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Barriers to uptake of evidence from systematic reviews and meta-analyses: a systematic review of decision makers' perceptions

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PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	2
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	3
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	22
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	3
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	3
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	3
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	3
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	3
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	4
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	4
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	6
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	6

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	6
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	-
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	5
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	6
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Table 2
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Table 3
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	6
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	6
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	-
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	8
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	9
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	9
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	13

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Barriers to uptake of evidence from systematic reviews and meta-analyses: a systematic review of decision makers' perceptions

Authors: John Wallace, Bosah Nwosu, and Mike Clarke

ABSTRACT

Objective: To review the barriers to the uptake of research evidence from systematic reviews by decision makers.

Search strategy: We searched 19 databases covering the full range of publication years, utilised three search engines, and also personally contacted investigators. Reference lists of primary studies and related reviews were also consulted.

Selection criteria: Studies were included if they reported on the views and perceptions of decision makers on the uptake of evidence from systematic reviews, meta-analyses, and the databases associated with them. All study designs, settings, and decision makers were included. One investigator screened titles to identify candidate articles then two reviewers independently assessed the quality and the relevance of retrieved reports.

Data extraction: Two reviewers described the methods of included studies and extracted data that were summarised in tables and then analysed. Using a pre-established taxonomy, the barriers were organized into a framework according to their effect on knowledge, attitudes, or behaviour.

Results: Of 1,726 articles initially identified, we selected 27 unique published studies describing at least 1 barrier to the uptake of evidence from overviews. These studies included a total of 25 surveys and 2 qualitative studies. Overall, the majority of participants (n=10,218) were physicians (64%). The most commonly investigated barriers were lack of use (14/25), lack of awareness (12/25), lack of access (11/25), lack of familiarity (7/25), lack of usefulness (7/25), lack of motivation (4/25), and external barriers (5/25).

Conclusion: This systematic review reveals that interventions to foster uptake of evidence from reviews and meta-analyses will need to address a broad range of factors. Our review offers a differential diagnosis for why decision makers, especially physicians, do not use systematic reviews, as well as a rational approach towards improving their uptake and also a framework for future research.

INTRODUCTION

Many researchers are sceptical about the extent to which research is used.[1] One of the most common findings from health research is the failure to routinely translate research findings into daily practice. Studies can't guarantee the use of their results. While facts do not speak for themselves, studies can increase the likelihood of their use. Bridging the knowledge-to-practice gap entails multiple challenges and the process involves an evaluation of the many barriers to change.[2]

The communication of clinically important research findings is hampered by the volume and geometric growth of the medical literature. Systematic reviews address this problem. A

systematic review is a review of a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research, and to collect and analyse data from studies that are included in the review.[3] The contribution of systematic reviews is captured by a number of online databases such as The Cochrane Library.

Evidence synthesis that interprets the results of individual studies within the context of global evidence should be considered the basic unit of knowledge translation.[4] Synthesis should inform policy briefs, patient decision aids, clinical practice guidelines and clinical decision making. Failure to optimally use results from systematic reviews can lead to healthcare inefficiencies and reduced quality and quantity of life.

But the existence of systematic reviews does not ensure their dissemination and application to clinical practice and policy making. Evidence from systematic reviews has not been widely adopted by healthcare professionals.[4] A review of physicians' information-seeking behaviour found that textbooks are still the most frequently used source of information, followed by advice from colleagues.[5]

While many investigations have been conducted on the barriers to the uptake of research evidence in general, little is known specifically about the determinants of uptake of systematic review evidence in particular. In the past, there have been reviews of the barriers to adherence to clinical guidelines,[6] of the barriers to the appropriate use of research evidence in policy decisions,[1] of the barriers and facilitators to implementing shared decision-making,[7] of the barriers to improving the usefulness of systematic reviews for health care managers and policy makers[8] and lastly, of the barriers and incentives to optimal health care.[9] Here we set out to identify the barriers to uptake of evidence specifically from systematic reviews, meta-analyses and the databases that contain them, focusing on all decision makers including physicians. Such knowledge can help developers of systematic reviews, researchers and clinicians design effective interventions to improve the uptake of systematic reviews and meta-analyses.

