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Peer Review of Search Strategies

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Agency for Healthcare Research and Quality
U.S. Department of Health and Human Services
540 Gaither Road
Rockville, MD 20850
www.ahrq.gov

Contract No. [redacted]

Prepared by:

[redacted]

Investigators:

[redacted]

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Statement of Funding and Purpose

This report is based on research conducted by an Evidence-based Practice Center (EPC) under contract to the Agency for Healthcare Research and Quality (AHRQ), Rockville, MD (Contract No. xxx-xxxx-xxxxx-x). The findings and conclusions in this document are those of the authors, who are responsible for its contents; the findings and conclusions do not necessarily represent the views of AHRQ. Therefore, no statement in this report should be construed as an official position of AHRQ or of the U.S. Department of Health and Human Services.

The information in this report is intended to help health care decisionmakers—patients and clinicians, health system leaders, and policymakers, among others—make well-informed decisions and thereby improve the quality of health care services. This report is not intended to be a substitute for the application of clinical judgment. Anyone who makes decisions concerning the provision of clinical care should consider this report in the same way as any medical reference and in conjunction with all other pertinent information, i.e., in the context of available resources and circumstances presented by individual patients.

This report may be used, in whole or in part, as the basis for development of clinical practice guidelines and other quality enhancement tools, or as a basis for reimbursement and coverage policies. AHRQ or U.S. Department of Health and Human Services endorsement of such derivative products may not be stated or implied.

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None of the investigators has any affiliations or financial involvement that conflicts with the material presented in this report.

Preface

The Agency for Healthcare Research and Quality (AHRQ), through its Evidence-based Practice Centers (EPCs), sponsors the development of evidence reports and technology assessments to assist public- and private-sector organizations in their efforts to improve the quality of health care in the United States. The reports and assessments provide organizations with comprehensive, science-based information on common, costly medical conditions and new health care technologies and strategies. The EPCs systematically review the relevant scientific literature on topics assigned to them by AHRQ and conduct additional analyses when appropriate prior to developing their reports and assessments.

To improve the scientific rigor of these evidence reports, AHRQ supports empiric research by the EPCs to help understand or improve complex methodologic issues in systematic reviews. These methods research projects are intended to contribute to the research base in and be used to improve the science of systematic reviews. They are not intended to be guidance to the EPC program, although may be considered by EPCs along with other scientific research when determining EPC program methods guidance.

AHRQ expects that the EPC evidence reports and technology assessments will inform individual health plans, providers, and purchasers as well as the health care system as a whole by providing important information to help improve health care quality. The reports undergo peer review prior to their release as a final report.

We welcome comments on this Methods Research Project. They may be sent by mail to the Task Order Officer named below at: Agency for Healthcare Research and Quality, 540 Gaither Road, Rockville, MD 20850, or by e-mail to epc@ahrq.hhs.gov.

Carolyn M. Clancy, M.D.
Director
Agency for Healthcare Research and Quality

Jean Slutsky, P.A., M.S.P.H.
Director, Center for Outcomes and Evidence
Agency for Healthcare Research and Quality

Stephanie Chang, M.D., M.P.H.
Director
Evidence-based Practice Program
Center for Outcomes and Evidence
Agency for Healthcare Research and Quality

Kim Marie Wittenberg, M.A.
Task Order Officer
Center for Outcomes and Evidence
Agency for Healthcare Research and Quality

Introduction

Systematic reviews are distinguished from other types of reviews by the process by which they are conducted. In the attempt to arrive at and present a comprehensive, unbiased view of the available evidence, systematic reviewers carefully follow methodological guidance for some portion of each step in the systematic review process. As have other groups that routinely fund or produce systematic reviews, the Agency for Healthcare Research and Quality (AHRQ) Effective Health Care (EHC) program has developed such guidance(1). In nearly all steps of the review process, group consensus (e.g., topic development, selection criteria development), dual reviews (e.g., title and abstract review, quality rating, data abstraction) or peer review (e.g., manuscript development) are employed. By not relying on a single individual, peer review and other group processes help to reduce bias and improve quality.

