

# So many filters, so little time: the development of a search filter appraisal checklist

**Julie Glanville, MSc, MCLIP; Sue Bayliss, BA (Hons); Andrew Booth, MSc, MCLIP; Yenal Dundar, MD; Hasina Fernandes, BA (Hons); Nigel David Fleeman, MPH; Louise Foster, MSc; Cynthia Fraser, MA (Hons); Anne Fry-Smith, BA (Hons); Su Golder, MSc; Carol Lefebvre, MSc, HonFCLIP; Caroline Miller, MA; Suzy Paisley, MA; Liz Payne, PG Dip Lib, MCLIP; Alison Price, MSc; Karen Welch, PG Dip Info Sci, on behalf of the InterTASC Information Specialists' Sub-Group**

See end of article for authors' affiliations.

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**Objectives:** The authors developed a tool to assess the quality of search filters designed to retrieve records for studies with specific research designs (e.g., diagnostic studies).

**Methods:** The UK InterTASC Information Specialists' Sub-Group (ISSG), a group of experienced health care information specialists, reviewed the literature to evaluate existing search filter appraisal tools and determined that existing tools were inadequate for their needs. The group held consensus meetings to develop a new filter appraisal tool consisting of a search filter appraisal checklist and a structured abstract. ISSG members tested the final checklist using three published search filters.

**Results:** The detailed ISSG Search Filter Appraisal Checklist captures relevance criteria and methods used to develop and test search filters. The checklist includes categorical and descriptive responses and is accompanied by a structured abstract that provides a summary of key quality features of a filter.

**Discussion:** The checklist is a comprehensive appraisal tool that can assist health sciences librarians and others in choosing search filters. The checklist reports filter design methods and search performance measures, such as sensitivity and precision. The checklist can also aid filter developers by indicating information on core methods that should be reported to help assess filter suitability. The generalizability of the checklist for non-methods filters remains to be explored.

## INTRODUCTION

Search filters are developed to improve the efficiency and effectiveness of searching and are typically created by identifying and combining search terms to retrieve records with a common feature [1]. Filters can be expert informed, research based, or a combination [1]. Information about the methods of filter development, along with the results of testing, is important to enable potential users to judge whether the filter is relevant and reliable [1, 2].

Over the last two decades, research methods have been increasingly used to develop and test search filters, to make them more robust and reliable [3–6]. Research-based search filters are included in bibliographic databases such as PubMed (Clinical Queries function), and others have been developed to assist with international study identification exercises for databases such as CENTRAL and The Database of Abstracts of Reviews of Effects (DARE) [5–9]. Search filters are proliferating as librarians and researchers try to identify records reporting projects with specific study designs (e.g., randomized controlled trials) to assist with evidence-based health care [5, 7–9]. For example, at least eight search filters are available for retrieving diagnostic test accuracy studies from MEDLINE [10]. Even experienced health sciences librarians may be challenged to select appropriate filters and to advise researchers about which, if any, to use for a particular search query.

### Highlights

- Increasing numbers of search filters to identify research conducted according to specific research methods are being published.
- Users may need help to identify and select filters.
- The authors developed a structured tool to extract the key methods and performance data from reports describing search filters.

### Implications

- The UK InterTASC Information Specialists' Sub-Group (ISSG) Search Filter Appraisal Checklist can assist with the practice of evidence-based librarianship.
- The tool assesses the methods, reliability, and generalizability of search filters, and completed appraisals are available on the ISSG search filter website.

In evidence-based health care, many critical appraisal tools have been developed to assess the quality and relevance of research reports [11–13]. The UK InterTASC Information Specialists' Sub-Group (ISSG), which supports the research groups providing technology assessments to the National Institute for Health and Clinical Excellence in the United King-

dom, identified the need for such a tool to help its members select from the search filters on its website [14]. This paper describes the ISSG's process for developing a tool to appraise search filters that would help their members, health sciences librarians, and others to choose the most relevant filter for their needs.

