

BRIEF COMMUNICATIONS

Need a bloody nose be a nosebleed? or, lexical variants cause surprising results

By MaryEllen Cullinan Sievert, Ph.D.
Professor
School of Information Science and Learning Technologies
College of Education and

Clinical Professor
Department of Health Management and Informatics

Timothy B. Patrick, Ph.D.
Assistant Professor

Department of Health Management and Informatics
School of Medicine
324 Clark Hall

John C. Reid, Ph.D.
Professor

Integrated Technology Services
School of Medicine
410 Clark Hall

University of Missouri–Columbia
Columbia, Missouri 65211

Most health professionals recognize that patients and other consumers of health care information are not familiar with medical terminology. When MEDLINE searching was restricted to the few who understood Medical Subject Headings (MeSH), medical terminology, and the intricacies of searching the database, there was little need to accommodate the uninitiated. Health professionals knew that over the years MEDLINE has adopted a number of mappings from entry terms to the MeSH headings. Many of these mappings are from the extensive entry vocabulary of MeSH, described on the home page as "over 300,000 terms."* Because of this large entry vocabulary, a search for "heart attack" now maps to "myocardial infarction," a term consumers are unlikely to use.

With knowledge about such mappings, health professionals might expect all lexical variants of a term to be mapped to a single form. The early tests of information retrieval systems noted the problem of lexical variants, and one of the purposes of controlled vocabularies was to control for such grammatical variations

* The MeSH home page may be viewed at <http://www.nlm.nih.gov/mesh/meshhome.html>.

[1]. In fact, the management of such variants is still a topic of research [2].

The data presented here showed that the expectation that all variants would be mapped to the MeSH term was not true. The researchers used the topic "bloody nose" (scientific name, "epistaxis") and two lexical variants to search a commercially available and a free system offering access to MEDLINE (OVID and PubMed) and on a sample of Websites consumers might access (MEDLINEplus, NetWellness, drkoop.com, Excite Health, and CBSHealthWatch). We also tested two other phrases for which we recognized lexical variants ("pink eye" or "pinkeye" and "color blindness" or "color blind" and their British equivalents) on MEDLINE to determine if our initial query was idiosyncratic.

The National Library of Medicine offers free access to MEDLINE from its home page through either Internet Grateful Med (IGM) or PubMed. Although the interfaces of the two systems differ considerably, both perform the same search. The details of the search when we entered "bloody nose" were:

bloody (all fields) and nose (all fields)

The resulting set had twenty items. One title contained the phrase "bloody nose" ("The Role of Branhamella Catarrhalis in the 'Bloody-Nose Syndrome' of Cynomolgus Macaques"). Consumers would find little of value in the other items in this set. Some of the other irrelevant titles were:

- "Exhaled Nitric Oxide in Patients with Wegener's Granulomatosis"
- "Compensatory Response of Colon Tissue to Dextran Sulfate Sodium-Induced Colitis"
- "The Oral and Intratracheal Toxicities of ROUNDUP and Its Components to Rats"

Because these systems offered the option of clicking on Related Articles, our imagined consumers could retrieve some relevant items from the system by clicking on the title of an item with bloody nose in it. Browsing the related items revealed that the condition Branhamella was the focus of the new search, not the concept of bloody nose. Thus, the search term "bloody nose" retrieved no relevant documents.

OVID also provides access to MEDLINE. The OVID search screen has a box that allows users to choose the Map to Subject Heading option. When this box is clicked, the system automatically attempts to map the search term to the most appropriate MeSH term. When we clicked the box and entered the term "bloody nose," the following list of terms was displayed:

Glycine;
Herbicides;
Surface-Active Agents;

Polyethylene Glycols;
Administration, Oral;
Lung;
Dose-Response Relationship, Drug;
Rats, Wistar;
"bloody nose".mp. (Search as Keyword)

Most consumers would not see an obvious relationship between any of the terms listed and the topic, so they would likely choose the final option, "bloody nose.mp." The result of this search was a single citation, which was about the effects of herbicides (the one with ROUNDUP above).