In contrast, current guidance within the EHC program does not specify group consensus, dual review, or peer review of the search strategies for bibliographic databases(2). Because the search strategy forms the foundation of a systematic review, it is important that it be unbiased and of high quality. And yet, studies of published systematic reviews show that search strategies often contain errors or are sub-optimal in terms of recall and precision(3, 4), although quality assessment of search strategies is often hampered by poor reporting(5-7). Peer review of search strategies could be a way to improve the quality of the search and thereby the systematic review it supports.

While the current guidance on standards for systematic reviews from the Institute of Medicine (IOM) requires independent peer review of search strategies(8), most methodological guidance for systematic reviews does not mention peer review of search strategies. This includes guidance developed for the European Collaboration for Health Technology Assessment (ECHTA)(9), National Institute for Health and Clinical Excellence (NICE)(10), Danish Centre for Health Technology Assessment (DECEHTA)(11), Institute for Quality and Efficiency in Healthcare (IQWiG)(12), and The Cochrane Handbook(13). The

York Center for Review and Dissemination systematic review methodology(14) suggests peer review of search strategies but does not require it.

To address this issue, the Canadian Agency for Drugs and Technology in Health (CADTH) and the Cochrane Information Retrieval Methods Work Group have developed the Peer Review of Electronic Search Strategies (PRESS) instrument(15, 16). The developers of PRESS first conducted a systematic review to identify evidence related to quality issues and errors in complex electronic search strategies(15, 16). The review identified elements important to complex search strategies. These elements were then sent to a group of expert searchers who were asked to identify any additional elements and assess the importance of the previously identified elements. These elements were combined to produce the PRESS instrument, which was subsequently checked for validity with peer review forums of expert searchers.

The resulting PRESS checklist contains the following elements:

- conceptualization of research question
- spelling errors and wrong line numbers
- translation of search strategy to different databases
- missed subject headings
- missed natural language search terms
- spelling variants and truncation
- irrelevant subject headings
- irrelevant natural language terms
- search limits

While peer review has the potential to improve search strategies it is not clear that it does(17).

Additionally, the costs associated with the implementation of a peer review process are unknown. In order to investigate peer review of search strategies within the context of the EHC program, we implemented a peer review pilot to both test the process and determine if the PRESS instrument is a useful tool for such

review. Expert searchers from within the program were asked to review search strategies from current EHC reports without the PRESS instrument and then asked to review a different search strategy using the PRESS instrument. After each review they were asked about the process of the review. The authors of the original searches were shown the reviews and asked if the reviews would have changed their search strategies. Finally, the content of all reviews was analyzed.

Specifically, we investigated whether peer review has the potential to change search strategies (are reviews useful and will they be used?), measured the harms of the intervention (how much time does it take for peer review? How will this affect the systematic review timeline?), and compared the use of the PRESS instrument with “free form” reviews (in terms of time required to write the review and the type of comments). This study investigated only the resources needed for peer review, the preferences of participants, and the potential impact on the search strategy. It did not attempt to measure actual differences between peer reviewed and non-peer reviewed search strategies, or what effect this would have on the conclusions of a systematic review. If peer review has the potential to affect search strategies, further research will be needed to investigate whether peer review might change search results and the conclusions of a systematic review.

The objectives of the current study were:

- 1. To determine if peer review changes search strategies*
- 2. To discover the time burden for peer review, and*
- 3. To examine whether use of the PRESS instrument would improve review processes.*

Methods

Active search strategies were used to simulate real conditions and were identified at the research protocol phase on the EHC Web site(1). Search strategies posted at the research protocol phase were chosen because they are publicly available on the EHC Web site, contain background materials needed to

evaluate the search strategies (e.g., key question, analytic framework), and represent the stage of the systematic review process at which reviewing and changing a search strategy is most likely to be accommodated. Intervention either prior or after this point is impractical; on one hand, final search strategies cannot exist prior to the formulation of the research protocol, and on the other, waiting until a draft of the review is posted is more than likely too late in the process to change search strategies and literature retrieval.

Five search strategies were selected from posted pharmacological treatment research protocols on the EHC website in July 2011. Pharmacological treatment topics were chosen because they represent the most common type of comparative effectiveness review published by the Effective Health Care program.

