], and their representation in the profession continues to grow. Few books have been written about men in nursing, and those materials that do exist should be kept in a collection. Add books on this topic, such as *Men in Nursing: History, Challenges, and Opportunities* [24], as they become available, because this subject is a large gap in all nursing collections. Men in Ursuline's nursing program are a small but growing number, so this issue is sure to be discussed in the future.

Table 1
Example resources

Resource	Comments
Nursing pioneers	
American Nurses Association's Nursing Hall of Fame Web page [3]	Major source to consult that has already honored 75 pioneers
American Nursing: A Biographical Dictionary [4]	
American Women of Nursing [5]	
Celebrating Nursing History: What to Keep [2]	Margaret (Peg) Allen's compilation of an impressive list of important nursing publications, many with annotations, in her Web article
Dictionary of American Nursing Biography [6]	
Nursing Studies Index [7]	Four-volume set edited by Virginia Henderson that has author indexes
Material published before 1960	
A Bibliography of the Nursing Literature: 1859–1960 [8]	Provides an excellent introduction to the development of the literature of nursing
The History of Women and Science, Health, and Technology: A Bibliographic Guide to the Professions and the Disciplines [9]	Has an excellent section on nursing and midwifery, with an author index
Issues in Nursing: An Annotated Bibliography [10]	(1985) Has author index
Nursing: A Historical Bibliography [11]	(1981) Has author index
Nursing Studies Index [7]	Good source for books published before 1960
Minorities in nursing	
Black Women in the Nursing Profession: A Documentary History [14]	1985 book from the series History of American Nursing that contains reprints of primary documents
Black Women in White: Racial Conflict and Cooperation in the Nursing Profession [15]	
Contemporary Minority Leaders in Nursing: Afro-American, Hispanic, Native American Perspectives [16]	Contains personal statements by minority nurses
Early Black American Leaders in Nursing: Architects for Integration and Equality [17]	1999 National League for Nursing publication
No Time for Prejudice: A Story of the Integration of Negroes in Nursing in the United States [18]	1961 book written by Mabel Keaton Staupers, another black pioneer, and published by the National Association of Colored Graduate Nurses; the only book she has written, and one of the few about the association
Pathfinders: A History of the Progress of Colored Graduate Nurses [19]	Early work from 1929 was reprinted in 1985. Ursuline does not own; buy a copy if you can
Men in nursing	
Current Issues in Nursing [20–22]	Editions with chapters on men in nursing
The Male Nurse: Addressing the Myths of Maleness in Nursing [23]	A 2001 book addressing men in psychiatric nursing
Men in Nursing edited by O'Lynn and Tranbarger [24]	Source for the names of important men in nursing
Nursing theories	
Foundations of Nursing Theory: Contributions of 12 Key Theorists [25]	
Nursing Theories: The Base for Professional Nursing Practice [26]	
Nursing Theorists and Their Work [27–31]	Five editions that discuss major nurse theorists
Publications of nursing organizations	
A History of Diploma Programs in Nursing and the National League for Nursing, 1952–1987 [32]	Documents history of a type of school that has all but disappeared
The Nurse in Industry: A History of the American Association of Industrial Nurses [33]	
Nurse-midwifery in America: A Report by the American College of Nurse-Midwives Foundation [34]	
Nurses for a Growing Nation [35]	Published by the National League for Nursing, addressing the shortage of nurses in 1957, only three copies in Ohio
Nursing Studies Index [7]	Lists many important publications by nursing organizations
Twenty Thousand Nurses Tell Their Story: A Report on Studies of Nursing Functions Sponsored by the American Nurses' Association [36]	A study commissioned by the American Nurses Association in 1958 that reports what functions nurses were performing at that time
Documents important events or trends	
To Bind up the Wounds: Catholic Sister Nurses in the U.S. Civil War [37]	Written by a sister from the Pepper Pike Ursuline community in 1989, this has local interest
Nurses in Vietnam: The Forgotten Veterans [38]	
Nursing for the Future [39]	Published by the National Nursing Council, an international group, in 1948; stressed the importance of high standards for nursing education and paved the way for nursing education in institutions of higher education
Nursing in the 1980s: Crises, Opportunities, Challenges [40]	Published by the American Academy of Nursing in 1982
The Nursing Profession: Tomorrow and Beyond [41]	2001 publication in which many important contributors discuss the future in nursing
The United States Cadet Nurse Corps [1943–1948] and Other Federal Nurse Training Programs [42]	Published by the United States Public Health Service in 1950
Biography or autobiography	
Making Choices, Taking Chances: Nurse Leaders Tell Their Stories [43]	The library has two copies of this much-used book; it contains first person stories of 46 contemporary nurse leaders
Hildegard Peplau: Psychiatric Nurse of the Century [44]	A 2002 biography of the nurse who developed the interpersonal nursing theory
Trailblazer: Negro Nurse in the American Red Cross [45]	1969 biography of Frances Elliott Davis, pioneer of African American nursing
Nurse [46]	1978 biography of nurse Mary Benjamin

