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A Technical Review of the ISPOR Presentations Database Identified Issues in the Search Interface and Areas for Future Development

Chris Cooper[1]* [ID], Anna Brown[2], Rachel Court[2] and Ute Schauberger[3]

[1]Department of Clinical, Educational and Health Psychology, University College London, London, United Kingdom; [2]Warwick Medical School, University of Warwick, Coventry, United Kingdom and [3]Independent Researcher, Glasgow, Scotland

Abstract

Objective: To undertake a technical review of the search interface of the ISPOR Presentations Database. By technical review, we mean an evaluation of the technical aspects of the search interface and functionality, which a user must navigate to complete a search.

Methods: A validated checklist (Bethel and Rogers, 2014, *Health Info Libr J*, 31, 43-53) was used to identify where the interface performed well, where the interface was adequate, where the interface performed poorly, where functionality available in core biomedical bibliographic databases does not exist in the ISPOR database, and to establish a list of any issues arising during the review. Two researchers independently undertook the technical review in October 2021.

Results: The ISPOR database scored 35 of a possible 165 (27/111 essential criteria and 8/54 desirable criteria). Two issues arising were identified, both of which will cause searchers to miss potentially eligible abstracts: (i) that search terms, which include * or ? as truncation or wildcard symbols should not be capitalized (e.g., cost* not Cost*; organi?ation not Organi?ation) and (ii) that quotation marks should be straight sided in phrase searching (e.g., "cost analyses" not "cost analyses").

Conclusions: The ISPOR database is a promising and free database to identify abstracts/posters presented at ISPOR. We summarize two key issues arising, and we set out proposed changes to the search interface, including: adding the ability to export abstracts to a bibliographic tool, exporting search strategies, adding a researcher account, and updating the help guide. All suggestions will further improve this helpful database.

The Professional Society for Health Economics and Outcomes Research, also known as ISPOR (formerly, the International Society for Pharmacoeconomics and Outcomes Research) is a not-for-profit organization focused on advancing the science and practice of health economics and outcomes research worldwide (1). As part of their work, ISPOR run a number of conferences and summits where delegates and ISPOR members can present their research. Although the presentations focus on health economics and outcomes research, the topics presented by researchers can be broad in scope. This makes the ISPOR presentations database a recommended resource for researchers interested in health technology assessment and a valuable resource for researchers looking for economic, cost, or outcomes data across a range of health topics (2;3).

Abstracts of podium and poster presentations from ISPOR meetings are reported in the journal, *Value in Health*, but ISPOR also offer a free, online, searchable database, the ISPOR Presentations Database (4). In this paper, we report a technical review of the search interface of the ISPOR Presentations Database. The reason for this technical review is an observation that some of the search functionality in the presentations database does not appear to work, and that some traditional search functionality, which is not mentioned in the help guide, does appear to work. Furthermore, we see areas for development of the database, which we believe will improve the database. This technical review aims to empirically identify issues arising and areas for development to provide searchers with clear guidance and to make recommendations for improvements.

Research Aim

To undertake a technical review of the search interface of the ISPOR Presentations Database. By technical review, we mean an evaluation of the technical aspects of the search interface and

functionality, which a user must navigate to complete a search (5). We subdivide this aim into five objectives:

1. to identify areas where the interface performed well;
2. to identify areas where the interface was adequate;
3. to identify areas where the interface performed poorly;
4. to identify areas where functionality available in core biomedical bibliographic databases does not exist; and
5. to establish a list of any issues arising in review.

Methods

We apply the same checklist and methods as in our recent technical review of trials registry resources reported elsewhere (5).

The Checklist

To ensure a transparent and replicable review, we used a checklist developed by Bethel and Rogers to assess the ability of bibliographic database platforms to process literature searches for systematic reviews. Bethel and Rogers identified ten domains, which they considered necessary in the search interface of a bibliographic database to process a literature search for a systematic review (see Table 1). Within these domains, fifty-five individual criteria were identified as being either essential ($n = 37$) or desirable ($n = 18$). Bethel and Rogers indicate that a score of 1–3 be assigned by a researcher to grade each criterion (5;6).

We used the checklist exactly as reported by Bethel and Rogers, but we amended the scoring criteria by adding a score of zero (0). The original checklist gave a score of 1 where an interface did not perform the function, or it was so difficult to find that it was deemed "ineffective" (6). We felt that there was a perceptible difference between an interface not performing a function well, or being difficult to find, and the function not existing. It could help interpretation of findings to specifically indicate which functionality does not exist. Our revised scoring criteria is set out in Table 2.