The reports selected were:

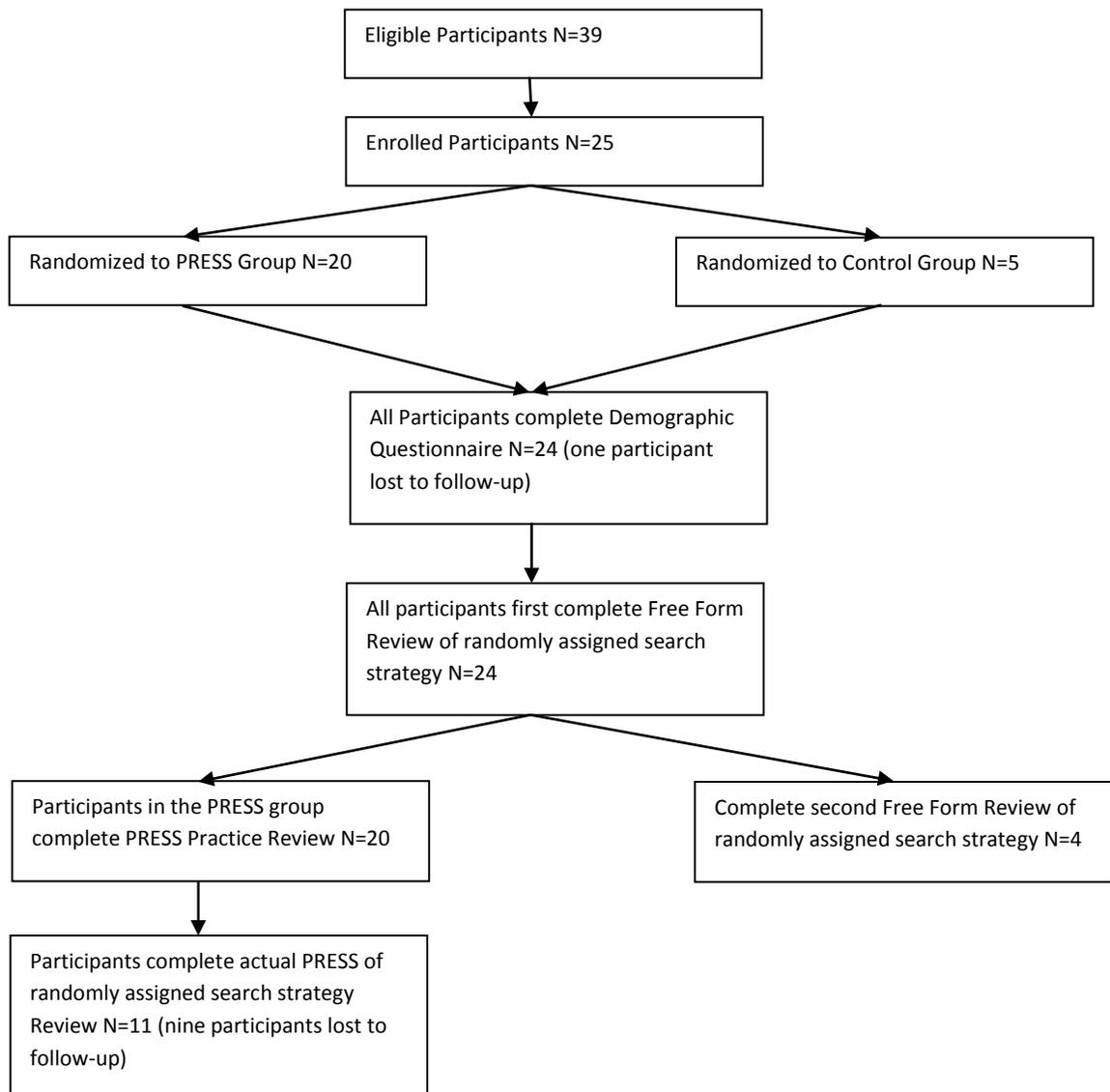
- *Effectiveness of Epoetin and Darbepoetin for Managing Anemia in Patients Undergoing Cancer Treatment*
- *Comparative Effectiveness of Treatment for Glaucoma*
- *Comparative Effectiveness of Treatments for Phenylketonuria*
- *Comparative Effectiveness of Pharmacologic Therapies for the management of Crohn's Disease*
- *Comparative Effectiveness of Treatment of Women with Coronary Artery Disease (CAD)*

Once the reports were selected, the EHC Evidence-based Practice Centers (EPCs) responsible for each of them was contacted to identify the original expert searcher who had developed the search strategy. The searchers were recruited to respond to the reviews of their search strategies and to indicate whether the reviews would have likely changed his/her search strategies. All five original expert searchers agreed to participate.