Table 1
Continued

Resource	Comments
History of nursing	
A Bibliography of Nursing Literature, 1961–1970 [47]	(1974) Indexes the rapid growth of the profession during the 1960s and 1970s
The Care of the Sick: The Emergence of Modern Nursing [48]	Vern and Bonnie Bullough describe the history of nursing from the viewpoints of accomplished historians
A History of Nursing: The Evolution of Nursing Systems from the Earliest Time to the Foundations of the First English and American Training School for Nurses [49]	A 1913 book by Adelaide Nutting, a nursing pioneer
Nursing in Ohio: A History [50]	(1951) Local nursing history that contains unique and valuable information
A Short History of Nursing, from the Earliest Times to the Present Day [51]	A fourth edition (1938) edition of a classic by pioneer, Lavinia Dock
Taking Charge: Nursing, Suffrage and Feminism in America, 1873–1920 [52]	(1996) Describes nursing's relationship to women's suffrage
Trends in Nursing History: Their Relationship to World Events [53]	(1944) Describes the effects of two world wars on the practice of nursing

5. Is this material by or about a nursing theorist or theory? Is it about a specific nursing model?

Nursing theoretical models provide a unique framework for understanding the nature of human beings, their health, and their environments and for understanding the methods by which nursing is studied and practiced [56]. Florence Nightingale, the most celebrated pioneer in the field, wrote about the conceptual and philosophical foundations of nursing in the mid 1800s. More nurses began to write specifically about nursing philosophy during the 1970s, when well-educated nurses began to formulate and write about theories. This theoretical framework is still a work in progress, so any significant writings should be kept as part of evolving nursing history. Because nursing theory is a special focus of the Besse Library's collection development policy, materials written by or about these theorists will be kept in the collection.

6. Is this item published by an important nursing organization (such as the American Nurses Association or the National League for Nursing) or another health organization of historical importance?

Since the birth or the American Society of Superintendents of Training Schools of Nursing at the World's Fair in Chicago in 1893, professional organizations have influenced the evolution of nursing and, in turn, been impacted by the profession. Important changes and developments have often been first discussed and documented in such organizations. In general, documents by nursing or health organizations about the practice of nursing contain valuable historical insights. The guidelines for collection development in nursing for the Besse Library include publications of local, state, and national professional organizations, so important materials by such organizations will be kept.

7. Does this resource document events or ideas important to nursing at a specific time in history?

Some historical materials are clearly important for an understanding of nursing history such as books about nurses in the Civil War or Vietnam War or in the United States Cadet Nurse Corps. Other materials may be important because they relate the issues and events that have occurred in the past few decades but may be easily dismissed as not ''historical'' enough. Table 1 includes some examples.

8. Is this a biography or autobiography of an individual nurse?

Practicing nurses who work in hospitals, homes, and agencies are prone to be doers rather than writers, so biographies of and autobiographies by individual nurses and their struggles are relatively uncommon and should be kept, if possible. Assignments that require information about individual nurses recur in Ursuline's nursing curriculum, so biographies are often needed by nursing students. Table 1 lists some useful resources.

9. Is this book about the history of nursing?

The growth of a profession can be measured by its recorded history, and all histories of nursing reflect the thinking of the time they were written. Many examples of nursing history can be found in every nursing library. Allen notes that ''all editions of books on nursing history should be kept'' [2]. If space is a problem, libraries could keep only the first edition of each history as well as those that are mentioned in notable bibliographies [7–11] and those that are written by important persons in nursing [3–6]. Histories that cover the local area of the library are also valuable. Histories by lesser-known authors or histories that repeat ground already covered are candidates for withdrawal, if necessary. Examples of those that will be kept in the Besse Library's collection are included in Table 1.