Methods

Search strategy

We conducted a systematic review of the literature to identify barriers to evidence uptake from integrative reviews and meta-analyses. The primary researcher (JW) searched 19 databases and used 3 search engines, for articles, not limited to the English language, covering the full range of publication years available in each database up to Dec 2010 using a combination of index terms and text words derived from relevant articles previously identified. The databases included the Cochrane Library, TRIP, Joanna Biggs I.N.G, N. G. Clearing House, Health Evidence, PubMed (1950-2010), EMBASE (1980-2010), ERIC, CINAHL, PsycInfo, OpenSigle, Index to Theses in Great Britain and Ireland, and Conference Papers Index. Campbell Collaboration, Canadian Health Services Research Foundation, EPOC, KT+, McMaster University, Keenan Research Centre, and the New York Academy of Medicine. The search engines ALTA VISTA and Google scholar were also utilised. References from included primary studies and related review articles were scanned, experts in the field contacted, and bibliographies of textbooks were reviewed. The following search terms were included: obstacle, barrier, impede, utilisation, uptake, systematic review and meta-analysis.

We repeated parts of the search for the period December 2010 to February 2012 in order to identify any potentially relevant or on-going studies to be listed under 'Studies awaiting

classification' or 'On-going studies' to be used in a later update of this review. We applied the same search strategies to PubMed and EMBASE, the two most productive databases in terms of reports already identified for inclusion in the review.

Selection criteria

We included studies if they were an original collection of data. Studies containing interviews, focus groups and surveys with all decision makers were eligible. We did not restrict our search to the inclusion of studies reporting as their main objective the assessment of barriers specifically to systematic review uptake. No study design or language was excluded. Studies were included if they addressed perceived barriers to uptake of evidence specifically from systematic reviews, meta-analyses and the databases that contained them such as The Cochrane Library, The Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effectiveness, Cochrane Pregnancy and Childbirth Database, Oxford Database of Perinatal Trials, and the Reproductive Health Library. All decision makers were included.

A barrier was defined as any factor that limits or restricts complete uptake of evidence from overviews. We focused on factors that could be changed by intervention, rather than age or sex of participants.[6] In many of the articles, respondents indicated barriers via response to survey questions. For qualitative studies, major themes from focus groups or interviews identified barriers.

We reported studies that included usable data. Care was also taken to identify studies that produced multiple publications.[10] When more than one publication described a single study and each presented the same data, only the most recent publication was included. However, if more than one publication described a single study but each presented new and complementary data, both were included.

Data collection and analysis

Articles were retrieved if it appeared likely that they contained empirical data regarding barriers to uptake of evidence from systematic reviews. The first reviewer reviewed all the citations, and followed up reference lists, while the retrieved full articles were assessed by at least two reviewers (JW and BN) for inclusion in the review. Disagreements were resolved by discussion. If this were not possible, provision was made for adjudication by a third party. Studies that appeared relevant, but which were not, were included in a list of excluded studies maintained by the author (JW).

Two investigators (JW and BN) extracted data from the included studies using a data collection form. The following information was extracted from each article: description of the barriers, the percentage of respondents describing the barrier, demographics of the respondents, and study characteristics. If possible, we calculated the percentages of respondents affected by a barrier as the difference between 100% and the sum of the percentage with no opinion and those not affected.[6] A data extraction sheet was created based on a taxonomy of barriers to implementing clinical guidelines in actual practice.[6] This taxonomy had been used successfully elsewhere and has been compared well to other taxonomies.[7]

Both reviewers independently read each publication and identified the unit of text relevant to each of the main outcomes of interest. During the process, barriers were aggregated into themes and ordered according to the number of studies in which they were identified. All themes were organised into groups based on whether they affected knowledge, attitude, or

behaviour.[6] The categories are based on a model that describes an ideal, general mechanism of the knowledge, attitudes, behaviour framework.[11] Lack of familiarity and lack of awareness were grouped under the knowledge heading; lack of outcome expectancy, self-efficacy, and lack of motivation were grouped under attitudes; patient, review and environmental factors were grouped under behaviour.

