Beyond PICO: The SPIDER Tool for Qualitative Evidence Synthesis

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Abstract

Standardized systematic search strategies facilitate rigor in research. Current search tools focus on retrieval of quantitative research. In this article we address issues relating to using existing search strategy tools, most typically the PICO (Population, Intervention, Comparison, Outcome) formulation for defining key elements of a review question, when searching for qualitative and mixed methods research studies. An alternative search strategy tool for qualitative/mixed methods research is outlined: SPIDER (Sample, Phenomenon of Interest, Design, Evaluation, Research type). We used both the SPIDER and PICO search strategy tools with a qualitative research question. We have used the SPIDER tool to advance thinking beyond PICO in its suitable application to qualitative and mixed methods research. However, we have highlighted once more the need for improved indexing of qualitative articles in databases. To constitute a viable alternative to PICO, SPIDER needs to be refined and tested on a wider range of topics.

Keywords

literature; metasynthesis; research, mixed methods; research, qualitative; systematic reviews

Systematic reviews and meta-analyses are the "gold standard" of research reviews (Clarke & Stewart, 1994, para. 1). Systematic review methods can be applied to almost any study type and aim to be systematic, explicit, and reproducible (Tricco, Tetzlaff, & Moher, 2010). We use meta-analysis methods to examine the research findings (specifically strength of the relationship) for one typically focused research question. Applying this method allows researchers to combine and examine quantitative findings using individual effect sizes to arrive at an overall effect for the research question. However, in health care settings and relevant disciplines (e.g., psychology), qualitative research designs are becoming increasingly used, either to complement quantitative research designs or within mixed-method designs (Holloway & Wheeler, 2002).

Metasyntheses are "systematic reviews of qualitative research" (Booth, 2001, p. 1). Metasynthesis is comparable to meta-analysis in that it is also a systematic research technique. Researchers conduct metasynthesis to contribute to knowledge by bringing together the rich and detailed findings of qualitative research studies and thus to offer a new interpretation of a research question (Sandelowski, Docherty, & Emden, 1997). The process of metasynthesis involves "peeling away the surface layers of studies to find their hearts and souls in a way that does the least damage to them" (Sandelowski et al., 1997, p. 370). This essentially interpretive function contrasts with the statistical amalgamation involved in a meta-analysis (Sandelowski & Barroso, 2007; Walsh & Downe, 2005).

In recent years researchers have increasingly recognized that multiple potential methods exist for the synthesis of qualitative research. They need to select their chosen method judiciously according to the overall purpose of the synthesis and the desired outputs from the process (Barnett-Page & Thomas, 2009; Dixon-Woods, Bonas, et al., 2006). Factors that influence the choice of method of synthesis include the extent to which a synthesis is intended to be theory generating or theory validating, the extent to which the review is intended to be aggregative or interpretive (Thorne, Jensen, Kearney, Noblit, & Sandelowski, 2004), the "thick description" of data from included studies (Noyes & Popay, 2007, p. 230), the role of the reviewer

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(Dixon-Woods, Cavers, et al., 2006), and whether the focus is on identifying commonalities (as with thematic synthesis) or on investigating differences (as for realist synthesis).

In practice each of the above represents not a binary decision but rather a continuum on which an individual review or type of synthesis can be located. So the once important distinction between theory-driven approaches (e.g., framework synthesis; Lloyd-Jones, 2004) and theory-generating approaches (e.g., meta-ethnography or grounded theory; Lloyd-Jones, 2007) has recently been eroded by advancement of "best fit" approaches that follow an imperfect model in the place of a contingent staging post on the road to theory development (Carroll, Booth, & Cooper, 2011, para. 1). It has been suggested that this almost bewildering plethora of methods should be subsumed under a generic umbrella term *qualitative evidence synthesis* (Hannes & Lockwood, 2011, p. 1632). This term has been chosen, and subsequently championed, by members of the Cochrane Collaboration Qualitative Methods Group to represent a neutral term that does not carry the preconceptions associated with the labels coined by particular individuals or research groups (Noyes, 2010).

Notwithstanding the richness of such methodological developments, a basic distinction, identified relatively early on in the evolution of the science of qualitative evidence synthesis, persists. This distinction broadly characterizes methods of synthesis into those that draw their credentials, and hence their underlying methods, from quantitative synthesis and those that aim to parallel methods of primary qualitative research (Booth, 2001; Dixon-Woods, Bonas, et al., 2006) using appropriated elements of grounded theory (Barbour, 2003). Such a wider methodological debate forms a backdrop to this particular article because of the impact on the fundamental principles of literature searching. That is, do methods prespecified for quantitative systematic reviews (e.g., the formulation of a PICO-type question) translate to qualitative evidence syntheses? Furthermore, does qualitative evidence synthesis share the requirement for comprehensive exhaustive searches, or does it merely aim to create an appropriate, but not necessarily comprehensive, sampling frame from which studies are selected until a point of data saturation is reached (Booth, 2001)?