This set of results is not of particular interest, because it illustrates that MEDLINE is not designed for consumers, as stated in the first paragraph. What is interesting about this example is that by using a grammatical variation of the original term, consumers would get a completely different set of results. Bloody nose is a phrase composed of an adjective and a noun. Reversing the order of the words and moving from the adjectival to the noun form results in the noun-noun phrase "nose bleed." The results of a search with "nose bleed" are different. This phrase, too, has a variant, the single word "nosebleed."

When we entered "nose bleed" as a search term on either PubMed or IGM, the resulting set contained 1,849 items. When we clicked on the Details box, the search clearly was for:

epistaxis (MeSH) or nose bleed.tw

When we entered the composite noun "nosebleed," the same set is retrieved and clicking on the details box reveals that the search was performed as follows:

epistaxis (MeSH) or nosebleed.tw

Using either of these options, we got a large set containing titles such as the following:

- "59-Year-Old Man with Epistaxis, Headache, and Cough"
- "Successful Epistaxis Control in a Patient with Glanzmann Thrombasthenia by Increased Bolus Injection Dose of Recombinant Factor VIIa"
- "A New Bipolar Diathermy Probe for the Outpatient Management of Adult Acute Epistaxis"
- "The Use of Nasal Endoscopy to Control Profuse Epistaxis from a Fracture of the Basi-Sphenoid in a Seven-Year-Old Child"

If we clicked on the Details button and saw epistaxis, we might have found articles in the resulting set of interest. If we did not, we would not have found a relevant title among the first thirty items on the list.

With OVID, if the Map to Subject Heading box was clicked, then either nose bleed or nosebleed would map to epistaxis, and we saw a message to that effect.

Table 1
Results of searching MEDLINE for information on pink eye and color blindness

Term	# of items retrieved on PubMed	# of items retrieved on OVID
Pink eye	32	32
Pinkeye	20	20
Conjunctivitis	12,299	10,907
Keratoconjunctivitis	2,927	2,294
Color blind	539	61*
Colour blind	216	50*
Color blindness	2,477	178*
Colour blindness	2,463	126*
Color vision defects	2,474	2,443

* These terms were searched only as keywords on OVID. In all cases, OVID mapped them to a list of MeSH terms with "color vision defects" at the top of the list.

If we chose just the MeSH term, the resulting set had 1,833 items with titles like the following:

- "Recurrent Epistaxis in a College Athlete"
 - "Comparison of Computer-assisted Instruction and Seminar Instruction to Acquire Psychomotor and Cognitive Knowledge of Epistaxis Management"
 - "A Randomized Clinical Trial of Antiseptic Nasal Carrier Cream and Silver Nitrate Cautey in the Treatment of Recurrent Anterior Epistaxis"
 - "A Treatment Algorithm for the Management of Epistaxis in Hereditary Hemorrhagic Telangiectasia"
- Because this system shows the mapping to the user, the resulting set may seem more relevant with the knowledge that epistaxis means bloody nose.

While PubMed does not show any mappings directly to the user in its search process, it does offer access to the MeSH browser where the user could see some relationships between terms. Because consumers might try to use the MeSH browser, we tested all our variations in it. The results showed the same disparities as the MEDLINE retrieval. When we entered "bloody nose," the response was "No term found." Both nose bleed and nosebleed led directly to the MeSH Descriptor Data, where both appeared as entry terms for the scientific name, epistaxis.

We have focused our discussion so far on a single term and its variations but found similar results, at least on MEDLINE, with two other phrases. Pink eye could be written as two words or one, pinkeye. We could talk of being color blind or having color blindness or use their equivalent British spellings. In both cases, searching for the variations of the terms resulted in different retrieval, and consumers are not always directed to the official MeSH term. Table 1 contains the results for searching MEDLINE both through PubMed and through OVID. We would likely get similar different results with a search of Websites, but we did not test that hypothesis.