All 14 EPCs were contacted to identify individuals who regularly conduct literature searches within each center. Twelve centers responded, identifying 39 eligible individuals, of whom 25 agreed to participate as peer reviewers. The 25 peer reviewers were randomly divided into two groups using Random.org(18).

The first group was assigned to write a free form review, followed by a PRESS instrument training review and the actual PRESS review. The other group was asked to write two free form (i.e., unstructured) reviews to act as a control. The five reports, used across both the experimental and control groups, were randomized within each group of reviewers, using Random.org(18) (See Figure 1).

Figure 1: Flow diagram for study participants



Peer reviewers and original expert searchers were required to complete one demographic information form at the beginning of the project, and for each review they completed a review form and process questionnaire. All forms for the research project were created and administered online using Survey Monkey. The demographic information survey was completed to gain more information about the project participants within the EHC program (peer reviewers who were also original expert searchers only completed the demographic information survey once). Demographic form questions included (see Appendix A for complete survey):

- What is your position title?
- Do you have a Master of Library Science degree (MLS, MLIS, MA-LIS, etc)?
- How many years of experience do you have as a librarian or other information professional?
- Approximately how many years of experience do you have contributing to systematic reviews?
- Approximately how many systematic reviews have you contributed to in the past?
- What is your employment status with your Evidence-based Practice Center (EPC)?

Both experimental and control peer reviewer groups were then asked to write a free form review with these guiding instructions:

“Please indicate the title of the Brief/Report/Review whose search strategy you are reviewing and then complete your review of it. It would be most helpful when you identify an issue(s) with the search strategy that you indicate:

- List any errors or changes you would want to make in the search strategy.
- Whether you consider it a conceptual or technical error.
- Describe any changes you would make to the search strategy.”

After completing the initial free form review, all reviewers were asked to complete a process questionnaire, which included the following questions (see the appendix B for the complete questionnaire):

- How long did it take you to complete your review?
- How helpful was the background material provided with the search strategy?
- During the peer review process, did you do any of the following (please check all that apply):
(Run live searches in databases ; Consult documentation for a database to check syntax, etc. ; Consult a database's thesaurus ; Other)
- Considering the time and effort needed to review the search strategy, is this something that could be incorporated into your workflow?
- Would you be willing to take on peer review duties on a more permanent basis?

After each peer reviewer submitted his/her first free form review, the second set of reports was sent out to the reviewers. Each of the five reviewers in the control group was assigned a second randomly selected report search strategy to review and was given the same the free form review instructions and online forms (review and process questionnaire) as above. Once these reviewers submitted the second free form review and process questionnaire their participation was complete.

The participants in the experimental group were all given the same report as a training exercise in using the PRESS instrument. This training exercise allowed them to practice with the new review format and seek guidance on any questions. The search strategy from the *Screening and treatment of subclinical hypothyroidism or hyperthyroidism* report was used for the training exercise. No content analysis was performed on these reviews. The experimental group filled out the PRESS instrument review form, which included the following PRESS instrument specific questions (see the appendix C for the complete form):

- Translation: Is the search question translated well into search concepts?
- Operators: Are there any mistakes in the use of Boolean or proximity operators?

- Subject headings: Are any important subject headings missing or have any irrelevant ones been included?
- Natural language: Are any natural language terms or spelling variants missing, or have any irrelevant ones been included? Is truncation used optimally?
- Spelling & syntax: Does the search strategy have any spelling mistakes, system syntax errors, or wrong line numbers?
- Limits: Do any of the limits used seem unwarranted or are any potentially helpful limits missing?
- Adapted for database: Has the search strategy been adapted for each database to be searched?

The process questionnaire peer reviewers completed after their reviews included extra questions on the PRESS instrument in addition to the process questions used for the free form review:

- Did the PRESS Checklist help you to prepare your review?
- Do you prefer to formulate your review however you wish or have guidance in the form of a checklist or something similar?

After completing the training review, each peer reviewer from the experimental group received his/her last report search strategy to review and completed the same PRESS instrument review form and process questionnaire as in the training exercise. A content analysis was performed on the contents of these reviews.