Undertaking the Technical Review

The search interfaces were independently reviewed by C.C. and A.B. using the search interface provided on the ISPOR website:

Table 1. Summary of the Bethel and Rogers Checklist

Bethel and Rogers identified ten domains, which they considered necessary in a bibliographic database interface to undertake and process a literature search for a systematic review. These were:

1. searching (functions);
2. searching (syntax);
3. field codes;
4. controlled vocabulary;
5. display (search);
6. display (records);
7. downloading;
8. search history;
9. performance; and
10. other.

Within these ten domains, fifty-five individual criteria were identified as being either essential ($n = 37$) or desirable ($n = 18$). *NB: An inaccuracy in the scoring criteria reported in the paper by Bethel and Rogers was identified. It is stated that there are fifty-six individual criteria (thirty-eight essential and eighteen desirable) when, in fact, the checklist provided in the paper reports only fifty-five individual criteria, where thirty-seven are essential and eighteen desirable. We have taken the checklist at face-value and so use the fifty-five individual criteria.*

Table 2. Scoring and Research Aims

Score	To address research aim
3: the interface performed the function well.	1. to identify areas where the interface performed well
2: the interface performed the function, but was not intuitive or confusing terminology	2. to identify areas where the interface was adequate
1: the function was so difficult to find that it was deemed ineffective	3. to identify areas where the interface performed poorly
0: the function identified by Bethel and Roger was not present in the ISPOR database.	4. to identify areas where functionality available in core biomedical bibliographic databases does not exist.

https://www.ispor.org/heor-resources/presentations-database/search.

C.C. used an Apple Macintosh (OS Catalina, Version 10.15.6) and the Firefox web browser (92.0.1 64-bit) with a Virtual Private Network (SurfShark version 3.7.0). All cookies were cleared prior to testing and the author was logged out of all linked accounts (e.g., Google; 7;8).

A.B. used a Dell laptop running Windows 10 Enterprise and Microsoft Edge (version 94.0.992.50) and Google Chrome (version 94.0.4606.81) web browsers. The laptop is managed by University of Warwick IT department and the author used both browsers while logged in to her university Microsoft live account.

The authors then met to reconcile scores awarded (as is common in resolving study selection decisions in a systematic review) to produce a final, unified score for each criterion. R.C. acted as a third reviewer, helping to test functionality where C.C. and A.B. were producing different results.

We used the criterion level scoring to structure our results, as set out in Table 2. We correlated a high total over-all score for each criterion (3/3) as representing the best possible search experience. Lower scores indicated where the user experience might be suboptimal or could be improved (1–2), and a score of zero (0) indicated a feature, identified by Bethel and Rogers, was absent in the ISPOR database. Issues arising were identified through discussion of the results. Recommendations for improving the database were made by review of criteria scoring 0 or 1 and our knowledge as expert searchers.

Results

The checklist was applied independently by the authors in October 2021. No issues were reported with the database, and we believed the platform to be working correctly at the time of the review.

Figure 1 reports the unified scoring table for each of the ten criteria. The combined score was 35 of a possible 165, with 27 essential criteria of a possible 111, and 8 desirable criteria of a possible 54. The unified reviewer scores are reported in Figure 1 alongside detail on the tests performed and notes made in testing. Below, we summarize scoring by objective.

Objective 1: to identify areas where the interfaces performed well (unified reviewer score of 3). Nine criteria achieved a score of 3, seven of which were essential criteria. These were in the searching

(syntax), performance, and other domains. The two desirable criteria with a score of 3 were in the searching (syntax) domain.

Objective 2: areas where the interfaces were adequate (unified reviewer score of 2). Two criteria achieved a score of 2, one in essential criteria (phrase searching) and the other desirable criteria (single character truncation). Both criteria were in the searching (syntax) domain.

Objective 3: areas where the interfaces performed poorly (unified reviewer score of 1). Four criteria achieved a score of 1, all of which were essential criteria. Three of these related to the controlled vocabulary domain and one in the domain "other."

Objective 4: to identify areas where functionality available in core biomedical bibliographic databases does not exist (unified reviewer scope of 0). Forty criteria achieved a score of 0. Twenty-five of these were essential criteria and fifteen were desirable, relating to the following domains: searching (functions/syntax), field codes, controlled vocabulary, display (search/records), downloading, search history, performance, and "other."

Discussion

Previous technical reviews using the Bethel and Rogers checklist have focused on evaluating the search interfaces of biomedical bibliographic databases and trials registers resources (5;6). These reviews found similar overall scores despite differences in the resources and their interfaces. We continue to find the Bethel and Rogers checklist a useful tool to assess general search functionality, regardless of database content or purpose. We focus now on the issues arising in this evaluation (things, which a searcher using the ISPOR database should be aware of when searching) and changes, which might be made to improve the use of the search interface in future updates.