10. Does this item describe original research or represent a primary source?

The landmark Goldmark study on nursing education is an example of such a primary source [57]. Published in 1923 and reprinted in 1984, it set the stage for the advance of nursing education. All primary sources

should be kept in the collection or, if this is not possible, offered to another library that maintains a historical nursing collection.

11. If items do not fall into any of the above categories, what else is known about the authors and what else have they written?

- Check the Website for American Nurses Association's Nursing Hall of Fame [3].
- Consult the biographical materials [4–6] or any good historical biography of nursing.
- Search for authors in Science Citation Index to see what articles they have written and if the articles have been cited by others.
- Search for authors in WorldCat or other bibliographic database to see what books they have written.
- What other libraries own a copy of this work? If this is the only copy in the state or in the United States, it should be kept. If only a few copies exist, a decision should be made based on all the other factors mentioned above. If possible, err on the side of caution.

OUTCOMES AND ADDITIONAL CONSIDERATIONS

Having read these questions to ask before discarding materials in a nursing collection, the reader may wonder if the author had anything left to weed. In fact, about 1,500 books or 15% of materials were withdrawn, leaving 85% of the collection intact, including nursing materials of historical interest. Weeding also allowed the library to designate books that needed repair.

Faculty resistance is often a factor in the weeding process. Librarians may decrease faculty anxiety by providing them with a list of items to be weeded in their subject areas and allowing them to choose items to keep. During the Besse Library weeding, very few items were so chosen, and faculty felt they had a voice in the process. Lastly, once a book is identified as having interest for the history of nursing, the librarian who is weeding the collection must decide on a book-by-book basis whether to keep it in the collection or offer it to another library. Items that are determined to be rare or of great historical value, but cannot be kept in the collection, should be offered to another library that keeps a historical nursing collection.

CONCLUSIONS

Librarians who are considering weeding their nursing collections should do so, despite the time and effort required, because the benefits are clear. The collection is leaner, more attractive, and usable for students, and the shelves are less crowded. The library has room to add newer materials as they are published without major shifting of books. As an added bonus, staff have a much better knowledge of what is in the collection and are able to provide better reference services to all students, especially nursing students.

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A partnership in teaching evidence-based medicine to interns at the University of Washington Medical Center

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INTRODUCTION

Evidence-based medicine (EBM) is the process of identifying and assessing the best available scientific evidence and integrating this evidence with the clinician's judgment and the patient's values to make medical decisions [1]. The Accreditation Council for Graduate Medical Education (ACGME) has incorporated EBM

This article has been approved for the Medical Library Association's Independent Reading Program <http://www.mlanet.org/education/irp/>.

A supplemental appendix is available with the online version of this journal.

Table 1
Evidence-based medicine resources searched in each class

Resource	Type
BMJ's Clinical Evidence	Evidence guidelines and summaries
Cochrane Library	Systematic reviews
PubMed	Research articles with Medical Subject Heading emphasis
PubMed Clinical Queries	Systematic reviews and meta-analyses
Turning Research Into Practice (TRIP)	Meta-search engine (evidence guidelines, systematic reviews, research articles, etc.)
PrimeEvidence (in UW PrimeAnswers)	Meta-search engine (selections from highly used sources; e.g., *New England Journal of Medicine*, *JAMA*, etc.)

into one of the expected general competencies for all graduating residents in the United States [2]. The requirement can be met a number of different ways, two of which include freestanding curricula in classroom settings and instruction at the point of care.

University of Washington's (UW's) medicine faculty identified problems common to both of the aforementioned curricular models. First, they tended to emphasize critical appraisal at the expense of other core skills such as question formulation and literature searching, and second, time constraints and real-time practice situations were not being taken into account. The previous UW model for teaching was classroom based and focused on the critical appraisal of one research article encompassing one clinical topic (e.g., diabetes, osteoporosis). Interns expressed to faculty that they often experienced difficulties in remembering and applying these skills at the point of care.

In July 2004, based on faculty and housestaff feedback, the UW Medicine Residency Program chose to follow a new ''hybridized model,'' which included aspects of both freestanding curricula in a classroom setting and instruction at the point of care, with extensive librarian involvement throughout. The goal was to provide a self-contained session in which interns could develop a foundation of skills in a more structured and controlled setting, while retaining the benefits of an integrated approach emphasizing time efficiency. This paper describes the current UW approach to teaching EBM to medicine interns, detailing librarian involvement in this approach and illustrating a model for meeting ACGME's EBM requirements.