Search Strategies: The Basis of All Reviews

Confidence in the literature search is vital to all research, especially meta-analysis and metasynthesis, which are founded on the sound retrieval of initial search results (Cooper, 1998). However, the quality of indexing of qualitative research in databases, for example, MEDLINE and Embase, might cause the researcher to lack confidence that every relevant qualitative article has been found (Shaw et al., 2004). Effective retrieval terms rely on clarity in the title and abstract, although assignment of indexing terms depends on the indexer's interpretation of the full article. In qualitative articles, any of these terms might be unclear because of authors and searchers defining concepts differently (Evans, 2002). Some observers have concluded that searching for qualitative research using thesaurus terms in databases is of limited value (Barroso et al., 2003; Evans).

Complementary search methods (e.g., follow-up of references, citation searching, and citation pearl growing) are all considered particularly important to compensate for any deficiencies in retrieval terms (Grayson & Gomersall, 2003; Papaioannou, Sutton, Carroll, Wong, & Booth, 2010). Longer-term solutions might include authors improving retrieval of their articles by making their methodology clear in the title or by using a structured abstract (Shaw et al., 2004). However, the retrospective review process nature of qualitative evidence synthesis means that such problems will persist for many years to come, especially where retrieving already-written articles is concerned. For the foreseeable future, researchers and clinicians might derive confidence that a metasynthesis is high-quality evidence to support change if the search process, together with subsequent stages of the review process, contributes to the improved reliability of the qualitative synthesis.

Limitations With Current Search Tools

The PICO (Population/problem, Intervention/exposure, Comparison, and Outcome) tool has spread from its early origins in epidemiology to become a fundamental tool in both evidence-based practice and systematic reviews. It enables researchers to define their quantitative research question and search terms, laying the pathway for a systematic search strategy (Booth, O'Rourke, & Ford, 2000; Schardt, Adams, Owens, Keitz, & Fontelo, 2007; Villanueva, Burrows, Fennessy, Rajendran, & Anderson, 2001). Therefore, we have come to widely use the PICO search strategy in systematic reviews of quantitative research, being deemed the most reliable basis for a search strategy. Furthermore, it is the best method of question formulation to use when conducting a quantitative systematic literature review and has been adopted by the Cochrane Collaboration (O'Connor, Green, & Higgins, 2008). However, the PICO tool is not an optimal working strategy for qualitative evidence synthesis.

Current Cochrane guidance on qualitative systematic reviews appears unable to specify an appropriate alternative search tool (Noyes, Popay, Pearson, Hannes, & Booth, 2011). Acknowledged limitations of PICO for qualitative evidence synthesis include the fact that combining the two most commonly used components, namely, the P for "Population" and I for "Intervention," will more typically

retrieve references to quantitative research. The qualitative reviewer will therefore have correspondingly more irrelevant "hits" to sift through when searching for genuinely qualitative studies for potential inclusion in his or her review. In addition, the "Comparison" (C) is not typically part of a qualitative research question so becomes irrelevant, whereas both "Intervention" (I) and "Outcome" (O) might need to be manipulated to fit with the qualitative paradigm. Therefore, specification using PICO might become a subjective exercise when used for qualitative research questions, rather than the systematic search strategy tool intended when used for quantitative research questions.

Several alternative search strategy tools to PICO have been proposed for use with qualitative research. One such example is the SPICE (Setting, Population, Intervention, Comparison, and Evaluation) search strategy. SPICE was developed in the context of evidence-based librarianship and subsequently promoted by the Joanna Briggs Institute for qualitative systematic reviews (Booth, 2006). Another example is the ECLIPSE (Expectation, Client group, Location, Impact, Professionals, ServicE) search strategy, which was introduced to handle health management topics (Wildridge & Bell, 2002). However, neither tool meets the full requirements of the qualitative research paradigm having been developed for specific user groups, nor might they be suitable for use with more general qualitative research questions. Such a limitation might also extend to a comparative newcomer, Context–Intervention–Mechanism–Outcome (CIMO), also developed for management questions, although this might hold potential specifically within realist synthesis (Denyer, Tranfield, & Van Aken, 2008).