Before a systematic review can affect patient outcome, it first affects knowledge, then attitudes, and finally, behaviour. Factors limiting uptake through a cognitive component were considered barriers affecting knowledge. If an affective component was involved then the barrier was regarded as affecting attitude. A restriction on ability was considered a barrier affecting behaviour. Lack of familiarity included the inability to correctly answer questions about overview content, as well as self-reported lack of familiarity. Lack of awareness was defined as the inability to correctly acknowledge systematic review existence.

Study characteristics were abstracted and included in Table 1. Methods were outlined in Table 2; the results were tabulated in Table 3.

For purposes of quality assessment, study characteristics were extracted: country of origin, year of publication, main objective of the study, design of the study, characteristics of participants, sampling strategy, response rate, and methodological approach, including data collection strategies.

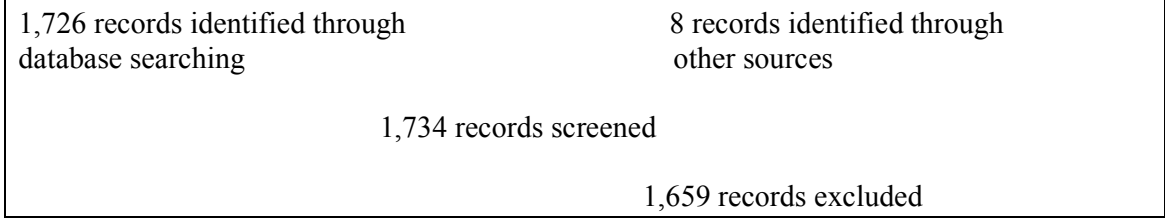
RESULTS

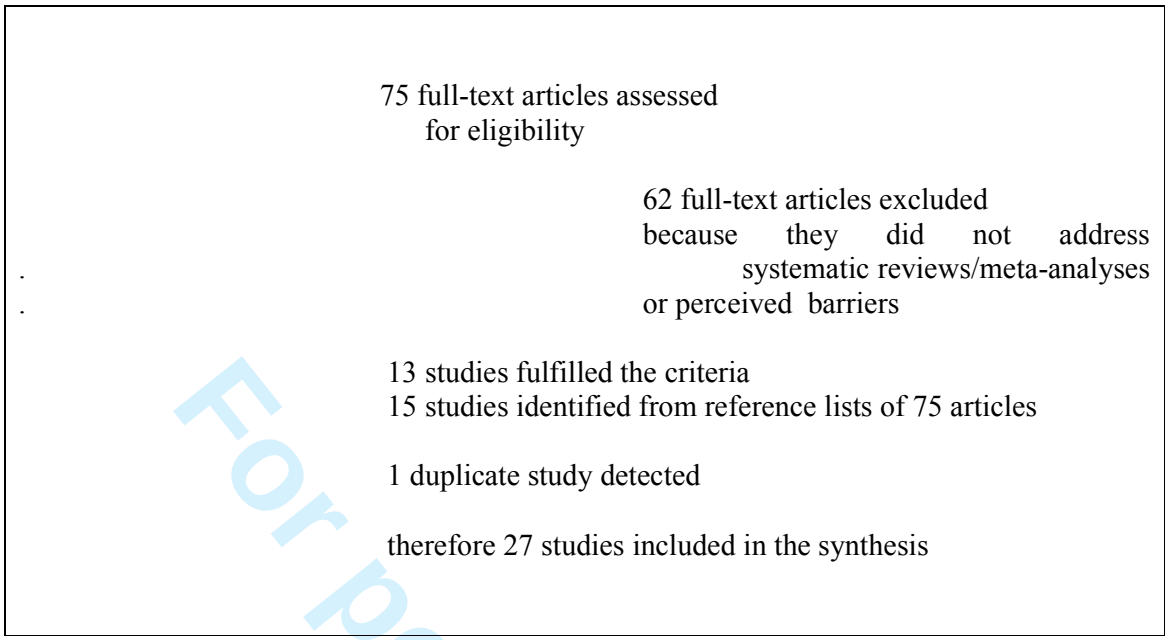
Search yield

Of 19 databases searched and three search engines utilized, there were 1,726 specific candidate articles found possibly examining barriers to uptake of evidence from systematic reviews. Some 1,651 titles were excluded after examination of the bibliographic citation. After examination of the full text of 75 articles, 13 articles fulfilled the criteria. Fifteen primary studies were detected from the reference lists of these 75 articles. A total of 28 detected reports describing 27 unique studies met inclusion criteria. A search of EMBASE and PubMed from January 2011 to February 2012, failed to detect any relevant, completed or on-going studies to be added to 'Studies awaiting classification' and 'On-going studies' tables.