CURRICULUM DESCRIPTION

The curriculum, adapted from David Sackett's program at McMaster University [3], emphasized the five-step EBM process of developing a focused question, searching using a variety of electronic resources, appraising the findings, applying the findings back to patient care, and assessing the process. Through a combination of lectures and interactive methods, a total of forty-eight interns were trained to apply EBM to clinical encounters in the 2004/05 academic year.

Interns attended an eight-week EBM course for a total of twenty-four hours' instruction led by faculty, chief ambulatory residents, and librarians, held in the UW Health Sciences Library's computer lab. The course covered four themes: (1) an overview of EBM concepts and principles, (2) therapy, (3) prognosis, and (4) diagnosis. Each session was three hours in length. The first session provided an overview of EBM centered on formulating a focused clinical question and searching efficiently using a broad array of medical databases. The following sessions were each directed at addressing clinical questions pertaining to therapy, prognosis, and diagnosis. Each class involved a short lecture on the week's theme, individual work by interns to formulate questions from their clinical encounters, and a frequently spirited vote by the interns on which question to pursue as a group.

Curriculum support was provided by two librarians in the form of an instructional overview of selected EBM resources, search support during each class, and creation and maintenance of the course Website. Five EBM resources were used regularly in the course (Table 1): Turning Research Into Practice (TRIP), PubMed and PubMed Clinical Queries, the Cochrane Library, BMJ's Clinical Evidence, and UW's PrimeAnswers [4]. Interns rotated through using each of the search tools until they gained familiarity with each resource and developed understanding of when each tool should be employed, given the type of inquiry. The librarians were able to provide immediate search assistance to address interns' questions at the point of inquiry.

Each session led to the creation of a critically appraised topic (CAT), authored by the group of interns led by the faculty instructor. Sauve et al. defined a CAT as a

> structured one-page summary of the results of an evidence-based learning effort, in which a patient's illness stimulates a learner's question, for which the learner finds evidence, appraises the evidence, and decides whether and how to use that evidence in the care of the patient. [5]

The CAT format used in this course was adapted from the Sauve article, and completed CATs were later uploaded to the course Website [6]. An embedded PubMed search, crafted by the librarians, was later added to provide ongoing value to the completed CAT by allowing individuals to view more recent literature on the topic.

COURSE WEBSITE DEVELOPMENT AND USE

One of the librarians' major contributions to the course was the creation of an accompanying Website, developed using Catalyst SimpleSite, a proprietary software from the University of Washington [7]. As the digital

presence for the course, the Website provided a dynamic repository of all course materials, including electronic presentations of lectures and readings, teaching tools such as the downloadable CAT forms, and the completed CATs, organized by theme (therapy, diagnosis, or prognosis) and disease categories. Furthermore, informal feedback gathered by the librarians found that the course Website allowed not only the interns but also the UW Department of Medicine faculty to share, review, and identify more recent relevant literature using the embedded PubMed search strategies. Current course participants and faculty instructors have also used the Website to generate further clinical questions. The medicine program's knowledge-base is therefore captured, archived, and enhanced through promoting access to the EBM products created by all program interns.

COURSE EVALUATION

A pretest survey was administered to all interns prior to starting the EBM course to provide a measure of effectiveness and feedback for the instructors (Appendix). After interns complete the eight-week course, the same survey was administered as a posttest. Participants' responses to the surveys indicated increased confidence in using Medical Subject Headings (MeSH) to search PubMed and increased comfort level in teaching EBM to their teams. Qualitative comments from interns indicated that the focus on both literature searching and critical appraisal was particularly useful and favorably noted that the structure limited time investment outside of the class. Interns also reported that they were exposed to new resources and found the Website and the assistance of the librarians highly useful.

In addition to considering the interns' feedback, course instructors and librarians met quarterly to informally discuss the direction of the course and participants' reactions to the structure and content of the sessions. One of these discussions, for example, revealed that the course needed to include additional instruction in how to formulate structured clinical questions, evidenced by interns' difficulty in focusing their searches.