## METHODS

The ISSG Search Filter Appraisal Checklist was developed using consensus methods over three meetings of the ISSG during 2006 and 2007. ISSG members felt that, as a group of highly skilled health care information specialists, they had the relevant skills to develop such a tool, having experience with publishing search filters, testing search filter performance, practicing critical appraisal, and developing checklists and structured abstracts.

### Assessment of existing tools

Before the first meeting, the ISSG members searched the MEDLINE and Library and Information Science Abstracts databases and their own personal reference collections to identify existing tools. The searches included the following terms (with the asterisk representing truncation):

("search filter\*" OR "search hedge\*" OR "search strategy") AND (appraisal OR checklist\* OR tool\* OR assessment\*)

### Consensus meetings

The team held a series of meetings in person with follow-up conversations through email to discuss existing filter appraisal tools, draft and test checklists to promote discussion of key elements, and determine the final form of the checklist. The group also debated the need for an accompanying summary or abstract to complement the filter checklist and provide an overview of the methods used to develop a filter.

As noted, the group drafted a pilot checklist to begin discussion of tool specifications. The team tested the pilot checklist against a recent filter developed by Zhang et al., which had a detailed methods description [15], and developed a subsequent, revised checklist informed by members' critiques of the pilot tool. At a second meeting, the group tested the revised checklist against three different filters that used different methods of filter design [16–18]. Two of the filters were from published articles with detailed methods sections [16, 18], and one was published on a website that reported little about its development [17]. During the meeting, the ISSG members discussed the usability, clarity, practicality, and reproducibility of the draft checklist and two abstract or summary formats (Figures 1 and 2).

## RESULTS

### Review of existing search filter appraisal tools

One checklist was identified by searches: Jenkins's search filter appraisal checklist [1]. The ISSG felt that Jenkins's checklist was helpful but not entirely suitable because it focused on generally determining whether filter design methods were reported rather than collect filter design details. The tool also offered few opportunities to extract data describing a filter's performance. For example, Jenkins's checklist asked "Do the authors report clearly how the filter performance was tested?" but did not ask what performance testing was undertaken or prompt the assessor to report performance data. Jenkins's checklist also asked some highly technical questions that might be difficult for some assessors to answer; for example, "Does the gold standard have sufficient power to allow statistically significant results?" Some of the questions—such as "Are the methods of search term derivation clearly described, and are they reasonable and likely to be effective?"—were difficult to answer because they contained several elements. ISSG members agreed that Jenkins's checklist was a helpful prompt, however, a more detailed checklist was required.

### Pilot checklist development and tool specifications

Based on information gained through assessing the existing filter tool and participants' prior knowledge of searching, the ISSG drafted a pilot checklist and a brief summary. The checklist and the summary template were tested on a search filter by Zhang et al. [15], and the group discussed strengths and weaknesses, determining key checklist concepts:

- the focus and scope of a filter: limitations, generalizability, and obsolescence;
- the quality of the methods used to develop the filter: specifically, how gold standards of relevant records (sets of publications relevant to a topic, identified through hand-searching publications or other methods, that may be used to identify search terms and/or test the performance of a filter) were identified, how search terms were identified, how the strategy was developed, and how the filter performance was tested on the test gold standard (internal validity) and on separate validation gold standards (external validity).

The group agreed that a checklist should contain both categorical and descriptive information. A checklist should avoid numerical quality scores, for individual elements and the overall tool, because of known difficulties in assigning scores to individual dimensions of a tool and in interpreting a final combined score [19]. ISSG members also felt that the dilemma of reporting adequacy should be addressed by wording comments to indicate that the assessment of the quality of the search filter design must be made from the (sometimes limited) information provided in filter creators' reports describing a filter.

**Figure 1**

Example brief abstract format (describing filters published by Wong et al.) tabled and rejected by the UK InterTASC Information Specialists' Sub-Group (ISSG)

Wong SSL, Wilczynski NL, Haynes RB. Optimal search strategies for qualitative studies in MEDLINE. *Medinfo*. 2004;11(1):311–6.

