

Use of deprescribing search filters in systematic review search strategies: a case study

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Abstract

Deprescribing search filters aiming at maximizing sensitivity for MEDLINE and for Embase were recently developed. Simultaneously, The US Deprescribing Network (USden) developed a deprescribing search strategy that included a deprescribing search filter for MEDLINE. The aim of this case study was to implement these deprescribing search filters in original search strategies from deprescribing related systematic reviews (SRs) and to calculate their performances. Two deprescribing SRs were included. Authors were asked to repeat the selection process described in SRs original methods. Performances of search strategies implemented with deprescribing search filters (ISS) were calculated and compared to original search strategies (OSS). In MEDLINE, sensitivity for SR 1 was 50% for OSS (Precision: 2.8%), 58% for ISS with maximised sensitivity filter (Precision: 1.7%) and 42% for ISS with USden filter (Precision: 5.1%). Sensitivity for SR 2 was 25% for all search strategies (Precision: 0.1%, 0.2% and 1.2% respectively). In Embase, sensitivity for SR 1 was 33% (Precision: 4.1%) for OSS and 58% for ISS (Precision 2.1%). No articles were included through Embase search strategies for SR 2. Using maximized sensitivity deprescribing filters may increase the exhaustivity of deprescribing SRs. Precision offered by the USDeN deprescribing filter is a convenient alternative for non-systematic reviews.

Use of deprescribing search filters in systematic review search strategies: a case study

Running title: Use of deprescribing search filters

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INTRODUCTION

Deprescribing literature has been increasing continuously for the last ten years, as have systematic reviews focusing on deprescribing-related questions. Authors developed various search strategies to retrieve deprescribing literature. To our knowledge, there is still no consensus on the terms to use to exhaustively retrieve deprescribing articles in bibliographic databases (*i.e.* MEDLINE, Embase, *etc.*). The use of carefully selected terms is recommended to ensure the exhaustiveness of a systematic review search strategy¹. However controlled vocabulary aimed at identifying deprescribing articles remains unclear.

Search filters are specifically developed to avoid indexing pitfalls due to imprecise controlled vocabulary, therefore improving search effectiveness². Search filters usually focus on a particular study design or a specific topic³. The performance of a search filter is usually evaluated based on a reference set of relevant articles for the target study design or topic.

We recently developed two deprescribing search filters with maximized sensitivity for MEDLINE (using PubMed interface) and for Embase (using Embase.com interface) with a sensitivity of 92% (95% CI: 83–97) and 91% (95% CI: 82–96) respectively⁴. The efficiency gained by using these maximized sensitivity filters in systematic reviews search strategies remains unknown. Simultaneously, The US Deprescribing Network (USDeN) developed a deprescribing search strategy that included a deprescribing search filter for MEDLINE using PubMed interface, but its performance has not been evaluated yet⁵.

The aim of this case study was to implement these three deprescribing search filters in systematic review search strategies and evaluate their performances.

METHODS

We have identified recent or ongoing systematic reviews that focused on deprescribing research-related questions using PROSPERO and active monitoring of MEDLINE via PubMed. A call for additional candidate reviews was sent out via Twitter. Eligible systematic review had to use the deprescribing definition developed by Reeve *et al.*⁶, and must have developed a search strategy for MEDLINE via PubMed and Embase via Embase.com independently from the tested deprescribing search filters, *i.e.* authors were not aware of the maximized sensitivity, or USDeN search filters when they developed their search strategies.

First, authors were contacted and gave their consent to the use of their original search strategies. Information provided by systematic review authors included original search strategies for MEDLINE and Embase, a flowchart of the selection process, and data on excluded and included studies.

Then, we studied the deprescribing maximized sensitive filters for MEDLINE and Embase⁴ and the USDeN deprescribing filter for MEDLINE⁵ (table S1). One author (TM) implemented the deprescribing filters in each search strategy. For that purpose, all terms originally used by systematic review authors that referred to deprescribing were removed and replaced by the tested deprescribing filter. We thus obtained two implemented search strategies for MEDLINE, and one implemented search strategy for Embase, for each systematic review. MEDLINE and Embase were then searched using both the original and implemented search strategies on the same date. Articles retrieved from each strategy were included for performance calculation. Systematic review authors were then asked to complete the same selection process described in their original

methods and to provide the list of excluded articles after title/abstract screening, after full-text screening and the list of included articles.

Performances of implemented search strategies were calculated and compared to performances of original search strategies. Performances calculated were sensitivity, *i.e.* proportion of articles included among relevant articles indexed in the database, precision, *i.e.* proportion of articles included among all articles retrieved by the search strategy, and the number needed to read (NNR) in title, abstract or full text to include one relevant article, *i.e.* the number of articles that need to be read to include one articles⁷.

RESULTS

Eleven systematic reviews authors were contacted. Five systematic review authors answered. Among them, two systematic reviews met the inclusion criteria and authors consented to participate.

Systematic review 1 aimed at exploring the barriers and enablers perceived by healthcare workers toward deprescribing in long-term care facilities⁸. Eight bibliographic databases were searched by the authors. Systematic review 2 aimed at identifying guidelines for deprescribing in older patients with diabetes⁹. Three bibliographic databases and 18 websites were searched by the authors.