CURRENT STATUS AND FUTURE DIRECTIONS

The EBM course is now in its third year and has been completed by ninety-six interns as of the end of June 2006. One addition to the course content has been the concept of harm, an EBM topic concerning adverse events (e.g., ''What is the risk of suicide in an adult starting an selective serotonin reuptake inhibitor antidepressant?''). To further evaluate interns' EBM knowledge and understanding, a more formal research tool, adapted from the Society of General Internal Medicine [8] and modified by course instructors, has since replaced the original pre- and posttest surveys.

Plans for the future include a formal controlled research study to evaluate the impact of the EBM intervention on interns' understanding and further use of EBM principles in clinical practice. The categorical interns' pre- and posttest results will be compared with those of the preliminary interns, who do not take the course and will thus serve as the control group. Categorical interns are in the program for three years, whereas preliminary interns leave the program after one year to pursue training in primary areas such as ophthalmology, psychiatry, or neurology.

With fifty-eight CATs as of February 2007, the course Website continues to be maintained and remains readily available to all as the online repository and digital presence for the course. The possibility of migrating the Website into an alternative content management system to encourage instructor participation in uploading, maintaining, and indexing course materials and CATs is currently being explored.

CONCLUSIONS

This model for teaching EBM to interns provides one example of how librarians can be integral to meeting the EBM requirements for ACGME's residency training programs. The project's CATs can be used as teaching examples in any program and can provide the opportunity for health sciences librarians to refresh clinical searching skills. Additionally, the online availability of the curriculum tools such as the Website, the CAT templates, and electronic slides [6] provides an opportunity for interested clinical faculty and librarians from other institutions to replicate this model for their training programs and extend this type of collaboration to other organizations.

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Navigating the US health care system: a video guide for immigrant and diverse populations*

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INTRODUCTION

Commitment to diversity is an important part of the strategic plan of the University of Nebraska Medical Center (UNMC) [1]. As part of this commitment, the university provides support and incentives for diversity initiatives. It is hoped that, in addition to promoting diversity, the funded initiatives will strengthen existing relationships and build new, positive relationships with local community service organizations.

In 2004, the McGoogan Library of Medicine at UNMC was selected as one of the units to receive diversity funds. A team of five librarians, the authors, was chosen to work on this project. While no exact guidance was given, the team was encouraged to address the health information needs of diverse or underserved populations in Nebraska. Twenty-five thousand dollars in one-time funding was provided. As continued funding could not be anticipated, it was important that the project be relatively timeless.

While brainstorming about the type of project to undertake, the team found numerous studies describing difficulties recent immigrants might encounter when dealing with the US health care system [2–7]. Difficulties ranged from making appointments to understanding the need to disclose personal information or express disagreement with a physician. The team realized that many of these issues can result from a lack of knowledge about the basic elements of a doctor's appointment in the United States. These basics likely do not change rapidly over time; thus, a resource explaining these concepts should have long-lasting usefulness.

PLANNING FOR THE INTERVENTION

A literature search revealed reports of some health education programs that had been designed to teach basic health maintenance concepts to children of immigrants. Creators of one program felt that it was successful because the children could share the basic information they had learned with their parents and that parents were open to people who cared about their children [8].

The team felt that aiming the project at children could teach basic information without being condescending, and it was likely that such basic information would be shared with the children's parents. After meeting with several individuals who worked with Nebraska's diverse underserved and immigrant populations, the team decided that much information could be conveyed through a video, narrated in several languages, that would follow a child's family through the process of making a doctor's appointment, visiting the doctor, and visiting the library to obtain additional health information. A subsequent meeting with a local school nurse confirmed the need for basic information about what to expect when visiting the doctor.

Because none of the team members had ever participated in the creation of this type of video, it was unknown if it would be possible to produce a video with the given budget and proposed one-year timeframe. Several local video production companies were contacted, but ultimately the team decided to work with the UNMC Video Services Department. The video services staff had worked on previous projects with the library, and it was felt that a familiar face on campus might ease some of the team's anxiety about venturing into new territory.

Review of the literature about the obstacles faced by immigrants seeking health care produced a list of elements that the team wanted to include in the video (Figure 1). Children's books and a children's video about going to the doctor were also reviewed to see what others considered important or interesting to children. The team decided to aim the video at an early- to mid-elementary school audience. Specifically, the aim was for complete comprehension by eight-year-old children and at least partial comprehension by five-year-olds. To accommodate the attention span of younger children and viewers of all literacy levels, the target length for the video was set at ten minutes [9].