Finally, original expert searchers were sent all of the reviews of their search strategies and asked to complete an online form for each review, answering the following questions (see the appendix D for the complete form):

- Did the review comments cause you to alter your search strategy?
- Do you have any responses to specific review comments?
- If you edited your search strategy, did you (please check all that apply):

- Change search concepts
 - Change Boolean operators
 - Add/delete subject terms
 - Add/delete natural language terms
 - Correct a misspelling
 - Add/delete spelling variants (e.g. randomized/randomized)
 - Correct truncation
 - Correct system syntax errors
 - Correct wrong line number
 - Add/delete limits
- Do you think peer review of search strategies should be incorporated as standard practice for systematic reviews?
 - Regardless of whether or not the review comments changed this search, does having the search peer reviewed increase your confidence in the quality of the search?
 - Thinking about all of the reviews you received, which format was the most useful (free-form or PRESS Instrument)? (Note: you need only answer this question once, after you have read and commented on all of the reviews.)

Results

Demographic information of peer reviewers

As a whole, the group of people available to conduct and review search strategies in the EHC program are professionally educated and very experienced. Of the 24 respondents to the demographic survey, 20 (83%) have master's degrees in library science. Most have more than 10 years' experience as a librarian or other information professional. Sixty-seven percent of respondents have more than 5 years experience contributing to systematic reviews, with 63% having contributed to more than 10 systematic reviews. These experienced searchers have a variety of relationships with the EPCs for whom they do searches.

Although 33% are full time EPC team members, another 38% have appointments to other institutional units and perform searches on an as-needed basis. (See Table 1.) This variety can be seen in the various titles the searchers hold: Assistant EPC director; Program Director; Associate Director for Public Services (2); Research Librarian (2); Senior Information Specialist (2); Research Associate (3); Electronic Services Librarian; Head, Reference Services; Program Manager, Medical Information and Coding Services; Information Specialist; Library Director; Acting Associate Director for Information Services; Hotline Response Team Leader; Senior RA; Hotline Information Specialist; Program Support Assistant; Librarian; Director, HTA/EPC Information Center; Library and Information Technician; and Associate Director.

Table 1: Demographic information from peer reviewers

Do you have a Master of Library Science degree?				
Yes 83% (20)		No 17% (4)		
How many years of experience do you have as a librarian or other information professional?				
<5 8% (2)	5-10 38% (9)		>10 54% (13)	
Approximately how many years of experience do you have contributing to systematic reviews?				
<5 33% (8)	5-10 50% (12)		>10 17% (4)	
To approximately how many systematic reviews have you contributed in the past?				
<5 25% (6)	5-10 13% (3)		>10 63% (15)	
What is your employment status with your Evidence-based Practice Center (EPC)?				
Full-Time 33% (8)	Part-Time 17% (4)	Contractor to the EPC 4% (1)	As needed for searching 38% (9)	Other 8% (2)

Review process questionnaires

Of the 25 peer reviewers invited to participate, 24 completed the initial free-form round of reviews, and 15 completed either the PRESS review or a second free-form review as part of our control group.

Although it is not clear why respondents failed to complete all reviews, it may be related to the reviewers' relationship to the EPC they work for, as only one of the reviewers lost to follow up reported having a full-time appointment to their EPC.

For the most part peer reviewers were positive about the review process, although many hesitated to incorporate the review process into their current workflow. Although the PRESS instrument appears to cut down on the time needed to review the search strategy, the control reviewers all took less than 2 hours to complete reviews as well. It may be that more experience with the process of reviewing search strategies makes reviewers more efficient or that subsequent free-form reviews were less thorough, rather than the effect being due to the PRESS instrument alone. Only a minority of respondents reported that they could incorporate peer review into their workflow or that they would be willing to take on peer review duties on a more permanent basis, while a smaller number reported that they definitely could or would not (See Table 2).

Table 2: Time taken for reviews and willingness to review in the future.