Results for MEDLINE search strategies are available in Table 1. Twelve articles included in systematic review 1 were indexed in MEDLINE. The original search strategy retrieved six of twelve included articles from 10 articles retrieved in MEDLINE (sensitivity: 50.0%, precision: 2.8%, NNR: 35). During inclusion process, authors were required to read two articles in full text to include one relevant articles. The implemented search strategy using the maximized sensitivity filter retrieved seven of the twelve included articles from 389 articles in MEDLINE (sensitivity: 58.3%, precision:1.7% and NNR: 55). During inclusion process, authors were required to read 2.1 articles in full text to include one. The implemented search strategy using USDeN filter retrieved five of twelve included articles from 9 articles in MEDLINE (sensitivity: 42%, precision: 5.1%, NNR: 20). During inclusion process, authors were required to read 1.6 articles in full text to include one. Four articles included in systematic review 2 were indexed in MEDLINE. The original search strategy retrieved one of four included articles from 1,119 articles retrieved in MEDLINE (sensitivity: 25%, precision: 0.09%, NNR: 1,119). During inclusion process, authors were required to read fourteen articles in full text to include one. The implemented search strategy using the maximized sensitivity filter retrieved one of four included articles from 454 articles in MEDLINE. (sensitivity: 25%, precision: 0.2%, NNR: 454). During inclusion process, authors were required to read three articles in full text to include one. The implemented search strategy using USDeN filter retrieved one of four included articles from 55 articles in MEDLINE (sensitivity: 25%, precision: 1.8%, NNR: 55). During inclusion process, authors were required to read two articles in full text to include one.

Results for Embase search strategies are available in Table 2. Systematic review 1 included twelve articles indexed in Embase. The original search strategy retrieved four of twelve included articles from 97 articles retrieved in Embase. (sensitivity: 33%, precision: 4.1% and NNR: 24). During inclusion process, authors were required to read 1.7 articles in full text to include one. The implemented search strategy using the maximized sensitivity filter retrieved 7 of 12 included articles from 339 articles in Embase (sensitivity: 58%, precision: 2.1%, NNR: 48). During inclusion process, authors were required to read 2 articles in full text to include one. Among systematic review 2 included articles, none were indexed in Embase. The original search strategy retrieved 997 articles in Embase. None of them were finally included. The implemented search strategy with maximized sensitivity filter retrieved 339 articles. None of them were finally included.

DISCUSSION

This case study investigated the prospective implementation of different deprescribing search filters in deprescribing systematic reviews search strategies. The maximized sensitivity search filters and the USDeN filter were developed with alternative approaches. USDeN filter was developed as part of a larger search strategy that include older people filter and specific drug name deprescribing filter. These alternative approaches partially explain difference between the filters. The maximized sensitivity deprescribing filter for MEDLINE

included 18 free-text terms, phrases and MeSH terms against 9 free-text terms and MeSH terms for USDeN's. Only 3 terms were in common and 2 differs only by truncation applied. This explained observed differences in sensitivity and precision.

In both systematic reviews, using the maximized sensitivity search filters for MEDLINE and Embase either increased or maintained the strategy's sensitivity. These results are consistent with the aim of developing maximized sensitivity filters.

Sensitivity is critical in order for systematic reviews to exhaustively summarize the evidence⁷. At equal sensitivity, the maximized sensitivity search filter was more precise than the original search strategy in systematic review 2. However, higher sensitivity (compared to the original search strategy) in systematic review 1 was associated with lower precision. On the other hand, the USDeN deprescribing filter had higher precision, thus allowing a significant decrease in the number needed to read of articles, at the cost of a lower sensitivity. Precision and number needed to read reflect the research burden of a search strategy⁷: the lower the precision, the higher the number of articles to read to identify one supplemental relevant article. These performances are crucial for researchers who have limited resources. From that perspective, the USDeN deprescribing filter is a valuable tool for scoping reviews or rapid reviews which are not intended to be systematic.

The main limitation of our case study is the small number of systematic reviews included. This reduces the extent to which the results can be generalized. Another limitation is the lack of systematic review focusing on deprescribing interventions in the included reviews.

To conclude, using maximized sensitivity deprescribing filters may increase the exhaustivity of deprescribing systematic reviews. On the other hand, the precision offered by the USDeN deprescribing filter is a convenient alternative for non-systematic reviews.

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Table 1. Performances of search strategies for MEDLINE

		Original search strategy	Implemented search strategy with maximized sensitivity filter	Implemented search strategy with USDeN filter
Systematic review 1 (Articles included in the review and indexed in MEDLINE: n=12)	Articles retrieved in MEDLINE (n)	210	389	99
	Included articles retrieved (n)	6	7	5
	Sensitivity (%)	50.0%	58.3%	41.6%
	Precision (%)	2.8%	1.7%	5.1%
Systematic review 2 (Articles included in the review and indexed in MEDLINE: n=4)	Articles retrieved in MEDLINE (n)	1,119	454	55
	Included articles retrieved (n)	1	1	1
	Sensitivity (%)	25.0%	25.0%	25.0%
	Precision (%)	0.1%	0.2%	1.8%
	NNR (n)	35	55	20
	NNR (n)	1,119	454	55

NNR: Number needed to read.

Table 2. Performances of search strategies for Embase

		Original search strategy	Implemented search strategy with maximized sensitivity filter
Systematic review 1 (Articles included in the review and indexed in Embase: n=12)	Articles retrieved in Embase (n)	97	339
	Included articles retrieved (n)	4	7
	Sensitivity (%)	33%	58%
	Precision (%)	4,1%	2,1%
	NNR (n)	24	48
Systematic review 2 (Articles included in the review and indexed in Embase: n=4)	Articles retrieved in Embase (n)	977	293
	Included articles retrieved (n)	0	0
	Sensitivity (%)	0%	0%
	Precision (%)	0%	0%
	NNR (n)	NA	NA

NNR: Number needed to read. NA: Not Applicable