It is important to have a tool that, like PICO for quantitative search strategies, can prompt the qualitative researcher to brainstorm relevant search terms. Such a tool might then contribute a more systematic process to qualitative evidence synthesis, improving researcher confidence that all relevant articles have been sought in the search process. The aim of this article is to start to bridge this gap in efficient search strategy tools for qualitative research questions by trialing an alternative search strategy tool. Using PICO, an alternative search strategy tool was designed that assists researchers in pinpointing search terms for qualitative research to be included in evidence synthesis. This new tool (SPIDER) is compared to an established search tool (PICO) for a qualitative metasynthesis research question, and the findings of both search strategies are discussed.

Method

Design of the New Search Strategy Tool

The frequently applied PICO tool provided a starting point for the design of an alternative tool for use with qualitative and mixed-methods research articles. The SPIDER search strategy was designed following reflections by the authors on the difficulties of using PICO when searching for qualitative and mixed-methods research for metasynthesis (Cooke, Mills, & Lavender, 2010; Smith & Lavender, 2011). The SPIDER tool, described below, required adaptation of the PICO components to make them more suitable for qualitative research, together with the addition of one new component (see Figure 1).

Sample size is typically smaller in qualitative research with the data collated being richer and more detailed than quantitative data. In contrast to those from epidemiological research, findings from qualitative research are not always intended to be generalized beyond the study population; therefore, "Sample" was preferable to "Population/problem," which is part of PICO (P → S). An "Intervention/exposure," used in PICO, is not always evident in qualitative research, where the aim is frequently to understand more about the certain behaviors, decisions, and individual experiences. Therefore, "Phenomenon of Interest" was deemed more suitable for use with qualitative research encompassing behaviors, experiences, and interventions (I → PI). Because of the exploratory nature of qualitative research and the smaller sample sizes, "Comparison" groups are frequently excluded. Instead, "Design" was used in the SPIDER tool because the design of a study (including any supporting theoretical framework) influences the robustness of the study and analysis (C → D). The researchers believed that the introduction of "design" might increase the detection of qualitative studies in databases where titles and abstracts are unstructured by prompting retrieval of specific study types. Qualitative research outcomes might be unobservable and subjective constructs, so the term "Evaluation" was deemed more suitable than "Outcomes" used in PICO (O → E). Finally, the SPIDER tool has the added advantage that it might be suitable for mixed-methods and quantitative research search strategies, made possible by the addition of "Research type" (R).

The SPIDER Tool: An Alternative Search Strategy to PICO

To perform an initial trial testing the effectiveness of the SPIDER search tool, two systematic literature searches, one using the PICO tool and one using the SPIDER tool, were used to answer one qualitative research question. We examined the effectiveness of the SPIDER search strategy tool according to both the returned number of articles and their relevance to the research question. The chosen research question derives from an area familiar to two of the authors (Cooke and Smith). It is likely to require both qualitative and mixed-methods research articles and is relevant to several disciplines and to both the clinical and research domains: What are young parents' experiences of attending antenatal education?

PICO	SPIDER	Justification
P – Population/problem	**S** – Sample	Smaller groups of participants tend to be used in qualitative research than quantitative research, so this term was deemed more appropriate.
I – Intervention/exposure	**PI** – Phenomenon of Interest	Qualitative research aims to understand the how and why of certain behaviours, decisions, and individual experiences. Therefore, an intervention/exposure per se is not always evident in qualitative research questions.
C – Comparison	**D** – Design	The theoretical framework used in qualitative research will determine the research method that is used. As inferential statistics are not used in qualitative research, details of the study design will help to make decisions about the robustness of the study and analysis. In addition, this might increase the detection of qualitative studies in the databases in which titles and abstracts are unstructured.
O – Outcomes	**E** – Evaluation	Qualitative research has the same end result as quantitative research methods: outcome measures. These differ depending on the research question and might contain more unobservable and subjective constructs when compared to quantitative research (e.g., attitudes and views and so forth), so evaluation was deemed more suitable.
	R – Research type	Three research types could be searched for: qualitative, quantitative, and mixed methods.

Figure 1. The construction of the SPIDER search tool from the PICO search tool

Table 1. The Search Terms Used in the PICO Search

PICO Tool[a]	Search Terms
P	"young" OR "teen*" OR "parent*" OR "mother*" OR "father*"
I	"antenatal" OR "prenatal" OR "pregnancy" OR "birth" OR "class*" OR "education" OR "workshop*"
C	
O	"view*" OR "experienc*" OR "opinion*" OR "attitude*" OR "perce*" OR "belie*" OR "feel*" OR "know*" OR "understand*"

[a](P AND I AND O).