Presents filters for clinically relevant qualitative research in MEDLINE. Search terms were collected by consulting widely with experts and from relevant records. A gold standard (GS) of 366 records was derived by hand-searching 161 core health care journals in 2000. 60% of the GS was used to derive the search terms and filters. The remaining 40% of the GS was used to validate the filters. Offers highly sensitive (92.47%), highly specific (99.36%), and best sensitivity and specificity compromise filters. The scale of the hand-search is impressive, but the focus on 1 year may affect the future currency of the filter.

Additionally, the group felt that the format of a checklist should be flexible to cope with the variety of search filter design methods. The stages of search filter design and purpose should also be broken down into focused questions, and the checklist should include data extracted from the publication describing the filter. The members agreed that the ISSG checklist should allow for narrative comment.

The ISSG also addressed the need for a summary statement to complement the checklist. Two alternative templates were developed: a one hundred-word summary and a longer, structured abstract (Figures 1 and 2). The structured abstract template was designed to describe the filter objective, the methods used to develop the filter, key validation data, any reported limitations of the filter design, and additional comments, as appropriate.

Using these design principles, the group drafted a revised checklist and abstract template.

### Refinement of the checklist tool

As described in the "Methods" section, the ISSG tested the revised checklist against three published filters [16–18] with varied design methods and noted improvements. The revised checklist captured relevance information more effectively, and members felt that the revision addressed the issue that the assessor can only assess what a filter author reports. The tool achieved this not only by recording the reporting of the design, but also by including prompts reflecting issues of design quality. These prompts should alert assessors to consider whether (unreported) alternative approaches might have been more suitable.

The ISSG felt that the revised checklist was flexible enough to capture the growing variety of methods reported in search filter design. It could capture

information about multiple gold standards and validation testing activity. It also allowed an assessor to report performance comparisons against other filters, which strengthened the information available for deciding between filters. The checklist, however, still required work to capture information on how strategies were derived from the selected search terms.

ISSG members also chose between summary and abstract formats to accompany the checklist portion of the filter appraisal tool. A structured abstract was agreed to be more helpful than a one hundred-word summary because it captured the filter objective, the main methods used to develop the filter, any key validation data, and any major limitations to the filter design. An abstract also provided space to summarize the strengths and weakness of the filter design. ISSG members agreed that the abstract was suitable for quick assessment of relevance, with the checklist offering the essential detail required for informed decision making.

Following discussions, the checklist was revised again and underwent a final round of feedback. The ISSG agreed on the final ISSG Search Filter Appraisal Checklist and structured abstract format at a third meeting in April 2007. The final ISSG Search Filter Appraisal Checklist is shown in Table 1. Examples of completed checklists are published on the ISSG website [20], and an example structured abstract is shown in Figure 2.

### DISCUSSION

The ISSG Search Filter Appraisal Checklist is being used by ISSG members to appraise published search filters. Checklists are completed by an information professional, checked by an independent assessor,

**Figure 2**

Example structured abstract format (describing filters published by Wong et al.) tabled and accepted by the ISSG

Wong SSL, Wilczynski NL, Haynes RB. Optimal search strategies for qualitative studies in MEDLINE. *Medinfo*. 2004;11(1):311–6.

**Objective:**

This filter is designed to identify qualitative research in MEDLINE.

**Methods:**

The authors identified a GS of 366 records by hand-searching 161 core health care journals in 2000. 60% of the GS was used to derive the filters, and the remaining 40% was used to validate the filters. The search terms for the filters were collected from consulting widely with experts and from relevant records.

**Results:**

Several filters are offered. In the validation set, the most sensitive filter scored 92.47%, the most precise scored 39.59%, the most specific scored 99.36%, and the best compromise between sensitivity and specificity scored 86.99% sensitivity and 92% specificity (7.53% precision). The authors reported that the differences in performance between the development and validation sets were not statistically significant.

**Discussion:**

The authors note that, unlike their other filters, the records were not assessed for methodological quality and that further testing of the filters is required to provide more performance data.

**ISSG commentary:**

The scale of the hand-search is impressive, but the focus on one year may affect the future currency of the filter, especially if the authors' desired changes to reporting and indexing of qualitative research are realized. More detail of the number of qualitative terms tested and test methods would have been helpful.