Issues Arising

We found differences in testing the truncation feature. In further testing, we conclude that the search interface cannot process capitalization where a search term is truncated or includes a wildcard symbol, for instance: Cost* $n = 0$ or cost* $n = 22,556$ (see Supplementary Figure 1). The capitalization of C in cost appears to affect retrieval. This also affects left truncation, for instance: *Diabetes $n = 0$ or *diabetes $n = 4,192$ (see Supplementary Figure 2).

In common with bibliographic databases, the formatting of quotation marks (speech marks) impacts retrieval. For instance, we found differences between "cost analyses" and "cost analyses" (See Supplementary Figure 3), where "curly" quotation marks appear to affect retrieval. This does not affect users writing their search enquires directly into the interface, but it is important for searchers who write and then copy and paste their search terms into the search interface, which is a recommended practice when translating search strategies developed in other resources to avoid misspellings.

Changes that Might Improve the Interface

The changes are proposed from the point of view of expert searchers and researchers undertaking searches for abstracts/posters or data to inform systematic reviews or evidence synthesis. This includes both full systematic searches and ad hoc iterative searches.

We propose that the following additions would improve the search interface and searcher experience:

1. *Search history*: a search history function would allow a searcher to view their searches across a session of searching. An additional use of this feature would be to include functionality to combine searches, for example, to build up a search. The ability to edit search lines to account for adjustments to the search as it develops would also be desirable.
2. *Ability to export search strategies*: that is, the ability to export the search strategies used to identify abstracts/posters when a search is completed. Search data should include the number of records returned by each search line. This will improve the transparency of searching and rigor of the interface.
3. *Ability to download abstracts to a bibliographic tool and Excel*: we see this as a key change, because it would allow searchers to export data for review and citation. Ability to export data to research information systems (RIS) format or to Excel would be favored. We consider RIS format the priority, because the format works with bibliographic tools, such as EndNote and Zotero, de-duplication tools, and resources to manage the process of evidence synthesis, such as Covidence and EPPI-Reviewer.
4. *A researcher account function*: where searchers can save searches and set up automatic update searches.
5. *Updating the help guide*: we would propose adding to the help guide to make the following points clear:

1.1. the search interface supports searching using parentheses—expert searchers who wish to construct complicated search strategies may find this useful to know—especially where searches can be saved for alerts on particular topics or methods;
1.2. the interface supports phrase searching (defined as searching for phrases (e.g., cost analysis) as opposed to individual search terms). It should be made clear that the formatting of the quotation marks affects retrieval (e.g., "this" NOT "this");
1.3. search terms should not be capitalized other than for Boolean connectors since this appears to impact retrieval where truncation is used;
1.4. both * and ? can be used as wildcard or truncation symbols, however * represents any number of characters (including 0), whereas ? always represents a single (1) character only. For example, economic* will retrieve economic, economics, economical, economically, and so on, whereas economic? will *only* retrieve economics.

We do not consider adding the ability to use adjacency/proximity searching to be a priority, since searches of the ISPOR database is relatively small and does not commonly yield a large number of abstracts, unlike searches of a bibliographic database, such as Embase.

We note that there are other ways to search ISPOR content, for example, through handsearching of Value in Health, or via Embase. Further research to compare commonly used interfaces to these resources for retrieval of published/citable ISPOR abstracts would be useful.

Limitations

The criteria in the Bethel and Rogers checklist could put smaller bibliographic databases, such as ISPOR's database, at a disadvantage when scoring the search interfaces. We acknowledge (above) that the size of the ISPOR database makes some functionality less important than it might be in, say, MEDLINE (e.g., field codes and command line searching). In future, especially where

Resource searched: https://www.ispor.org/heor-resources/presentations-database/search

Unless otherwise specified, searches were performed in the keyword field with the 'citable' toggle switched to 'All Items'.
Browsers used were Microsoft Edge browser, on 6th October 2021 and Firefox on 30th September and 21st October 2021.