Table 2. The Search Terms Used for the SPIDER Search

SPIDER Tool[a]	Search Terms
S	"young" OR "teen*" OR "parent*" OR "mother*" OR "father*"
P of I	"antenatal" OR "prenatal" OR "pregnancy" OR "birth" OR "class*" OR "education" OR "workshop*"
D	"questionnaire*" OR "survey*" OR "interview*" OR "focus group*" OR "case stud*" OR "observ*"
E	"view*" OR "experienc*" OR "opinion*" OR "attitude*" OR "perce*" OR "belie*" OR "feel*" OR "know*" OR "understand*"
R	"qualitative" OR "mixed method*"

[a][S AND P of I] AND [(D OR E) AND R].

Procedure—Search Strategy

As stated above, two systematic searches were conducted to answer the research question; the first involved adaptation of the PICO framework (see Table 1 for the search strategy) and the second used the SPIDER tool (see Table 2 for the search strategy). The three largest databases for biomedical, clinical, and nursing research were searched: CINAHL, MEDLINE, and Embase. Search terms were truncated in both searches where appropriate to guarantee all relevant articles were highlighted. Two authors (Cooke and Smith) conducted searches independently, with results reviewed by the third author (Booth).

Results

The research team examined the findings of the searches and discussed them according to two metrics. First, we examined the number of generated hits (highlighted articles) from the two search strategies. Second, we examined the proportion of identified articles that were relevant to the research question. It was not possible to calculate the sensitivity of the search ("the number of relevant reports identified divided by the total number of

Table 3. The Outcome of the PICO and SPIDER Searches

		PICO SEARCH		SPIDER SEARCH	
Database	Comments	Articles Found in Initial Search	Articles Included	Articles Found in Initial Search	Articles Included
CINAHL Plus	Truncation - *	953	11 (1%) after title/abstract search and 3 after full-text review	176	8 (5%) after title/abstract search and 2 after full-text review
Embase	Truncation - *	870	15 (2%) after title/abstract search and 1 after full-text review	74	7 (9%) after title/abstract search and 1 after full-text review
MEDLINE	Truncation - *	998	14 (1%) after title/abstract search and 1 after full-text review	96	10 (10%) after title/abstract search and 1 after full-text review

relevant reports in existence"; Lefebvre, Manheimer, & Glanville, 2008, para. 6.4.4) as there is no way, short of examining every record on a database, of establishing the total number of relevant articles in existence.

Number of Articles Generated

The PICO search strategy created a greater number of hits compared to the SPIDER search strategy; over the three databases, a total of 2,821 articles were generated when using the PICO search strategy and 346 were generated using the SPIDER search strategy (as the metric of primary interest was overall effectiveness of the search strategy, not the comparative effectiveness of individual databases, duplicate articles are included in the summary statistics reported above). The refined SPIDER search strategy reduced the number of hits substantially, with a mean reduction across the three searched databases of 88%.

Proportion of Relevant Articles

Inspection of the titles and abstracts of the generated articles led us to obtain full text for 29 articles (approximately 1% overall). Using PICO, this included 1% of hits for CINAHL, 2% for Embase, and 1% for MEDLINE. Using SPIDER, this included 5% of hits for CINAHL, 9% for Embase, and 10% for MEDLINE (see Table 3). Two authors (Cooke and Smith) reviewed these full-text articles independently for relevance to the research question (i.e., young parents, antenatal education, and qualitative research). Five articles were relevant to the research question. Using the SPIDER tool, we found 1% relevance overall (3 articles/346 articles) compared to PICO, which generated 0.1% relevance (4 articles/2,821 articles). Two of the articles (Cox et al., 2005; Smith & Roberts, 2009) were identified when using both the PICO tool and the SPIDER tool, one was identified using the SPIDER tool only (Bailey, Brown, DiMarco, Letherby, & Wilson, 2004), and two were identified using the PICO tool only (Breedlove, 2005; Howie & Carlisle, 2005).

Discussion

In conducting this exploratory study, we sought to address the difficulties when using existing search strategy tools for qualitative research and begin to design an alternative search strategy tool to the PICO tool for use with qualitative and mixed-methods research. On reflection, the SPIDER search strategy was the easier of the two tools to generate search terms, primarily because the terminology was more suited to qualitative research questions. The results when we used the SPIDER search strategy were easier to manage than those when we used the PICO tool across all three tested databases, given the smaller number of articles generated through the search. Using the SPIDER search strategy, we found a lower proportion of relevant articles (60%; 3/5) compared to when we used PICO, with 80% (4/5), because two of the relevant articles were generated only when the PICO search strategy tool was used (Breedlove, 2005; Howie & Carlisle, 2005). The remainder of the discussion focuses on possible explanations for this and suggested improvements to the SPIDER search strategy tool.