**Table 1**  
UK InterTASC Information Specialists' Sub-Group (ISSG) Search Filter Appraisal Checklist

Information and methodological issues	Categorization options	Detailed information, as appropriate
<b>A. Information</b>		
A.1. State the author's objective.		
A.2. State the focus of the research.	<input type="checkbox"/> Sensitivity-maximizing <input type="checkbox"/> Precision-maximizing <input type="checkbox"/> Specificity-maximizing <input type="checkbox"/> Balance of sensitivity and specificity/precision <input type="checkbox"/> Other	
A.3. Database(s) and search interface(s).		
A.4. Describe the methodological focus of the filter (e.g., RCTs).		
A.5. Describe any other topic that forms an additional focus of the filter (e.g., clinical topics such as breast cancer, geographic location such as Asia, or population grouping such as paediatrics).		
A.6. Other observations.		
<b>B. Identification of a gold standard (GS) of known relevant records</b>		
B.1. Did the authors identify 1 or more gold standards (GSs)?	None/1/2/3/4/5/More than 5	
B.2. How did the authors identify the records in each GS?		
B.3. Report the dates of the records in each GS.		
B.4. What are the inclusion criteria for each GS?		
B.5. Describe the size of each GS and the authors' justification, if provided (e.g., the size of the GS may have been determined by a power calculation).		
B.6. Are there limitations to the gold standard(s)?	Yes/No/Unclear	
B.7. How was each GS used?	<input type="checkbox"/> To identify potential search terms <input type="checkbox"/> To derive potential strategies (groups of terms) <input type="checkbox"/> To test internal validity <input type="checkbox"/> To test external validity <input type="checkbox"/> Other, please specify	
B.8. Other observations.		
<b>C. How did the researchers identify the search terms in their filter(s)? (Select all that apply)</b>		
C.1. Adapted a published search strategy.	Yes/No/Unclear (please describe)	
C.2. Asked experts for suggestions of relevant terms.	Yes/No/Unclear (please describe)	
C.3. Used a database thesaurus.	Yes/No/Unclear (please describe)	
C.4. Performed statistical analysis of terms in a GS set of records (see B above).	Yes/No/Unclear (please describe)	
C.5. Extracted terms from the GS set of records (see B above).	Yes/No/Unclear (please describe)	
C.6. Extracted terms from some relevant records (but not a GS).	Yes/No/Unclear (please describe)	
C.7. Tick all types of search terms tested.	<input type="checkbox"/> Subject headings <input type="checkbox"/> Text words (e.g. in title, abstract) <input type="checkbox"/> Publication types <input type="checkbox"/> Subheadings <input type="checkbox"/> Check tags <input type="checkbox"/> Other, please specify	
C.8. Include the citation of any adapted strategies.		
C.9. How were the (final) combination(s) of search terms selected?		
C.10. Were the search terms combined (using Boolean logic) in a way that is likely to retrieve the studies of interest?		
C.11. Other observations.		
<b>D. Internal validity testing (This type of testing is possible when the search filter terms were developed from a known GS set of records.)</b>		
D.1. How many filters were tested for internal validity?		
For each filter report the following information.		
D.2. Was the performance of the search filter tested on the GS from which it was derived?	Yes/No/Unclear (please describe)	
D.3. Report sensitivity data (a single value, a range, "Unclear,"* or "Not reported," as appropriate).		
D.4. Report precision data (a single value, a range, "Unclear,"* or "Not reported," as appropriate).		
D.5. Report specificity data (a single value, a range, "Unclear,"* or "Not reported," as appropriate).		
D.6. Other performance measures reported.		
D.7. Other observations.		
<b>E. External validity testing (This section relates to testing the search filter on records that are different from the records used to identify the search terms.)</b>		
E.1. How many filters were tested for external validity on records different from those used to identify the search terms?		
E.2. Describe the validation set(s) of records, including the interface.		
For each filter report the following information.		
E.3. On which validation set(s) was the filter tested?		
E.4. Report sensitivity data for each validation set (a single value, a range, "Unclear," or "Not reported," as appropriate).		
E.5. Report precision data for each validation set (report a single value, a range, "Unclear," or "Not reported," as appropriate).		
E.6. Report specificity data for each validation set (a single value, a range, "Unclear," or "Not reported," as appropriate).		
E.6. Other performance measures reported.		
E.7. Other observations.		
<b>F. Limitations and comparisons</b>		
F.1. Did the authors discuss any limitations to their research?		
F.2. Are there other potential limitations to this research that you have noticed?		
F.3. Report any comparisons of the performance of the filter against other relevant published filters (sensitivity, precision, specificity, or other measures).		
F.4. Include the citations of any compared filters.		
F.5. Other observations and/or comments.		
<b>G. Other comments (This section can be used to provide any other comments. Selected prompts for issues to bear in mind are given below.)</b>		
G.1. Have you noticed any errors in the document that might impact on the usability of the filter?		
G.2. Are there any published errata or comments (e.g., in the MEDLINE record)?		
G.3. Is there public access to prepublication history and/or correspondence?		
G.4. Are further data available on a linked site or from the authors?		
G.5. Include references to related papers and/or other relevant material.		
G.6. Other comments.		