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
1. SEARCHING (FUNCTIONS)					
1A	**Command line searches**	Searches that incorporate syntax (e.g. field codes), with search terms in a single search box. Example: diabet*.ti,ab. AND Warwick.in.	E	0	Only one search screen and this is structured by field, so different fields or index and free text terms cannot be combined in one box
2. SEARCHING (SYNTAX)					
2A	**Boolean terms**		E	3	Tested the following: • *diabetes AND cost = 1135* • *diabetes and cost = 1135* • *diabetes OR cost = 19945* • *diabetes or cost = 1135* • *diabetes NOT cost = 2952* • *diabetes -cost = 2952* • *diabetes-cost = 1117* • *diabetes not cost = 1135* Use capitalization for AND, OR, NOT. Hyphen works for NOT too, but ensure there is a space before the hyphen.
2B	**Phrase searching**		E	2	Tested the following (note difference in quotation marks): • "*lifestyle change*" = 4 • "*type 2 diabetes*" = 1953 • "*lifestyle change*" = 11 • "*type 2 diabetes*" = 2223 Without quotation marks the results are: • *lifestyle change = 11* • *type 2 diabetes = 2223*
2C	**Adjacency terms**	Operators which dictate that search terms are next to each other in any order.	E	0	Tested the following: • *diabetes ADJ3 cost - no results found*

Figure 1. Combined results in full.

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
2D	Proximity terms	Operators which dictate that search terms are near to each other in any order, sometimes within a number of words that can be specified.	E	0	There is no reference to proximity search (advanced searching). Tested the following: • *diabetes N3 cost* • *diabetes NEAR/3 cost* • *diabetes NEAR cost* - retrieves 2 results but they have the word 'near' in the abstract • *diabetes N3 cost* = 17 results but is not functioning as a proximity operator (results have 'N3' in them somewhere) – results also appear to include several duplicates • *diabetes NEAR/3 cost* = 0 results
2E	Right truncation	Symbol at the end of a root word, representing any number of characters. Example: diabet*.	E	3 — NB: issue noted with capitalisation and truncation	The help guide indicates that this * would perform truncation. To perform a wildcard search, use the (*) symbol. For example, to search for "test", "tests" or "tester", you can use the search: **test*** Tested the following: • *cost = 16993* • *cost* = 21894* • *diabet* = 4767* • *trial* = 4902* • *Cost* = 0* • *Diabet* = 0* • *Trial* = 0*
2F	Left truncation	Symbol at the beginning of a word, representing any number of characters. Example: *planned.	D	3 — NB: issue noted with capitalisation and truncation	Tested the following: • **marked = 97* • *marked = 91* • **Marked = 0* • *marked OR unmarked OR hallmarked OR earmarked OR benchmarked OR self-benchmarked = 97*
2G	Single character truncation	Left-hand or right-hand truncation where the symbol represents a single character.	D	2	Tested the following: • *mark* = 5310* • *mark? = 68* • *marky OR marko OR marks OR mark1 OR mark2 OR mark3 OR mark4 = 68* • *mark = 405* • *marked = 91* ? represents a single character (not 0 or 1 character)

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
2H	Masking within a word	Single character truncation within a word. Example: organi*ation to find both organisation and organization.	D	3	Tested the following: • *(organisation OR organization) n = 751* • *(organi*ation OR organi*ation) n = 751* • *organi*ation n = 751* • *organi?ation = 751* Also: • *color = 12* • *colour = 2* • *colo?r = 2* • *colo*r = 33 (?!)* • *color OR colo*r = 33* Conclusions: • ** or ? both work* • *? appears to always represent 1 character* • ** appears to represent any number of characters, including 0*
2I	Parenthesis	e.g. (diabetes diabetic) iodine	E	3	Tested the following: • *diabetes diabetic = 305* • *diabetes AND diabetic = 305* The default without Boolean operators seems to be an 'AND' search so it is difficult to think of an occasion where it would be necessary to use parentheses without Boolean terms – see 2j below
2J	Combining parentheses within strings with Boolean	e.g. ((diabetes OR diabetic AND iodine)	E	3	Tested the following: • *single trial = 253* • *single AND trial = 253* • *double trial = 117* • *(single OR double) AND trial = 361* • *(single AND trial) OR (double AND trial) = 361*
2K	Combining parentheses within strings with adjacency		E	0	N/A: no adjacency searching
2L	Combining parentheses within strings with proximity		E	0	N/A: no proximity searching
2M	Combining parentheses with single field codes		E	0	N/A: no field codes

Figure 1. (cont.)

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
2N	Combining parentheses with multiple field codes		E	0	N/A: no field codes
2O	Short cut to combining strings with AND/OR (e.g. OR/1-10)		D	0	N/A: no search history

3. FIELD CODES

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
3A	Available to use		E	0	N/A: no field codes
3B	Easily accessible		D	0	
3C	Ability to combine (e.g. ti, ab)		E	0	

4. CONTROLLED VOCABULARY

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
4A	Subject headings e.g. MeSH		E	1	See 4b
4B	Thesaurus available (displayed in hierarchy)		E	1	Taxonomy is available but it is not embedded as an indexing structure; it is also quite brief/simplistic. It is possible to select a heading from the 'topic' list but this is only the highest level headings (not their sub-topics). It is possible to refine by topics and sub-topics from the results page.