Indexing of Qualitative Articles

On inspection of the two relevant articles generated uniquely by the PICO search strategy tool, we noted that the word "qualitative" was not mentioned in the title, abstract, or keywords. Omission of this word might have adversely affected indexing of the articles within the databases. We ran the SPIDER search strategy using "and R (qualitative and/or mixed methods)." Therefore, articles were not picked up that did not explicitly contain reference to the data being qualitative or mixed methods. We ran the search again in CINAHL, using "OR R" to examine whether the two articles were listed. Both articles

were listed in the CINAHL search results when "OR R" was used instead of "AND R." However, this was at the expense of the volume of hits, which increased from 176 (using "AND R") to 1,093 (using "OR R").

The problems of indexing of qualitative research within electronic databases are widely reported, with a variety of explanations advanced. It has been suggested that the indexing of articles for most databases does not take place according to research methodology (Barroso et al., 2003). This is an issue for researchers when their research question targets a specific methodology. This problem of indexing can be exacerbated by research articles using nonspecific titles, unstructured abstracts, and poor definition of qualitative methodology (Booth, 2011; Evans, 2002). Therefore, many qualitative searchers have identified a need to expand the basic bibliographic search using alternative techniques (Grayson & Gomersall, 2003; Papaioannou et al., 2010), including those techniques identified by the umbrella term "berrypicking" (Bates, 1989, p. 407).

Sensitivity and Specificity

Evans (2002) suggested that confidence in finding all articles related to a specific topic by searching relevant databases is difficult because the searcher cannot know the full quota of relevant articles. Retrieval of the entire population of relevant studies would be possible only if a hand search of all relevant journals were undertaken, something that ideally should be avoided! During the infancy of quantitative systematic reviews, it was suggested that, in MEDLINE, researchers captured only 30% to 80% of published randomized controlled trials when they ran literature searches (Dickersin, Scherer, & Lefebvre, 1994). As indexing and technologies have continued to improve, proportions of relevant articles now consistently appear toward the upper end of this range.

More recently, a team of health service researchers at McMaster University, Canada, explored the identification of optimal permutations of search terms (filters or hedges) for retrieval of specific study types, to varying degrees of sensitivity and specificity. Literature searchers add such filters or hedges to the end of topic-related search strategies to provide another limitation by study design or study type. Members of this self-styled Hedges team performed several related studies using popular databases for qualitative searches: MEDLINE (Wong, Wilczynski, & Haynes, 2004), CINAHL (Wilczynski, Marks, & Haynes, 2007), Embase (Walters, Wilczynski, & Haynes, 2005), and PsycINFO (McKibbon, Wilczynski, & Haynes, 2006). They performed various strategies including a narrow, focused search for high sensitivity, a broad search for high specificity, and a compromise between the two. Search results were compared to the results of a thorough hand search of 64 relevant gold-standard journals to assess accuracy of the search. The Hedges team found that indexing terms for qualitative research were not useful in any database other than CINAHL; all strategies depend heavily on variations of the terms *qualitative, interview, themes*, and *experience*, with multiple-term strategies leading to improved results. This general finding was not borne out in our specific case, where the two articles exclusively picked up by our PICO search (Breedlove, 2005; Howie & Carlisle, 2005) were both derived from the CINAHL search, which should have held a higher likelihood of correct indexing for qualitative research.

Using the findings, we suggest that the SPIDER tool is a good basis for a search strategy tool that can be used more efficiently with qualitative and mixed-methods research questions in opposition to the PICO tool. We have demonstrated that the SPIDER search tool is a promising method of performing a literature search, with the higher rate of yield reducing the time the researcher spent reviewing the search results. However, two relevant articles were missed when we ran the SPIDER search strategy, although this probably identified specific problems associated with poor indexing. More work is needed to investigate the sensitivity of the SPIDER tool and to ensure that it does not eliminate articles because of poor indexing. In particular, we believe that adapting the logic that originally underpinned the SPIDER tool, so that S and PI are initially combined with "AND" and then, in turn, "AND-ed" with the three methodological terms (namely "D OR E OR R"), might prove a fruitful line of inquiry. This might particularly be the case if the searcher could aim to make the S and PI specific to the indexing language of the database, but, in contrast, to make the D, E, and R sensitive for qualitative research-related terms. Such an approach would be particularly justified, in line with the earlier methodological discussion, where the intention is to sample the most relevant qualitative research articles (as for an interpretive review) rather than to search exhaustively and comprehensively (as for an aggregative review).

If this method were supported by future testing on a wider range of qualitative topics, researchers could eventually consider the SPIDER tool as a development of PICO, in that it can also include qualitative and mixed-methods research and not just quantitative research. Future development of the "SPIDER spinning a web for retrieval" (see Figure 2) might ultimately yield an antidote to suboptimal search strategies for qualitative and mixed-methods research.