If the OVID Map to Subject Heading box was clicked, pink eye mapped to a list with keratoconjunctivitis first and with "conjunctivitis" tenth. Pinkeye mapped to a different list with keratoconjunctiitis second and conjunctivitis fifth. Again, we tested the MeSH browser to see if variations all led to the MeSH term. Pink eye resulted in a list of three terms:

- pink-eyed dilution protein
- pink-eyed dilution gene product
- pink-eyed dilution protein, human

None of these terms are related to conjunctivitis or any eye disease. When we entered the single word "pink-eye," the response was "No term found."

If the OVID Map to Subject Heading box was clicked, all forms and spellings of color blind(ness) mapped to a list with the MeSH term "color vision defects" first. The MeSH browser had varying results depending on which lexical variant was used as the search term for the browser. Color blind resulted in a list of eight terms, beginning with the MeSH term color vision defects. The second term was "color blindness," and the remaining six all had qualifiers. Clicking on either color vision defects or color blindness resulted in the MeSH Descriptor Data display where both color blind and color blindness were displayed as entry terms. Either of the British spellings resulted in "No term found."

This tangled verbal variation for a single concept was not restricted to MEDLINE alone. We searched five health sites on the Web and found variations in retrieval on each site for the concept of bloody nose, our original inquiry. These were obviously not the only such sites but were merely examples. One of these sites (drkoop.com) was chosen because of its popularity as reported in the media, one (MEDLINEplus) because it was the official source of consumer health information coming from the National Library of Medicine, and one (NetWellness) because it was developed by librarians. The other two were the result of clicking on the Search button on a browser and then clicking on health information.

The results of using the three variants of bloody nose, nose bleed, or nosebleed are shown in Table 2. Obviously, what consumers will find depends on which grammatical variation of the concept is the search term. All three members of our research team evaluated the results for relevance and used the single criterion that the source appeared to be about bloody noses. We only evaluated the items (articles, consumer emails, or specially designed items) that were available on the site we were searching. In other words, we did not try to evaluate related Websites, even though some of the sites retrieved them. We used only the concept of bloody nose for this sample of Web searches, but

Table 2
Results of searching Internet sources with bloody nose and its lexical variants

Source	Bloody nose		Nose bleed		Nosebleed	
	Retrieved	Relevant	Retrieved	Relevant	Retrieved	Relevant
MEDLINEplus	0	—	1	0	2	1
NetWellness	2	2	16	5	1	1
drkoop.com	50	7	50	3	17	6
Excite Health	856*	0	928*	1	28	5
CBSHealthWatch	12	0	4	0	3	1

* First fifty examined.

we surmised that a similar pattern would emerge if we used the variations for color blindness or pink eye.

The point of these examples is to highlight the problems that can be encountered by using the "wrong" grammatical variation. Both PubMed and the OVID access to MEDLINE will map the user to the MeSH term, but only if the appropriate term is entered initially. Nose bleed and nosebleed are both mapped to epistaxis in MeSH, but bloody nose is not. With the OVID system, pink eye and all spellings and grammatical variations of color blindness map to appropriate MeSH headings, although consumers may need to know that conjunctivitis is a medical term for pink eye. With the PubMed system, however, the results differ considerably depending on the lexical variant entered.

If consumers are to use sources such as MEDLINE successfully, it becomes important that their language accesses pertinent literature. Even the Metathesaurus of the Unified Medical Language System [3, 4], rich as it is, does not contain color blind, colour blind, or bloody nose. It does include both variants for pink eye and the British and American spellings for color blindness.

If our health care system is to be driven by the informed decisions of patients and health care consumers [5], it is important that they are able to successfully use sources of health care information such as MEDLINE. Accordingly, it is important that the language of patients and consumers accesses pertinent literature. Yet our research, though preliminary, suggests that this is far from the case. From a terminological point of view, improving health care information retrieval for consumers requires that more consumer terms, with all of their lexical variations, be mapped to their MeSH counterparts. Gathering all consumer terms may be an impossible goal, but studying ways to add additional lexical variants, at the very least British equivalent spellings, could significantly improve retrieval for consumers.