The 27 included studies encompassed 2 qualitative studies, and 25 surveys asking a total of 57 questions regarding possible barriers to uptake of evidence from systematic reviews, meta-analysis, and the databases containing them. A survey was defined as at least one question to a group of decisions makers about barriers to uptake of evidence from systematic reviews. Barriers were grouped into themes: 18 derived from the surveys and an additional 10 from the qualitative studies.

Figure 1. PRISMA Flow diagram





The studies were undertaken in the UK (n=9), Canada (n=5), Australia (n=4), USA (n=3), Ireland (n=1), Holland (n=1), New Zealand (n=1), Switzerland (n=1), India (n=1), and SE Asia: Indonesia, Malaysia, Thailand, the Philippines (n=1). One country, Switzerland, surveyed participants from 78 countries. Therefore, included studies reported data from decision makers in 91 countries. Of 10,218 participants, 64% were physicians. Seventeen studies (63%) were published after the year 2000.

Comprehensiveness of Surveys

How often surveys considered the full variety of barriers to uptake was investigated. Theoretically, a survey could examine up to 7 different types of barrier.[6] Of the 25 surveys, 8 (31%) examined only one type of barrier, and the average number examined was 1.7. Of the remaining surveys, five (19%) examined 2 barriers, eight (31%) examined 3, four (15%) examined 4, and one (4%) study examined 5 barriers. None of the surveys examined 6 or more barriers.

Study Methods

The included studies were limited in terms of the quality and generalizability of their results. While all but one[12] had a well-described sampling frame, just eight of the 27 studies describe selecting a random sample of participants (Table 2). Response rates were not mentioned in two of the 27 studies (Table 2). The response rate was variable. The rate varied from 8.8% to 100% and 17 of the 27 studies describe a response rate of at least 60% (Table 2). Twenty-six studies reported the number of participants investigated, with the number varying from 16 to 1,406.

Most studies were surveys (n=25), 2 were qualitative studies with one included study using mixed methods. Data collection strategies included focus groups (n=1), individual interviews (n=1), together with mail, telephone, and web-based questionnaires (n=25).

Characteristics of Surveys

The characteristics of each study are outlined in Table 1. We found that the surveys used a heterogeneous variety of decision-making populations, based on location or speciality. They also investigated a number of review resources. The surveys looked at systematic reviews, meta-analyses, The Cochrane Library, Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effectiveness, the Reproductive Health Library, also the earlier Cochrane Pregnancy and Childbirth Database and the Oxford Database of Perinatal Trials.

The surveys displayed a wide range of the percentage of respondents reporting each barrier (Table 3).

Type of barriers

After classifying possible barriers into common themes, it was found that the 57 questions about obstacles to uptake of evidence from systematic reviews encompassed 28 barriers. The barriers affected knowledge (lack of awareness, lack of familiarity); attitudes (lack of confidence, lack of ability, lack of perceived usefulness, lack of motivation); and behaviour (review factors, environmental factors).

Barriers Identified by Studies

Lack of awareness: Eleven studies measured lack of awareness as a possible barrier. Sample size ranged from 248 to 8,100 (median, 475) and the response rate ranged from 8.8% to 90% (median, 66%). The sample size and response rate were not reported in one study.[13] The percentage of respondents reporting lack of awareness as a barrier was as high as 82% (for DARE[14]) and as low as 1% (for Cochrane Library[15]) with a median of 55%. In 9 (82%) of the 11 studies, at least 10% of the respondents cited lack of awareness as a barrier.

Lack of Familiarity: Seven surveys measured lack of familiarity as a possible barrier. Sample size ranged from 60 to 8,100 (median, 531) and the response rate ranged from 8.8% to 100% (median, 63%). The percentage of respondents suggesting lack of familiarity as a barrier was as high as 98% (DARE[14]) and as low as 19% (systematic reviews[14]) with a median of 70%. In 7 (100%) of the 7 surveys, at least 10% of the respondents cited lack of familiarity as a barrier.