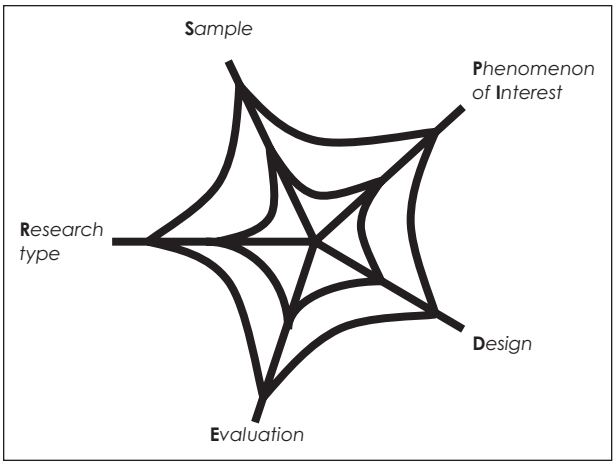

Figure 2. SPIDER: Spinning a web for retrieval

Conclusion

In this article we demonstrate the potential value of the SPIDER search strategy tool, an ongoing extension of thinking around the PICO search strategy tool. Using the SPIDER tool enabled us to search the literature in this exploratory study in a more timely and sensitive manner because of the suitability of the refined components for qualitative and mixed-methods research. However, more work is required to refine this new search strategy tool—for example, by compiling a test set of documents so that a known estimate of sensitivity can be calculated. We consider the optimal combination of specificity for the subject (topical) content and sensitivity for the methodological content form a potentially fruitful line of inquiry, particularly given recent clarification regarding differences in the intent of qualitative evidence synthesis and its quantitative counterparts. In addition, more development and testing of the SPIDER tool with a wide range of qualitative research topics are needed before it can be considered a viable alternative to PICO for retrieving qualitative research. Currently, this timely method for spinning a web for retrieval of relevant articles might make the systematic literature search process more efficient for researchers, thereby saving them valuable time by eliminating irrelevant articles. Moreover, SPIDER, albeit unintentionally, has highlighted the need for good quality indexing of qualitative articles in databases.

Authors' Note

Alison Cooke conceived the idea for the project, wrote the first draft and assisted in writing the final draft of the manuscript, helped to design the search tool, conducted the searches, and reviewed the search outcomes. Debbie Smith helped develop the project idea, assisted in writing the final draft of the manuscript, helped to design the search tool, conducted the searches, and reviewed the search outcomes. Andrew Booth helped to design the search tool, conducted the searches, and reviewed the final draft of the manuscript.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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References

Bailey, N., Brown, G., DiMarco, H., Letherby, G., & Wilson, C. (2004). Teenage pregnancy: Medical encounters. *British Journal of Midwifery, 12*(11), 680-685.

Barbour, R. (2003). The newfound credibility of qualitative research? Tales of technical essentialism and cooption. *Qualitative Health Research, 13*, 1019-1027. doi:10.1177/1049732303253331

Barnett-Page, E., & Thomas, J. (2009). Methods for the synthesis of qualitative research: A critical review. *BMC Medical Research Methodology, 9*, 59-69. doi:10.1186/1471-2288-9-59

Barroso, J., Gollop, C. J., Sandelowski, M., Meynell, J., Pearce, P. F., & Collins, L. J. (2003). The challenges of searching for and retrieving qualitative studies. *Western Journal of Nursing Research, 25*(2), 153-178. doi:10.1177/0193945902250034

Bates, M. J. (1989). The design of browsing and berrypicking techniques for the online search interface. *Online Review, 13*(5), 407-424.

Booth, A. (2001, May). *Cochrane or cock-eyed? How should we conduct systematic reviews of qualitative research?* Paper presented at the Qualitative Evidence-Based Practice Conference, Taking a Critical Stance, Coventry, UK. Retrieved from www.leeds.ac.uk/educol/documents/00001724.htm

Booth, A. (2006). Clear and present questions: Formulating questions for evidence based practice. *Library Hi Tech, 24*(3), 355-368. doi:10.1108/07378830610692127

Booth, A. (2011). Chapter 3: Searching for studies. In J. Noyes, A. Booth, K. Hannes, A. Harden, J. Harris, S. Lewin, & C. Lockwood (Eds.), *Supplementary guidance for inclusion of qualitative research in Cochrane Systematic Reviews of Interventions. Version 1*. Cochrane Collaboration Qualitative Methods Group. Retrieved from http://cqrmg.cochrane.org/supplemental-handbook-guidance

Booth, A., O'Rourke, A. J., & Ford, N. J. (2000). Structuring the pre-search reference interview: A useful technique for handling clinical questions. *Bulletin of the Medical Library Association, 88*(3), 239-246.