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Historically significant journal articles: their identification in older bound journal volumes designated for weeding and the creation of new access to these articles

By Jonathan D. Eldredge, M.L.S., Ph.D.*
Chief
Collections and Information Resources Development

Assistant Professor
School of Medicine

Henry Guenther, M.L.S.
Head of Cataloging

Health Sciences Center Library
The University of New Mexico
Albuquerque, New Mexico 87131-5686

OBJECTIVE

This project sought to identify historically significant articles in older bound journal volumes undergoing evaluation as candidates for weeding. Health sciences librarians can expect to be involved in similar weeding projects as collections continue to outgrow available space in library buildings. Digitizing collections and placing greater reliance upon electronic versions of books and journals will not solve space problems in libraries [1, 2]. Over the period of a recent decade, medical school libraries grew from an average of 174,488 bound print volumes to an average size of 233,562 volumes [3, 4]. This growth may largely be the

result of the appearance of both new journal titles and the larger numbers of articles published in established journals each year [5]. Print monographs also continue to play a vital role in health sciences libraries [6, 7]. In addition, with each passing year, others outside of libraries grow increasingly covetous of space occupied by libraries [8, 9].

This project began when approximately 1,500 linear feet of shelf space in an offsite storage facility needed to be created within a four-month period amidst a crowded bound journal collection. The extra space had to be created due to renovations in The University of New Mexico (UNM) Health Sciences Center (HSC) Library building that required shifts of bound journals to the offsite compact shelving storage facility. Of these nearly 6,900 bound journal volumes, 38.6% were published during the 1880 to 1950 era, raising concern that historical items of potential value to future researchers might be unintentionally discarded during the weeding project. Although the UNM HSC Library's mission supported historical collections relevant to the health sciences in the southwestern United States, this mission did not extend to the specific materials covered by this project. Once the first author identified for retention those individual volumes containing historically significant articles, the second author designed new modes of access to increase user awareness of their existence.

METHODS

This case study begins with a brief review of the weeding criteria employed by the first author. It then offers greater detail on how the first author identified historically significant articles housed in a bound journal collection principally from the 1880 to 1950 era. The second author describes the cataloging methods used to create access to these articles via multiple fields: author, journal title, subjects, and the global identification of this genre of material referred to as "classic articles."

In February 1998, the head of serials asked the first author to identify, for weeding, 1,500 linear feet of bound journals from a collection located at a storage facility in an adjacent building. A member of the serials staff provided usage data from the UNM HSC Library's Innopac system for each of the bound journal titles housed at this facility. The first author only considered sets of bound journal titles that had experienced no use or only one use over a nine-year period, as recorded in the Innopac online public access catalog (OPAC), for possible weeding. Past usage history and the language of the text in these bound journals appeared to be the best practical predictors of future use under the circumstances [10]. The staff of the Interlibrary Loan/Document Delivery Unit then checked these titles against holdings at other research libraries

* Correspondence should be sent to Jonathan Eldredge at jeldredge@salud.unm.edu.

in a five-state National Network of Libraries of Medicine (NN/LM) region. Provided that at least one other library had comparable or more extensive holdings of the same journal title, an identified title would remain in consideration for weeding.

The first author then consulted the second edition of Ash's *Serial Publications Containing Medical Classics* to match journal titles containing historic articles with those journal titles slated for possible weeding [11]. Ash's book was designed as a companion to the 1970 edition of Garrison and Morton's medical bibliography [12]. Ash's book contained some entries that did not match the 1991 edition [13] of Morton's bibliography, however. The first author had to locate the correct entries for the classic articles contained in the bound journal titles owned by the UNM HSC Library by searching in Morton's 1991 edition. In a few cases, the 1991 edition of Morton's had altogether deleted the citation referred to by Ash. This exercise led the first author to scan Morton's 1991 edition for journal title citations that were not listed in Ash's book.