DEVELOPING THE VIDEO

Initially, the team created a script in which a narrator spoke directly to the audience about what they should do when making an appointment and visiting the doctor but then switched to a third-person story about a boy named Ramon and his visit to the doctor for his

* Based on a poster presentation at MLA '06, the 106th Annual Meeting of the Medical Library Association; Phoenix, AZ; May 21, 2006.

Figure 1
Elements included in the video

- Calling to make a doctor's appointment
- Description of other health care professionals, such as physician's assistant and nurse practitioner
- Writing down questions to ask the doctor
- Making a list of vitamins and medications currently taken or other health treatments used
- Arriving on time for an appointment
- Checking in for an appointment
- Answering all of the doctor's questions, even if they are potentially embarrassing
- Doctor explaining results of the physical exam
- Asking for clarification about what the doctor says and why it is important to follow the doctor's directions
- Requesting health information at a library
- Learning how to evaluate health information found on the Internet
- Reviewing information received from the doctor and the library and compiling a list of new questions to ask the doctor
- Emphasizing that part of being a good patient is asking questions and doing what you can to learn about your health

school physical. This approach made the story more specific, which made it more realistic and interesting. An audience is often more likely to look for applications of realistic stories to their own lives [9, 10]. The team also decided the story would be interesting if the main character, Ramon, had a minor health problem that required diagnosis and treatment.

The introduction of a health problem allowed the team to incorporate the idea that doctors are like detectives who use clues. These clues include the information patients give the doctor, the results of the physical exam, and the results of blood work and other tests. Using the ''doctor as detective'' analogy, the video could address several of the misconceptions some patients from other cultures may have concerning health care.

Eczema was chosen as a good problem to give Ramon for several reasons: a family might notice and tell a doctor about triggers or behaviors that improve or worsen eczema. It is also a common, non-life-threatening condition. Treatment creams can be used to treat eczema, but the creams usually do not cure the problem forever. Families may need information on how to prevent worsening of the condition, and reliable, consumer-oriented information is available about eczema [11]. Ramon's mother could be shown obtaining information about eczema from the library and compiling a new list of questions for her doctor, nurse, or pharmacist.

A distinctive feature of the video was having the narration recorded in several languages: English, Spanish, and Nuer, a language spoken in Sudan. Nuer was selected because Nebraska has one of the largest populations of recent Sudanese immigrants in the United States, and Nuer is the predominant language spoken by this group [12–14]. Using a voice-over narration also allows for other languages to be added at a later date.

Once the script was finalized, it was translated into Spanish at no charge by the Nebraska Medical Center's Interpretive Services Department. Through the interpretive services department, the team learned of a company that was able to provide a translation for the Nuer version.

The cast of the video was made up of community members, the project team, family members, and coworkers. Whenever possible, actual health care professionals were cast in the health care workers' roles. Fortunately, one of the team members was a medical doctor in addition to being a librarian. Ideally, the team wanted the video to include individuals from diverse groups and the child to be similar in age to the target audience. Because a volunteer cast was used and filming took place on specific days, casting the lead characters proved challenging. To overcome these challenges, the roles for the main characters were rewritten. The story—formerly about Ramon, a Hispanic boy, and his mother—was revised to describe the doctor's visit of Alana, an African American girl, and her grandmother.

Filming of the doctor's office was done in one of UNMC's affiliated clinics. The library scenes were filmed in the patient resource center of the Nebraska Medical Center's Lied Transplant Center. This location was less crowded and looked more like a public library than the team's own academic library. The staff lounge of the team's library was used for filming the home scenes. Creative camera angles and well-placed props were required to make the lounge look like a home kitchen. All filming was done on the weekends to accommodate actors' schedules and to avoid disruption of normal activities at the various filming locations.

Because voice-over narration was recorded after filming was completed, there was no scripted dialogue. However, the actors' improvised dialogue was added to the final product as ''natural'' sound in a few spots. At least one team member was present during the recording of each narration. In cases in which the translated version of the script did not sound natural to the narrator, the team members and the narrator collaborated to find different words that still reflected the original intention of the script and would be easily understood by native speakers of the language.

Editing was the final step in the production of the video and was a time-consuming process. Because each of the spoken languages has different pacing, the video had to be edited for each narration. Graphics were also added during the editing process. Early in the planning process, the team decided that a cartoon character would appear during the video to reinforce important points. This cartoon character was drawn to look like a detective, tying it to the theme of doctors as detectives.