Lack of access: Eleven surveys measured lack of access as a possible barrier. Sample size ranged from 60 to 3,087 (median, 440), and the response rate ranged from 44% to 100% (median, 71%). The sample size and response were not reported in one study.[13] The percentage of respondents identifying lack of access as a barrier was as high as 95% (lack of easy access to Cochrane Library[16]) and as low as 3% (lack of access to Cochrane Library[17]), with a median of 55%. In 10 (91%) of the 11 surveys, at least 10% of the respondents cited lack of access as a barrier.

Lack of motivation: Four studies measured lack of motivation as a possible barrier. Sample size ranged from 98 to 8,100 (median, 1,305). The percentage of respondents identifying this barrier was as high as 10% (Oxford Database of Perinatal Trials[18]) and as low as 2% (meta-analysis[19]) with a median of 3.6%. In none of the surveys did more than 10% of respondents report lack of motivation as a barrier.

Lack of usefulness: Seven surveys measured lack of perceived usefulness as a possible barrier. Sample size ranged from 60 to 491 (median, 350), and the response rate ranged from 63% to 100% (median, 87%). The sample size and response rate were not reported in 1 of the

studies.[13] The percentage of respondents identifying lack of usefulness as a barrier was as high as 95% (systematic reviews[14]) and as low as 7% (Cochrane Library[15]) with a median of 16.5%. In six of the seven surveys, at least 10% of the respondents cited lack of usefulness as an issue.

External barriers: Five studies investigated 10 external barriers to overview uptake. The external barriers investigated were environment-related in 5 studies and also systematic review-related in one study, with no patient-related barriers cited. More than 10% of respondents cited lack of resources and lack of positive policy climate[20], lack of workshop attendance[13], and lack of training in Cochrane Library use[15, 17] as possible environmental barriers. Lack of time was not cited by more than 10%.[15] More than 10% of respondents cited the limited range of topics covered by the Cochrane Library[15] as a possible overview barrier.

Lack of use: Fourteen surveys looked at lack of use of systematic reviews. Sample size ranged from 150 to 8,100 (median, 490) and the response rate ranged from 8.8% to 100% (median, 63%). The percentage of respondents reporting lack of use was as high as 99% (DARE[14)] and as low as 18% (Cochrane Library[13]) with a median of 78%. In 14 (100%) of the 14 surveys at least 10% of the respondents did not use overviews or the databases containing them.

Qualitative studies

Two qualitative studies[21, 22] cited six important barriers to evidence uptake from systematic reviews. The two studies emphasised lack of accessibility. They also cited a lack of training in the purpose and methodology of systematic reviews as a barrier to uptake. Content issues such as lack of relevance, lack of implications for practice, and lack of implementation strategies were also cited. A deficient understanding of the information needs of the target audience of systematic reviews was also raised as a major barrier.

One study had a qualitative element exploring the perceived weaknesses of the Cochrane Library.[15] Participants suggested as barriers the limited range of topics and clinical areas covered, poor access, the narrow focus on RCTs and meta-analysis, difficulty of use, lack of regular update, poor promotion, and the time required to use and search the database.

COMMENT

Uptake of evidence from systematic reviews is crucial in translating pre-appraised evidence into practice. However, a variety of barriers undermine this process. Quantification of themes allows exploration of variation between studies. Lack of awareness and lack of familiarity affect stakeholder's knowledge of systematic reviews. In terms of attitudes, lack of outcome expectancy in terms of trust, usefulness and confidence are also potential barriers. Despite adequate knowledge and attitudes, external barriers can affect a person's ability to use reviews and meta-analyses.

Barriers to Systematic Review Uptake

Lack of Awareness: Although many overview resources, such as The Cochrane Library, have achieved widespread awareness, in 82% of studies more than 10% of the respondents cited lack of awareness of systematic reviews or the databases that contained them, as a barrier to uptake.