	First Round Free Form Reviews N=24	PRESS Reviews N=11	Control Reviews (second Free Form Review only) N=4
Time to complete review			
< 2 hours	54% (13)	91% (10)	100% (4)

> 2 hours	46% (11)	9%(1)	0% (0)
	First Round Free Form Reviews N=24	PRESS Reviews N=11	Control Reviews (second Free Form Review only) N=4
Could this be incorporated into your workflow?			
Yes	42% (10)	46% (5)	25% (1)
No	8% (2)	9% (1)	0% (0)
Maybe	50% (12)	46% (5)	75% (3)
Would you be willing to take on peer review duties on a more permanent basis?			
Yes	29% (7)	36% (4)	25% (1)
No	21% (5)	27% (3)	0% (0)
Maybe	50% (12)	37% (4)	75% (3)

All of the reviewers found the background material (systematic review protocol) helpful to the review. While reviewing the search strategies, reviewers did more than simply read the search strategy and accompanying protocol. Many reviewers in all groups performed additional activities to inform their comments. Such activities included running live searches, checking on documentation, and reviewing controlled vocabulary. The reviewers using the PRESS instrument performed slightly fewer of these auxiliary activities (See Table 3).

Table 3: Usefulness of background material and auxiliary activities performed

	First Round Free Form Reviews N=24	PRESS Reviews N=11	Control Reviews (second Free Form Review only) N=4
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Usefulness of background material (protocol)			
Helpful	96% (23)	100% (11)	100% (4)
	First Round Free Form Reviews N=24	PRESS Reviews N=11	Control Reviews (second Free Form Review only) N=4
Neutral	4% (1)	0% (0)	0% (0)
Unhelpful	0% (0)	0% (0)	0% (0)
Additional activities undertaking during review process			
Run live searches in database	92% (22)	64% (7)	75% (3)
Consult documentation for database to check syntax, etc.	62% (15)	46% (5)	75% (3)
Consult a database's thesaurus	75% (18)	82% (9)	50% (2)

Of those who used the PRESS instrument, 82% (9) indicated that the instrument was helpful, 18% (2) reported that it was neither helpful nor limiting, and none of the reviewers indicated that the PRESS instrument was limiting. Twenty seven percent (3) of respondents said that they preferred the PRESS instrument and being required to use it, while 54% (6) indicated that they prefer having the checklist but not being required to use it; 18% (2) indicated that they prefer not having the checklist at all.

Review content

The PRESS instrument reviews contained more recommendations on the whole and in particular had more comments that could be termed error detection—specific comments about spelling or syntax indicating that a mistake had been made. Other comments can be grouped into suggestions to increase sensitivity (recall), recommendations intended to increase specificity (precision), and recommendations about reporting the search strategy and other issues. The results of the control were similar to the other free form reviews in their lack of error detection and relative brevity. Therefore, it is likely that use of the

PRESS instrument prompts both more comments the identification of specific errors in the search strategy. At the same time, many of the reviewers were careful to point out that their suggestions were just that, suggestions; they were unsure if these would either change or improve the search results. Specific types of comments made each type of reviewer are listed in Table 4 below.

Table 4: Content of Reviews

	First Round Free Form Reviews N=24	PRESS Reviews N=11	Control Reviews (second Free Form Review only) N=4
Recommendations to increase sensitivity	<ul style="list-style-type: none"> • Additional terms suggested • Suggestions to search for observational studies (or to not limit to RCTs) • Use of plurals and truncation • Use of proprietary or brand names • Locating non-indexed citations in Pubmed 	<ul style="list-style-type: none"> • Additional terms suggested • Suggestions to search for observational studies (or to not limit to RCTs) • Use of plurals and truncation • Use of proprietary or brand names • Additional concepts suggested • Use of device names • Additional pharmacological action terms suggested 	<ul style="list-style-type: none"> • Additional terms suggested • Suggestions to search for observational studies (or to not limit to RCTs) • Use of proprietary or brand names
Recommendations to increase specificity	<ul style="list-style-type: none"> • Use of filters suggested • Use of publication type as a limiter • Use of human limits • Using sex limits • Use of field searching • Use of MeSH major headings • Use of subheadings 	<ul style="list-style-type: none"> • Use of filters suggested • Use of publication type as a limiter • Use of human limits • Use of sex limits 	<ul style="list-style-type: none"> • Use of publication type as a limiter • Use of human limits • Narrower MeSH terms suggested • Use of abbreviations that could bring false hits
Errors detected	None	• Errors in use of	None

		parentheses <ul style="list-style-type: none"> • Spelling errors identified • Error in phrase searching • Errors in use of Boolean operator 	
	First Round Free Form Reviews N=24	PRESS Reviews N=11	Control Reviews (second Free Form Review only) N=4
Other issues	<ul style="list-style-type: none"> • Previous indexing terms • English language limits (conflicting recommendations) • Database selection 	<ul style="list-style-type: none"> • Whether or not to search for specifically named outcomes or comparators • Apparent lack of use of controlled vocabulary 	None
Recommendations about reporting	<ul style="list-style-type: none"> • Identification of unnecessary explosions • General comments on “readability” of search strategies 	<ul style="list-style-type: none"> • Identification of unnecessary explosions • General comments on “readability” of search strategies 	<ul style="list-style-type: none"> • General comments on “readability” of search strategies