\* Please describe.

and edited by the website editor for consistency. Copies of checklists will be sent to the original authors of the filters, and feedback will be published. Completed checklists are published on the ISSG website [14].

The ISSG Search Filter Appraisal Checklist is designed to be comprehensive. Its structure follows the life cycle of the process involved in developing a search filter from gold standard identification, search term selection, strategy development, testing, and validation through to comparison with other filters. It may take time to complete but should provide clearer insight into the quality and suitability of a filter. The checklist is not exclusive. It does not “reject” search filters that have been designed informally or have not been tested or validated. It does, however, allow librarians and others to differentiate easily between evidence-based, validated filters and those of a less rigorous design.

### Future research

There is scope to evaluate the performance of the checklist, using independent assessors and a range of filters. Evaluations could assess ease of use, clarity, comprehensiveness, and consistency. Since the checklist was finalized, the Canadian Agency for Drugs and Technologies in Health’s (CADTH’s) critical appraisal and ranking tool for search filters has been developed. The CADTH tool is less detailed than the ISSG checklist and incorporates a score [21], and a formal comparison of the two tools is a topic for further research.

In addition, the ISSG checklist focuses on search filters designed to retrieve studies with specific research methods (such as systematic reviews) or study type focus (such as diagnostic tests). Some of the checklist’s elements are likely to be applicable to search filters in other areas. Health sciences librarians may wish to explore the applicability of the checklist beyond methods search filters.

### CONCLUSIONS

Health sciences librarians trying to decide between search filters now have several tools. They can use the ISSG website to find appraisals of filters in the form of structured abstracts and checklists. The abstract offers a rapid assessment of relevance, and the checklist offers more detailed information to assist with deciding whether a filter is useful. Alternatively, librarians can complete the blank checklist themselves to assess a filter of interest. The website and checklist are also resources that librarians can recommend to relevant inquirers.

Critical appraisal checklists serve several purposes. The clear breakdown of the reported methods in the ISSG Search Filter Appraisal Checklist is designed in the hope, shared with designers of other critical appraisal tools, that it will encourage filter authors, many of whom are librarians, to report detailed methods [22]. In highlighting methods to report to

help readers assess the quality and relevance of a filter, librarians can also assist authors in achieving more transparent research reporting.

### CONFLICT OF INTEREST STATEMENT

Andrew Booth, Cynthia Fraser, Julie Glanville, Su Golder, and Carol Lefebvre have published search filters.