By June 1998, the first author had identified forty-one volumes that contained either one or two historically significant articles. This project had to compete for the authors' time with another project to integrate history of medicine (but not historically significant) monographs into the general monographs collection. Thus, the project described in this article could possibly have been completed in half of the allotted four months. The forty-one volumes identified for retention occupied a total of only ten linear shelf feet. Those bound journal titles containing more than two historically significant articles were retained in the collection at the offsite storage facility. The first author authorized those bound journal volumes not containing historically significant articles to be withdrawn from the collection. These bound journals, comprising approximately 6,800 volumes and occupying about 1,700 linear shelf feet, were offered to other health sciences libraries via an electronic mailing list and discarded if no library requested them within two months. No libraries accepted this offer.

The second author used the entries in Morton's fifth edition [14] to create individual catalog records for the historically significant articles (Figure 1). The bound volumes containing these classic articles were shelved in the offsite storage area by newly assigned call numbers, so they could be retrieved within a few hours during weekdays. The second author created access via author(s), article title, journal title, and anywhere from one to six subject headings, with an average of 2.08 headings per article. The catalog† also enabled users to identify all historically significant articles

† The UNM HSC Library catalog may be viewed at <http://hsc.unm.edu/library/>.

Figure 1
Sample catalog entry

RECORD #: b10771797
 AUTHOR: Torquildsen, Arne 1899-
 TITLE: A new palliative operation in cases of inoperable occlusion of the Sylvian Aqueduct/by Arne Torquildsen.
 PUBLISHER: Stockholm: P.A. Norstedt, 1939.
 SERIES: Acta chirurgica Scandinavica; v.82, pp.117-124.
 NOTES: Morton, 5th ed. 4909.1.
 SUMMARY: Ventriculocisternostomy for the relief of obstructive hydrocephalus.
 SUBJECT: Cerebral Aqueduct—surgery.
 Hydrocephalus—surgery.
 Classic article.

from this project via the additional global subject heading "classic article." The first author had a minimal role in this phase, mainly limited to suggesting additional subject headings and editing other elements of catalog entries.

From the second author's viewpoint, the article-level cataloging required by this project was straightforward. A few records were already in OCLC, their records having been created by the Wellcome Institute. Selecting a call number was occasionally difficult, simply because the cataloger lacked sufficient knowledge either of the content or the language of the article. Translation of titles, necessary to give the cataloger a clearer indication of content, became a problem with many of the foreign titles. Scientific terms are often difficult to translate directly. Subject analysis, mapped to Medical Subject Headings (MESH), was initially done only broadly. After creating and printing out rough catalog records, the second author gave the records to the first author to proofread and to conduct a more comprehensive subject analysis. Each record also contained a series tracing for the journal title, including volume numbering and page information. As an aid to historical researchers, a citation/reference (510) note was included in each record giving the article's entry number in *Morton's Medical Bibliography*. Finally, if a summary of the article was present in Morton, it was included in the record in a summary (520) note.

One innovative approach to enhancing access to these articles was the use of the uniform subject heading "Classic article" in the genre index term (655) field. While the usefulness of this practice to the patron has yet to be determined, it certainly provided a simple way to track the records connected with this project. The most time-consuming process, though, was the need to establish authors' names. For the most part, *Morton's Medical Bibliography* provided birth dates, death dates, or both. In some instances, the bibliography did not provide anything more than a first and last name. Ascertaining life dates for these authors often proved quite difficult. Various sources such as OCLC's authority file, Web searches, and biographical

dictionaries were consulted, often yielding no results or, worse, contradictory results. For example, *Morton's Medical Bibliography* gave 1872 as the birth year for Christian Fredrick Heerfordt, but the Library of Congress gave 1871 as the birth year. In one case, an obituary announcement in a journal was used to provide life dates. Despite the many resources used, some names were never matched with life dates at all. Despite the historical significance of these articles in medicine, many of the authors were apparently being gradually forgotten.