Lack of familiarity: Casual awareness does not guarantee familiarity with systematic reviews or the ability to use them. Of the 25 surveys that measured awareness or familiarity, only 4 (14%) of the surveys measured both awareness and familiarity. Lack of familiarity was more common than lack of awareness of some databases containing systematic reviews.[14]

Lack of access: Accessible databases are an essential resource. Access impacts on awareness and familiarity. The percentage of respondents identifying lack of access as a barrier was as low as 3% (lack of access to Cochrane Library[17]). Clearly access is improving. However, in 10 (91%) of the 11 surveys, at least 10% of the respondents still cited lack of access as a barrier.

Lack of Motivation: Decision makers may not be able to overcome the inertia of previous practice and they may lack the motivation to use evidence from systematic reviews. This barrier has not been as widely investigated as others. Only four studies measured lack of motivation as a possible barrier. In none of the surveys did more than 10% of respondents report lack of motivation as a barrier. This is in contrast to the results of the Cabana study that indicated that lack of motivation is a significant barrier to adherence to clinical practice guidelines.[6]

Lack of usefulness: Seven surveys measured lack of perceived usefulness as a possible barrier. The percentage of respondents identifying lack of usefulness as a barrier was as high as 95% (systematic reviews[14]) and as low as 7% (Cochrane Library[15]) with a median of 16.5%. In all of the seven surveys addressing this issue, at least 10% of the respondents cited perceived lack of usefulness as a problem. More than 10% of some participants did not find The Cochrane Library useful for informing clinical decision making, guiding research, and finding references.[15]

External barriers: Appropriate knowledge and attitudes are necessary but not sufficient for uptake of evidence from systematic reviews. There may be review, patient, or environmental barriers that eventually can affect motivation to use this form of evidence. Content issues such as lack of relevance, lack of implications for practice, lack of implementation strategies[22] and the limited range of topics covered in systematic reviews[15] can be barriers. No patient-related barriers, such as inability to reconcile patient preferences with review evidence, were highlighted. More than 10% of respondents cited lack of resources[20], lack of appropriate policy climate[20], and lack of training in systematic review or database searching[17] as possible environmental barriers. Interestingly, lack of time did not emerge as a major barrier.

Lack of use: The practical usage of systematic reviews should lead to improved knowledge and attitudes to this form of pre-appraised evidence. However, in all of the 14 surveys that looked at this issue, at least 10% of the respondents did not use overviews or the databases containing them, with the percentage of respondents reporting lack of use as high as 99%.[14]

Limitations

The strengths of this study include an extensive and systematic literature search. Explicit inclusion criteria and a transparent approach to collecting and presenting data from the included studies were also used. Every included study was appraised by at least two of the authors. The limitations of our review largely reflect the limitations of the literature reviewed.

All the 27 included studies, except the two qualitative studies, were surveys using closed-ended questions with the barriers addressed dependent on investigator selection. A fear of being outside a consensus for instance, was not specifically investigated as a barrier. It is also possible that a different taxonomy used to content–analyse the data may have modified our results. But the taxonomy used here compares well to others.[23]

Because much of the research in the social sciences is poorly indexed in electronic databases, relevant studies may have been missed. Searching the reference lists of related studies yielded additional studies and we did show that some barriers were consistent across a large number of reports.

Another defect of the investigation is the use of participant self-ratings rather than objective, criterion-based assessments. The surveys depend on decision maker's perceptions and views. The primary studies were not an audit of actual practice. Self-rating can overestimate the actual understanding of terms such as 'meta-analysis' and the possibility of social-desirability bias needs to be considered. Whether an obstacle is real or perceived may affect the type of intervention needed to overcome the barrier.

Some of the included studies were limited with respect to sampling and generalizability. Some surveys were small and used non-random samples confined to specific groups, inhibiting the extent to which the results can be generalised.[24] A well-described sampling frame and a good response rate are important.[25] A low response rate in some of the surveys increases the potential for selection bias. A poor response means that the external validity of the studies can be questioned as it increases the impact of non-responder bias in the survey results.[26] However, by including all types of decision makers our systematic review allows a better understanding of how health-care system variation impacts on review uptake.

Implications

This analysis offers a differential diagnosis of why decision makers may be reluctant to use systematic reviews. A number of the barriers already cited by Cabana and colleagues[6] to guideline adherence were identified, though time constraints as a barrier were not identified often. The results of this review have a number of implications for systematic review uptake in particular and research uptake in general.