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## AUTHORS' AFFILIATIONS

**Julie Glanville, MSc, MCLIP (corresponding author)**, [jmg1@york.ac.uk](mailto:jmg1@york.ac.uk), Project Director-Information Services, York Health Economics Consortium, Level 2, Market Square, University of York, York, YO10 5NH, United Kingdom; **Sue Bayliss, BA (Hons)**, [s.bayliss@bham.ac.uk](mailto:s.bayliss@bham.ac.uk), Information Specialist, Aggressive Research Intelligence Facility/West Midlands Health Technology Assessment Collaboration, Department of Public Health and Epidemiology, University of Birmingham, Edgbaston, B15 2TT, United Kingdom; **Andrew Booth, MSc, MCLIP**, [A.Booth@sheffield.ac.uk](mailto:A.Booth@sheffield.ac.uk), Director of Information Resources and Reader in Evidence Based Information Practice, School of Health and Related Research (SchARR), University of Sheffield, Regent Court, 30 Regent Street, Sheffield, S1 4DA, United Kingdom; **Yenal Dundar, MD**, [yenal@liverpool.ac.uk](mailto:yenal@liverpool.ac.uk), Doctor, Department of Psychiatry, North Devon District Hospital, Raleigh Park, Barnstaple, EX31 4JB, United Kingdom; **Hasina Fernandes, BA (Hons)**, [Hasina.Fernandes@nice.org.uk](mailto:Hasina.Fernandes@nice.org.uk), Information Specialist, National Institute for Health and Clinical Excellence, MidCity Place, 71 High Holborn, London, WC1V 6NA, United Kingdom; **Nigel David Fleeman, MPH**, [Nigel.Fleeman@liverpool.ac.uk](mailto:Nigel.Fleeman@liverpool.ac.uk), Research Fellow, Liverpool Reviews and Implementation Group, School of Population, Community and Behavioural Sciences, University of Liverpool, Sherrington Buildings, Ashton Street, Liverpool, L69 3GE, United Kingdom; **Louise Foster, MSc**, [louisefoster@nhs.net](mailto:louisefoster@nhs.net), Health Information Scientist, National Health Service Quality Improvement Scotland, Delta House, 50 West Nile Street, Glasgow, G1 2NP, United Kingdom; **Cynthia Fraser, MA (Hons)**, [c.fraser@abdn.ac.uk](mailto:c.fraser@abdn.ac.uk), Information Officer, Health Services Research Unit, University of Aberdeen, Health Sciences Building, Foresterhill, Aberdeen, AB25 2ZD, United Kingdom; **Anne Fry-Smith, BA (Hons)**, [A.S.Fry-Smith@bham.ac.uk](mailto:A.S.Fry-Smith@bham.ac.uk), Lead Information Specialist, West Midlands Health Technology Assessment Collaboration, University of Birmingham, Edgbaston, Birmingham, B15 2TT, United Kingdom; **Su Golder, MSc**, [spg3@york.ac.uk](mailto:spg3@york.ac.uk), Information Officer, Centre for Reviews and Dissemination, University of York, York, YO10 5DD, United Kingdom; **Carol Lefebvre, MSc, HonFCLIP**, [CLefebvre@cochrane.co.uk](mailto:CLefebvre@cochrane.co.uk), Senior Information Specialist, UK Cochrane Centre, National Institute for Health Research, Summertown Pavilion, Middle Way, Oxford, OX2 7LG, United Kingdom; **Caroline Miller, MA**, [Caroline.Miller@nice.org.uk](mailto:Caroline.Miller@nice.org.uk), Information Specialist, National Institute for Health and Clinical Excellence, MidCity Place, 71 High Holborn, London, WC1V 6NA, United Kingdom; **Suzy Paisley, MA**, [s.paisley@sheffield.ac.uk](mailto:s.paisley@sheffield.ac.uk), Research Fellow, SchARR, University of Sheffield, 30 Regent Street, Sheffield, S1 4DA, United Kingdom; **Liz Payne, PG Dip Lib, MCLIP**, [eapayne@go.com](mailto:eapayne@go.com), Independent Information Specialist, Salisbury, United Kingdom; **Alison Price, MSc**, [A.M.Price@soton.ac.uk](mailto:A.M.Price@soton.ac.uk), Information Scientist, Wessex Institute for Health Research and Development, Mailpoint 728, Boldrewood, University of Southampton, Southampton, SO16 7PX, United Kingdom; **Karen Welch, PG Dip Info Sci**, [K.Welch@soton.ac.uk](mailto:K.Welch@soton.ac.uk), Information Scientist, Wessex Institute for Health Research and Development, Mailpoint 728, Boldrewood, University of Southampton, Southampton, SO16 7PX, United Kingdom; on behalf of the InterTASC Information Specialists' Sub-Group

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