RESULTS AND DISCUSSION

Some of the historic landmarks captured in these historically significant articles included: the establishment of a link between cholesterol and arteriosclerosis, a diagnostic test for color blindness, the first corneal transplant, the use of cyclopropane in anesthesia, the isolation of insulin from the pancreas, the discovery of erythromycin, and the treatment of polycythemia. The texts of these classic articles did not appear in two of the more widely recognized sources on medical history [15, 16]. In a later phase of this project, those more numerous classic articles contained in long runs of retained bound journal titles will also need to be cataloged. The authors elected to retain the actual volumes containing the classic articles rather than simply digitize the articles. The multisensory experience of seeing, handling, and even smelling the actual historic articles and skimming adjacent articles in the retained volume seemed like a more appealing alternative for future researchers.

The reader might think that citation analysis could be employed to identify articles in bound journal volumes published too recently to appear in either Ash's or Morton's books. Garfield has identified a number of heavily cited articles in the biomedical or the life sciences literature in subjects such as preclinical and clinical research, biochemistry, molecular biology, pediatrics, cancer research, pathology, surgery, and general medical and clinical journals [17–30]. Garfield and others, such as Smith, have suggested that citation analysis might supplement, but not replace, standard weeding methods in libraries [31, 32]. Unfortunately, no evidence exists to correlate historically significant articles with those receiving numerous citations. Some suggest that references to most historically significant articles will not be cited, due to a process called "obliteration through incorporation" as these classic articles are absorbed into the knowledgebase [33]. In some cases, a negative correlation may even exist between high citation and important elements of a discipline's knowledgebase found in classic articles [34].

Still undeveloped applications of citation analysis, such as tracking of certain types of references in core textbooks, might identify more recently published his-

torically significant articles in the future [35]. In a related approach, we were curious to learn if relevant medical history monographs cited classic sources frequently. The second author consulted ten medical history monographs that were selected using a derived subject search using the term "history" in conjunction with such terms as "antibiotics" and "tropical diseases." Upon reviewing these sources, the second author discovered that far more references in the selected medical history monographs cited secondary rather than classic works.

As noted above, the UNM HSC Library's mission did not support building collection resources containing the kinds of materials described in this case study. We primarily were concerned with preserving and making more accessible those items of recognized historic value. Libraries with missions that emphasize building or maintaining historic resources would want to employ different strategies such as digitizing or microfilming, or perhaps even storing, entire runs of journals rather than preserving select volumes. We had neither the time, finances, nor space to entertain these options, given our limited mission.

Growing collections in the UNM HSC Library will inevitably require further weeding of the bound journals in offsite storage within five years for the collection to occupy the same physical space. We are hopeful that by then, later editions (or their equivalents) of both Ash's and Morton's books will be available to identify more recent classic articles. Without the older editions of Ash's and Morton's, this project would have been far more difficult, if not impossible, to complete with the same amount of efficiency.

Will the authors' new system of access create increased circulation? We only will begin to answer this key question several years from now, when we can analyze the circulation data as part of a prospective cohort study. Weeding, alone, has not been convincingly linked to increased usage [36, 37]. In some respects, this project establishes the foundation for a unique type of weeding project [38]. We do know that these individual volumes, housed with other volumes from the same journal title, were not used during the nine years that preceded this project. Over the next five years, we can study use compared to modest baseline usage data for the volumes containing selected classic articles. In the meantime, health sciences librarians may hope that future editions [39] of Ash's and Morton's books will be able to keep pace with the inevitable weeding demands placed upon large library collections.

CONCLUSION

Readers can review all historically significant articles at the library by searching the subject heading "classic article" in the UNM HSC Library's online catalog. The

results of this case study suggested that existing tools such as Ash's and Morton's books were invaluable aids to identify and retain classic articles, otherwise slated for weeding, in bound journal volumes from the 1880 to 1950 era. These tools enabled the UNM HSC library to weed approximately 1,700 linear shelf feet more confidently. The approach outlined in this case study might lend greater confidence for health sciences librarians similarly prompted to engage in a weeding project due to limited space for collection growth.

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