B **Evidence Based Library and Information Practice**

Evidence Summary

Searching for Adverse Effects in MEDLINE and EMBASE Requires a Combined Approach for Efficient Retrieval

A review of:
Golder, Su, Heather M. McIntosh, Steve Duffy, and Julie Glanville. "Developing Efficient Search Strategies to Identify Reports of Adverse Effects in MEDLINE and EMBASE." Health Information & Libraries Journal 23.1 (Mar. 2006): 3-12.

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Abstract

Objective – To assess the sensitivity and precision of various search strategies for retrieving adverse effects studies from the *MEDLINE* and *EMBASE* databases.

Design – Analytical survey.

Subjects – A case study using a recently published systematic review of the effectiveness and adverse effects of seven new anti-epileptic drugs.

Setting – *MEDLINE* and *EMBASE* searches performed by researchers at the Centre for Reviews and Dissemination and the UK Cochrane Centre Search Filters Design Group at the University of York, UK.

Methods – Five key approaches to searching were defined. The first approach used either text words or controlled vocabulary to search for specific adverse effects. The second used subheadings or qualifiers either attached to drug names found in the controlled vocabulary (approach 2a) or 'floating' without drug names (approach 2b). The third approach used text words as synonyms for the phrase 'adverse effects.' The fourth used controlled indexing terms for adverse effects. The fifth and final approach used two published search strategies incorporating study design (Badgett et al., Loke et al.).

These five approaches were used to search for studies of the adverse effects of seven new anti-epileptic drugs. 5,011 unique papers were retrieved. Of these, 236 were judged potentially relevant and 225 full text articles were obtained. The inclusion criteria from a previously published systematic review (Wilby et al.) were applied to the papers, and 79 met the criteria. Five papers were added to the set after being identified from reference lists, clinical experts, and other sources. This new set of 84 studies was used as a quasi gold standard (QGS) against which more than 300 combinations of the five approaches could be tested. To create the set of possible approaches, the researchers combined search strategies one through four in all possible ways, and used all available subheading combinations from 2a and 2b. The Badgett and Loke searches were tested separately.

Main Results – Sensitivity and precision were determined for each combination. Formulas used to calculate sensitivity and precision were provided. In *MEDLINE*, search strategies using floating subheadings achieved the highest sensitivity. The most useful *single* subheading in both *MEDLINE* and *EMBASE* was "adverse effects," with 79.1% and 79.5% sensitivity respectively. Of the more than 300 *combinations* tested, the most sensitive combination in *MEDLINE* included specified adverse effects in combination with the floating subheadings "adverse effects," "complications," and "drug effects," together with text words for adverse effects. This strategy had 97.0% sensitivity, but low precision at 2.8%. The highest precision was achieved by using subheadings attached to drug indexing terms. In *EMBASE*, the strategy of Loke et al. provided the highest sensitivity at 86.3% and precision of 2.0%. Since researchers are not likely to know in advance all of the reported adverse effects of a particular drug therapy, the most sensitive strategies without specific adverse events were also

identified. The search with the highest sensitivity in *MEDLINE* had 95.5% sensitivity, and 97.3% sensitivity in *EMBASE*.

Conclusion – Searching for adverse effects requires a combination of approaches in both *MEDLINE* and *EMBASE*. In *MEDLINE*, the most sensitive combination yielded 97.0% sensitivity. Regardless of the approach used, precision remains low. An effective generic search filter for adverse effects searches may not yet be feasible. More research is needed on search strategies, as well as more consistent methods of reporting and indexing adverse effects.

Commentary

Locating reports of adverse events is one of the most difficult evidence-based clinical searches to undertake. Because adverse effects are reported a number of ways in the literature, and because newer and investigational drugs often have not been incorporated into a controlled vocabulary, finding these papers becomes as much an art as a science. The evaluation of over 300 multiple-term search strategies in this research study is an important step toward a generic clinical search filter such as the ones that currently exist to retrieve studies of diagnosis, therapy, prognosis, or etiology.

The authors describe in detail their five varied search approaches as well as their methods for creating the quasi gold standard (QGS) and search combinations. The researchers admit that additional adverse effects "were later identified by browsing the QGS set of records" (9). Adding these additional effects may have changed the percentage of relevant papers retrieved.

To create the QGS, the researchers applied the inclusion criteria developed by a recent systematic review to the combined results of

all search approaches. It is impossible to tell whether or not these criteria were appropriate without evaluating the methodological quality of that particular review. Also, testing search results by comparing them to the same search results seems somewhat redundant. Testing the search approaches against a set of externally developed records would go a long way toward eliminating any redundancy.

That the authors tested their strategies in both *MEDLINE* and *EMBASE* is important, since the degree of overlap in the two databases varies. *EMBASE* indexes pharmaceutical literature not found in *MEDLINE*, and *MEDLINE* indexes clinical information not found in *EMBASE*. The difference in the two databases is apparent in the controlled vocabulary: only one of the seven drugs has a MeSH term and is indexed in *MEDLINE*, while all seven drugs are indexed in *EMBASE*. The implication for the health sciences librarian is that a truly thorough adverse effects search should never use just one database, just as no librarian should ever base a thorough search in any discipline on the results from a single source.

The authors provide useful information on combinations of search approaches that yield high sensitivity. Although not quite ready for incorporation into a generic search filter, the most sensitive search strategy combining Approaches 1, 2b, and 3 (*MEDLINE*) or Approaches 1 and 3 (*EMBASE*) can currently be utilized by health sciences librarians searching for drug adverse effects.

Precision was low in all search approaches and strategies, indicating that searchers must be prepared to filter a high number of irrelevant papers from any given results set. This finding points to the need for librarians to sharpen their critical appraisal and

filtering skills, regardless of the subject of the search.

Works Cited

Badgett, Robert, Elaine Chiquette, Betsy Anagnostelis, and Cindy Mulrow. "Locating Reports of Serious Adverse Drug Reactions." *7th Annual Cochrane Colloquium Abstracts* (October 1999): PB54. 28 May 2006. <http://www.cochrane.org/colloquia/abstracts/rome/romePB54.htm>.

Loke, Yoon K., Sheena Derry, and Angharad Pritchard-Copley. "Appetite Suppressants and Valvular Heart Disease – a Systematic Review." *BMC Clinical Pharmacology* 2 (23 August 2002): 6. 28 May 2006. <http://www.biomedcentral.com/1472-6904/2/6>.

Wilby, Jennifer, et al. "Clinical Effectiveness, Tolerability and Cost-Effectiveness of Newer Drugs for Epilepsy in Adults: a Systematic Review and Economic Evaluation." Health Technology Assessment 9.15 (April 2005): 1-157, iii-iv. 28 May 2006.<http://www.hta.nhsweb.nhs.uk/execsumm/summ915.htm>.