The video was produced in VHS, DVD, and streaming video formats [15]. The video was marketed to school nurses, school media specialists, public and special librarians, and other human services provider groups in Nebraska. Project funding enabled distribution of the video to targeted audiences at no charge. As of February 2007, more than 2,200 VHS videos and DVDs have been distributed.

HEALTH LITERACY APPLICATIONS

The Institute of Medicine defines health literacy as ''a shared function of cultural, social, and individual factors'' [16]. This video attempts to encourage that sharing function in individuals by reaching out to English-speaking children and their families, as well as non-English-speaking immigrant children and their families in a nonthreatening manner. By identifying some basic health care vocabulary and activities that take place during a typical clinic visit, the video may bridge or even help to alleviate misunderstandings on both sides of the health care process.

The video is not intended as a cure-all for immigrants seeking health care information; it is simply an introduction for any newcomers to this culture. The team attempted to record basic information in a medium that would be most acceptable to young children and older family members who may watch with them. The team considered the possibility that children and parents might watch the video together in a school setting, because many schools have support classes and programs for parents. This approach would utilize one of the potential intervention points identified as a means to improve health literacy: the education system [16]. Ultimately, the team hopes that the video promotes trust and interaction between doctor, patient, and librarian and thus helps the patient reach a higher level of health literacy.

Although this video is aimed at children, it could also be used with patients with low literacy. Patient education that uses visual content to tell a story can help people with low literacy remember health information more effectively than programs or resources that present a list of facts [9, 17]. The video's script is written at a third-grade level and contains no long, complex sentences or hard-to-understand vocabulary, thus avoiding two of the possible barriers to comprehension faced by individuals with low literacy levels [18].

PRELIMINARY FEEDBACK AND USE

Mailings and email list announcements were used to market the video. Information about the video has been included in National Network of Libraries of Medicine newsletters and blogs that focus on minority health information. Team members also promoted the video at minority health conferences, health wellness fairs, and library conferences, and local community access television in Omaha showed the English version of the video for two weeks. Additionally, the National Library of Medicine has linked the video in MedlinePlus under the Resources for Children and Talking with Your Doctor sections. Although marketing was focused on individuals and groups in Nebraska, word spread quickly and requests for the video were received from a variety of groups across the United States.

Early, unsolicited feedback concerning the video has been positive. During the video's on-campus premiere, the director of community and multicultural affairs at UNMC praised the video for encouraging patients and the families of patients to ask their health care providers questions, something she indicated that many immigrants are unaccustomed to doing. Several video requestors said that they feel the video will help their immigrant clients find and adjust to US health care.

Some of those sending feedback have mentioned planned uses for the video including classroom instruction by English-as-a-second-language teachers, use by hospital inpatients through a hospital's video-on-demand system, showings at health fairs, viewings in outpatient clinic waiting rooms, and even inclusion in presentations to children about the career of medical librarianship. The team hopes that the video will also be viewed by elementary school classes, families in homeless shelters, children in after-school children's programs, and children attending day care and preschool. Copies sent to public libraries will, of course, be available for viewing in many family homes.

Some requestors have surprised the team by requesting copies of the video for use as an introduction to discussions with health care students and professionals about the practices patients use to treat their own illnesses and the way patients from different cultures view the US health care system. Fadiman similarly discusses the challenges that Hmong immigrants face when dealing with the US health care system and their feelings that their own cultural health practices are ignored by health care professionals [19]. Perhaps this video will help health professionals and students discuss and consider their own patients' healing practices.

CONCLUSIONS

This project has proved to be quite an adventure. Academic librarians are rarely presented with funds and little direction on the type of project that should be undertaken. The team was initially dumbfounded by the possibilities but found that literature review, conversations with those involved in helping the target population, and brainstorming sessions helped to quickly focus efforts. Lack of experience with video production made the project seem overwhelming, but as work began it became apparent that the team's complementary personality strengths and interests were significant factors in making this a successful project. The authors would recommend that others undertaking such projects seek group members with diverse interests and strengths.

Now that the video has been received by members of the targeted priority user groups, the team plans to formally evaluate how useful the video is and how and when it is used. This evaluation will be conducted while continuing to market and distribute the video. Formal evaluation should demonstrate the video's utility for improving health literacy for both immigrant and low-literacy populations as well as for uses such as cultural competency education.

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