Despite the high regard in which systematic reviews and The Cochrane Library are held, there are a variety of barriers to systematic review uptake, which include lack of awareness, lack of familiarity, lack of access, lack of perceived usefulness, limited actual use in practice and finally, a number of external barriers to do with systematic review content, presentation, and wider organisational factors. Few studies however, consider the full variety of barriers that must be overcome to achieve enhanced uptake. Some 27 studies were identified containing 25 surveys investigating systematic reviews. Of the 25 surveys, 8 (31%) examined only one type of barrier, and the average number of barriers examined was 1.7. By not considering the full variety of barriers, interventions to improve use are less likely to address all the important factors impacting on systematic review uptake and, as a result, are less likely to be successful. Future research needs to address a fuller range of obstacles. However, given the diversity of the included studies, the range of decision makers interviewed and the context in which they worked, it is striking that some factors were identified as frequently as they were.

Clinical guidelines represent a well-accepted tool for acquiring pre-appraised evidence. However, awareness of other common evidence-based resources, such as systematic reviews and the databases containing them, appear to be limited and the self-reported understanding of related concepts reflected a potential deficit in the ability of many decision makers to critically appraise the literature.[19] More emphasis on promoting an enhanced understanding of review concepts and terminology is required.

Access to The Cochrane Library is crucial to support the scientific paradigm now advocated in healthcare.[27] Connectivity appears to have increased[17] but access and use of evidence databases can be improved. Even different professionals working in the same clinical setting can have different levels of access to the same database, a topic meriting further investigation.[17] We also need to enhance awareness, familiarity and understanding of systematic reviews. Strategies to assist those least likely to use Cochrane databases may help our collective efforts towards evidence-based practice.[25] If most of those who have access to the database then go on to actually use the Cochrane Library then access may be an important, addressable issue.

Respondents who perceived the reviews as being easy to use were three times more likely to use the reviews than those who did not.[28] Respondents who expected to use a systematic review in the future were much more likely to have used a systematic review in the past.[28] So not using systematic reviews and not perceiving them as easy to use, are significant barriers to their practical use.

Conclusion

It has been suggested that strategies to promote change in clinical practice are more likely to be successful if based on an analysis of barriers and facilitators specific to the context.[29] To our knowledge, this study represents the first systematic review of a large group of decision makers on barriers to the uptake of evidence from systematic reviews, meta-analyses and their related databases. This study attempted to pull together the views of 10,218 decision makers from 91 countries, of whom 64% were physicians. From the 27 primary studies included in this systematic review, it is apparent that the barriers exist across continents and disciplines.[30]

The findings here have immediate and practical relevance for organisations such as universities, government agencies, and speciality colleges that are trying to improve access to the best available evidence and promote its use. These findings provide a useful foundation on which to plan future interventions to enhance the uptake of evidence from systematic reviews among physicians, leading to improved care for the individual patient.

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Competing interests

All authors declare that they have no conflicting interests.

All authors have completed the Unified Competing Interest form and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

The Corresponding Author has the right to grant on behalf of all authors and does grant on behalf of all authors, an exclusive licence (or non-exclusive for government employees) on a

Table 1 Characteristics of included studies

Year Published, Country	Objective	Design	Participants	Date Conducted
1. Wilson, P. Watt, I. and Hardman, P. 2001(15) UK	To determine attitudes on the importance of effectiveness information	Postal questionnaire	338 Medical directors	1999
2. Paterson -Brown et al 1995 (18) UK	To establish the availability of meta-analytic overviews and to find out how obstetricians keep up to date.	Telephone Survey	98 Obstetricians	1993
3. Hanson, Bhandari, Audige, . and Helfet, 2004 (35) Switzerland	To determine current understanding of study methodology and critical appraisal.	Questionnaire Self-administered	532 Surgeons and allied professionals from 78 countries	2002
4. Poolman et al. 2007 (36) Holland	They examinedb perceptions and competence in EBM	Postal survey	366 Orthopedic Surgeons	2005
5. Sur et al. 2005 (19) USA	Investigated the attitudes of urologists toward EBM	Web-based survey	714 Urologists	2005
6. Dahn et al.	To investigate the attitudes of urologists	Mail survey	889 Urologists	2006