Breedlove, G. (2005). Perceptions of social support from pregnant and parenting teens using community-based

doulas. *Journal of Perinatal Education, 14*(3), 15-22. doi:10.1624/105812405X44691

Carroll, C., Booth, A., & Cooper, K. (2011). A worked example of "best fit" framework synthesis: A systematic review of views concerning the taking of some potential chemopreventive agents. *BMC Medical Research Methodology, 11*, 29-37. Retrieved from http://www.biomedcentral.com/1471-2288/11/29

Clarke, M. J., & Stewart, L. A. (1994). Systematic reviews: Obtaining data from randomised controlled trials: How much do we need for reliable and informative meta-analyses? *British Medical Journal, 309*(6960), 1007-1010.

Cooke, A., Mills, T. A., & Lavender, T. (2010). "Informed and uninformed decision making"—Women's reasoning, experiences and perceptions with regard to advanced maternal age and delayed childbearing: A meta-synthesis. *International Journal of Nursing Studies, 47*(10), 1317-1329. doi:10.1016/j.ijnurstu.2010.06.001

Cooper, H. M. (1998). *Synthesizing research: A guide for literature reviews* (3rd ed.). Thousand Oaks, CA: Sage.

Cox, J. E., Bevill, L., Forsyth, J., Missal, S., Sherry, M., & Woods, E. R. (2005). Youth preferences for prenatal and parenting teen services. *Journal of Pediatric and Adolescent Gynecology, 18*(3), 167-174. doi:10.1016/j.jpag.2005.03.003

Denyer, D., Tranfield, D., & Van Aken, J. E. (2008). Developing design propositions through research synthesis. *Organization Studies, 29*(3), 393-413. doi:10.1177/0170840607088020

Dickersin, K., Scherer, R., & Lefebvre, C. (1994). Identifying relevant studies for systematic reviews. *British Medical Journal, 309*, 1286-1291.

Dixon-Woods, M., Bonas, S., Booth, A., Jones, D. R., Miller, T., Sutton, A. J., . . . Young, B. (2006). How can systematic reviews incorporate qualitative research? A critical perspective. *Qualitative Research, 6*(1), 27-44. doi:10.1177/1468794106058867

Dixon-Woods, M., Cavers, D., Agarwal, S., Annandale, E., Arthur, A., Harvey, J., . . . Sutton, A. J. (2006). Conducting a critical interpretive synthesis of the literature on access to healthcare by vulnerable groups. *BMC Medical Research Methodology, 6*, 35-47. doi:10.1186/1471-2288-6-35

Evans, D. (2002). Database searches for qualitative research. *Journal of the Medical Library Association, 90*(3), 290-293.

Grayson, L., & Gomersall, A. (2003). *A difficult business: Finding the evidence for social science reviews*. London, UK: ESRC UK Centre for Evidence Based Policy and Practice. Retrieved from http://www.kcl.ac.uk/sspp/departments/politicaleconomy/research/cep/pubs/papers/assets/wp19.pdf

Hannes, K., & Lockwood, C. (2011). Pragmatism as the philosophical foundation for the Joanna Briggs meta-aggregative approach to qualitative evidence synthesis. *Journal of Advanced Nursing, 67*(7), 1632-1642. doi:10.1111/j.1365-2648.2011.05636.x.

Holloway, I., & Wheeler, S. (2002). *Qualitative research in nursing* (2nd ed.). Oxford, UK: Blackwell.

Howie, L., & Carlisle, C. (2005). Teenage pregnancy: "I felt like they were all kind of staring at me. . . ." *Royal College Midwives, 8*(7), 304-308.

Lefebvre, C., Manheimer, E., & Glanville, J. (2008). Searching for studies. In J. P. T. Higgins & S. Green (Eds.), *Cochrane handbook for systematic reviews of interventions.* Retrieved from www.cochrane-handbook.org

Lloyd-Jones, M. (2004). Application of systematic review methods to qualitative research: Practical issues. *Journal of Advanced Nursing, 48*(3), 271-278. doi:10.1111/j.1365-2648.2004.03196

Lloyd-Jones, M. (2007). Metastudy and metasynthesis of qualitative research: Overview of methods. In C. Webb & B. Roe (Eds.), *Reviewing research evidence for nursing practice: Systematic reviews* (pp. 61-72). Oxford, UK: Blackwell.