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
4C	Ability to choose multiple terms from the thesaurus		D	0	It is only possible to choose 1 highest-level heading from the 'Topic' drop-down (see 4b). It is possible to refine by multiple topics from the results page – but these are AND-ed.
4D	Ability to combine controlled vocabulary terms with free text		E	1	It is possible to combine terms selected from the 'topic' or 'Disease/disorder' drop-down lists with free text terms in the 'keyword' field.
4E	Ability to explode headlines		E	0	
4F	Ability to choose a narrower term		E	0	
4G	Scope note available		E	0	

5. DISPLAY (SEARCH)

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
5A	Option to view search history while using search screen	Search history means all searches from a session including previous iterations of the current search.	E	0	
5B	Build up searches line-by-line with the number of hits visible for each string		E	0	
5C	Ability to edit previous lines of search as it develops		D	0	

Figure 1. (cont.)

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
5D	Ability to insert new lines of search into existing search		D	0	
5E	Ability to move search lines around within search		D	0	
5F	Combine searches (with Boolean?)		E	0	
5G	Renumber searches after deletion		D	0	
5H	Refine search by update code		D	0	

6. DISPLAY (RECORDS)

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
6A	Option to choose fields to display		D	0	
6B	Option to change the number of hits viewed per page		E	0	Always 10
6C	Option to view search history on record display screen	Search history means all searches from a session including previous iterations of the current search.	E	0	N/A: no search history

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
6D	Ability to choose records and not lose this choice when you move onto the next page		E	0	
6E	Can move onto next record when in full record display		D	0	
6F	Search term highlighted		D	0	

7. DOWNLOADING

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
7A	Select all results from complete set of records rather than page-by-page		E	0	No selection/marking functionality
7B	Able to download large numbers of records (500+) in one go		D	0	
7C	A wide choice of export/ download options		E	0	None

8. SEARCH HISTORY

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
8A	Can save search history	Search history means all searches from a session including previous iterations of the current search.	E	0	

Figure 1. (cont.)

CRITERION		DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
8B	Can share saved searches		D	0	
8C	Can export search history		D	0	
8D	Can edit saved searches		D	0	
8E	Re-run saved searches		E	0	

9. PERFORMANCE

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
9A	Can handle long and complex searches, >50 lines long		E	0	Platform cannot structure searches by line
9B	Can handle large numbers of records >1000		E	3	Will return 4,000+ results speedily
9C	Is compatible with major reference management systems		E	0	No export function
9D	Compatible with major web browsers: IE, Firefox and Google Chrome		E	3	Encountered no problems when using MS Edge for extensive testing and Google Chrome briefly.

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES

10. OTHER

	CRITERION	DEFINITION	ESSENTIAL / DESIRABLE	ISPOR	NOTES
10A	Help facility is easy to locate and informative		E	1	Easy to locate but very basic. Truncation did work but there was not enough detail in the help, e.g ?, left-hand truncation and within-word wildcard were not mentioned.
10B	Results are consistent		E	3	Left hand and right hand truncation searches (2e and 2f) were consistent across 3 dates in September and October 2021 and 3 browsers (Firefox, Edge and Chrome)
10C	Turn off any deduplication		E	0	Searches often seem to return duplicates, suggesting there is no deduplication function.

SCORES

OVERALL SCORE		35	**OF A POSSIBLE 165**
ESSENTIAL SCORE	E	27	**OF A POSSIBLE 111**
DESIRABLE SCORE	D	8	**OF A POSSIBLE 54**

Figure 1. (cont.)

comparing smaller databases, it might be desirable to weight the scoring according to the focus or priorities of the resource.

Conclusions

A technical review of the search interface of the ISPOR database using a validated checklist generated a score of 35 of a possible 165, with 27 for essential criteria of a possible 111, and 8 for desirable criteria of a possible 54.

Following this review, we highlight two issues to researchers using the database, both of which will cause searchers to miss potentially eligible abstracts: (i) that search terms, which are truncated should not be capitalized (e.g., cost* not Cost* or *diabetes not *Diabetes) and (ii) that quotation marks should be straight sided in phrase searching (e.g., "cost analyses" not "cost analyses").

We set out proposed changes to the search interface, including adding the ability to export abstracts/search strategies to a bibliographic tool, adding a researcher account, and updating the help guide. All suggestions would further improve this helpful database.

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