Original Searchers Response

In 97% of cases, the original searcher indicated that the comments did not cause them to alter their search strategies. However, it should be noted that only one original searcher indicated that this was because he or she disagreed with the review. In nearly all other cases, the reason given was simply that the report had already gone forward, and it would be too late to incorporate any changes suggested. Original searchers were also asked to comment on the content of the reviews. The responses to reviewers indicate that there are a number of areas where there is no commonly understood “correct” approach. In particular, the following issues seem to be unresolved in that multiple reviews on a search strategy offered conflicting suggestions or the original searcher had specific responses as to why his or her approach differed from a reviewer’s suggestion:

- Whether or not to specifically search on outcomes

- The usefulness of limits (humans, language, age, and sex)
- Whether or not additional search terms yield additional results or additional relevant results
- Which fields are most useful when using fielded searching
- The use of inclusion and exclusion criteria as a complement to search strategies

Discussion

Objective 1: Does peer review change search strategies?

In general, peer review didn't change search strategies. The original searchers overwhelmingly said that the content of the reviews did not change the search strategy. However, it is not clear if this is because the actual content of the reviews or the timing of the peer review. It may be that even at the protocol stage, the actual progress of the systematic review is too far along for peer review of search strategies to be helpful. However, reviews with the PRESS instrument did identify errors in search strings.

Objective 2: What is the time burden for peer review?

Most reviews were completed in less than two hours. Although most reviewers were ambivalent about whether they would be willing to take this on as a permanent duty, more respondents responded yes than no regardless of whether or not the PRESS instrument was used. The comments of the original searchers also suggest that waiting for a formal peer review of a search strategy may delay the entire report. Most of the comments from the original searchers indicated that by the time they received the reviews of the search strategies the reports were either at or near completion and it would be too late to adjust the search strategy.

Objective 3: Compare PRESS instrument to free form evaluations.

The PRESS instrument is preferred by the reviewers, although some would still prefer for the checklist to be optional. The reviews using the PRESS instrument take less time and yield more content, but it is also

likely that experience reviewing multiple search strategies also results in greater efficiency when reviewing. The PRESS instrument does seem to be superior to free form evaluations in that only with the PRESS instrument were actual errors in searches found.

Although this project gives us insight into the potential of peer review of search strategies for systematic reviews, it is important to remember some limitations of the current study. What started as a small sample suffered significant drop out. About a third of our peer reviewers failed to complete all reviews. As such, our conclusions are based on a small sample of respondents. This may provide additional insight into the barriers to implementing peer review.

Similarly, because we limited the number of search strategies reviewed, the sample of original searchers answering our questionnaire was severely limited. It is also clear from the text comments that the question “did this change your search” was ambiguous. Additional research focusing on the original authors of search strategies could give different results with a larger sample size and more clearly worded questionnaire.

While the results of this study suggest that a formal peer review process may be unlikely to actually change search strategies, the results do give us additional information about the search process within the Effective Health Care program. Even if a formal peer review process is not implemented, the PRESS instrument could be useful in informal peer review or even self review. The instrument seems to cut down the time needed to do the review, increase response, and do a better job of identifying actual errors in search strategies.

Additionally, the content of the reviews indicates that there are a number of areas where there is no agreed upon standard practice, and further research could help us to understand variation in practice around such issues as limits, searching for observational studies, and searching for outcomes and

comparators. The process of reviewing other searchers' work can bring these issues to light, and a peer review-like process could be used to start investigations and discussions of what techniques work and why.

Finally, many of the reviewers commented on the difficulty of reading the search strategies as currently presented. The EHC program currently has no standards for reporting search strategies, and there is no recognized standard for reporting search strategies (Sampson 2008). A consensus based standard of reporting may make it easier to review search strategies both internally and when reported to the public.

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