McKibbon, K. A., Wilczynski, N. L., & Haynes, R. B. (2006). Developing optimal search strategies for retrieving qualitative studies in PsycINFO. *Evaluation & the Health Professions, 29*(4), 440-454. doi:10.1177/0163278706293400

Noyes, J. (2010). Never mind the qualitative feel the depth! The evolving role of qualitative research in Cochrane intervention reviews. *Journal of Research in Nursing, 15*(6), 525-534. doi:10.1177/1744987110381696

Noyes, J., & Popay, J. (2007). Directly observed therapy and tuberculosis: How can a systematic review of qualitative research contribute to improving services? A qualitative meta-synthesis. *Journal of Advanced Nursing, 57*(3), 227-243. doi:10.1111/j.1365-2648.2006.04092

Noyes, J., Popay, J., Pearson, A., Hannes, K., & Booth, A. (2011). Qualitative research and Cochrane reviews. In J. P. T. Higgins & S. Green (Eds.), *Cochrane handbook for systematic reviews of interventions.* Retrieved from www.cochrane-handbook.org

O'Connor, D., Green, S., & Higgins, J. P. T. (2008). Defining the review question and developing criteria for including studies. In J. P. T. Higgins & S. Green (Eds.), *Cochrane handbook for systematic reviews of interventions.* Retrieved from www.cochrane-handbook.org

Papaioannou, D., Sutton, A., Carroll, C., Wong, R., & Booth, A. (2010). Literature searching for social science systematic reviews: Consideration of a range of search techniques. *Health Information and Libraries Journal, 27*(2), 114-122. doi:10.1111/j.1471-1842.2009.00863

Sandelowski, M., & Barroso, J. (2007). *Handbook for synthesizing qualitative research.* New York: Springer.

Sandelowski, M., Docherty, S., & Emden, C. (1997). Qualitative metasynthesis: Issues and techniques. *Research in Nursing and Health, 20*(4), 365-371. doi:10.1002/(SICI)1098-240X(199708)20:4<365::AID-NUR9>3.0.CO;2-E

Schardt, C., Adams, M. B., Owens, T., Keitz, S., & Fontelo, P., (2007). Utilization of the PICO framework to improve searching PubMed for clinical questions. *BMC Medical Informatics and Decision Making, 7*, 16-21. doi:10.1186/1472-6947-7-16

Shaw, R. L., Booth, A., Sutton, A. J., Miller, T., Smith, J. A., Young, B., . . . Dixon-Woods, M. (2004). Finding qualitative research: An evaluation of search strategies. *BMC Medical Research Methodology, 16*, 4-5. doi:10.1186/1471-2288-4-5

Smith, D. M., & Lavender, T. (2011). The pregnancy experience for women with a body mass index >30kg/m2: A meta-synthesis. *British Journal of Obstetrics and Gynaecology, 118*(7), 779-789. doi:10.1111/j.1471-0528.2011.02924

Smith, D. M., & Roberts, R. (2009). Young parents' perceptions of barriers to antenatal and postnatal care. *British Journal of Midwifery, 17*(10), 622-627.

Thorne, S., Jensen, L., Kearney, M., Noblit, G., & Sandelowski, M. (2004). Qualitative metasynthesis: Reflections on methodological interpretation and ideological agenda. *Qualitative Health Research, 14*, 1342-1365. doi:10.1177/1049732304269888

Tricco, A., Tetzlaff, J., & Moher, D. (2010). The art and science of knowledge synthesis. *Journal of Clinical Epidemiology, 64*(1), 11-20. doi:10.1016/j.jclinepi.2009.11.007

Villanueva, E. V., Burrows, E. A., Fennessy, P. A., Rajendran, M., & Anderson, J. N. (2001). Improving question formulation for use in evidence appraisal in a tertiary care setting: A randomised controlled trial. *BMC Medical Informatics and Decision Making, 1*, 4-12.

Walsh, D., & Downe, S. (2005). Meta-synthesis method for qualitative research: A literature review. *Journal of Advanced Nursing, 50*(2), 204-211. doi:10.1111/j.1365-2648.2005.03380

Walters, L. A., Wilczynski, N. L., & Haynes, R. B. (2005). Developing optimal search strategies for retrieving clinically relevant qualitative studies in EMBASE. *Qualitative Health Research, 16*, 162-168. doi:10.1177/1049732305284027

Wilczynski, N. L., Marks, S., & Haynes, R. B. (2007). Search strategies for identifying qualitative studies in CINAHL. *Qualitative Health Research, 17*, 705-710. doi:10.1177/1049732306294515

Wildridge, V., & Bell, L. (2002). How CLIP became ECLIPSE: A mnemonic to assist in searching for health policy/management information. *Health Information and Libraries Journal, 19*, 113-115.

Wong, S. S., Wilczynski, N. L., & Haynes, R. B. (2004). Developing optimal search strategies for detecting clinically relevant qualitative studies in MEDLINE. *MEDINFO, 11*(1), 311-316.

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