2009(26) USA	to EBM			
7. McAlister et al. 1999) Canada	To assess the attitudes of general internists to EBM.	Postal Survey	294 Physicians	1997
8. Wilson et al 2001(16) UK	To identify current methods of making research evidence accessible	Postal survey	1406 General practitioners	1999
9. Young, J and Ward, J. 2001(12) Australia	Examine views about EBM	Postal Survey and Semi-structured Interviews	60 GPs	1999
10. McCaw et al 2007(38) Ireland	Gain an insight into the use of Internet	Postal survey	542 Community pharmacist (178) GPs (364)	2005
11. Kerse, N et al. 2001(25) NZ	Access to Internet and Cochrane Library	Cross-sectional postal and fax survey	381 GPs	1999-2000
12. McColl et al. 1998(14) UK	To determine the attitude to EBM and perceived usefulness of databases	Postal questionnaire	302 GP principals	1997
13. Bennett	To find out about	Postal questionnaire	649	2000

et al. 2003(24) Australia	attitudes to EBP and implementation barriers		Occupational Therapists	
14. Young and Ward 1999(27) Australia	To determine awareness and use of the Cochrane Library and access to the Internet	Postal Questionnaire	311 General practitioners	1997
15. Prescott et al. 1997(31) UK	To establish the awareness of research evidence	Self-administered, postal questionnaire survey	800 GPs	1996
16. Jordans et al. 1998(32) Australia	To determine the proportion who report using systematic reviews	Cross-sectional telephone survey	224 neonatologists obstetricians	1995
17. Ciliska, et al. 1999(41) Canada	To gain an understanding of research needs, perceptions of barriers to research utilisation, and attitudes towards systematic reviews	Telephone questionnaire survey	226 decision makers in public health Included doctors	NK
18. Olatunbosun et al. 1998(33) Canada	To examine views of EBM	Self-administered, Two-page questionnaire	190 physicians in obstetric practice	1996
19. Melnyk et al. 2004(30) USA	Describe major barriers and facilitators to EBP.	Limited survey	160 nurses	2003
20. Gavgani, V. and Mohan, 2008(34) India.	Directed at exploring attitudes towards EBM	Survey method	98 physicians	2008

21. Wilson, et al. 2003(17) UK	To assess the awareness and use of NHSnet	Postal survey questionnaire	1364 GPs: 441 Nurses: 325 Practice Managers: 556	2001
22. Carey, et al. 1999(39) UK	To determine the attitudes of towards the practice of EBM	Postal questionnaire	139 psychiatrists	1998
23. Lawrie et al. 2000(40) UK	To examine attitudes to evidence - based psychiatry	survey postal	93 senior psychiatrists	NK
24. Hyde et al. 1995(42) UK	To examine use of Cochrane Pregnancy and Childbirth Database	postal survey	274 subscribers to CPCD included doctors	1994
25. Martis et al. 2008(13) Asia	The aim was to assess current knowledge of evidence-based practice	survey postal	660 health care professionals including doctors	2005
26. Dobbins, et al. 2007(22) Canada	The purpose was to identify preferences for the transfer and exchange of research knowledge.	Semi-structured interviews	16 decision-makers included a doctor	2001
27. Dobbins, et al.	To discover public health decision	One-hour focus groups	46 Policy makers	2002- 2003

2004(21) Canada	makers' preferences for content, format, and channels for receiving research knowledge	included doctors

Table 2 Study methods

Study.	Sample frame	Response rate	Measurement of use of evidence
1. Wilson et al. 2001(15)	Purposive sample of 491 Medical directors Well-described sample	(69%) 338/491	Reported use
2. Paterson-Brown et al. 1995(18)	Purposive sample of 98 obstetricians Well-described sample	(100%) 98/98	Reported use
3. Hanson et al. 2004(35)	Purposive sample of 1,064 surgeons/others Well-described sample	(50%) 532/1,064	Reported use
4. Poolman et al. 2007(36)	Purposive sample of 611 orthopaedic surgeons Well-described	(60%) 366/611	Reported use
5. Sur et al. 2006(19)	Purposive sample of 8,100 urologists Well-described sample frame	(8.8%) 714/8,100	Reported use
6. Dahm et al. 2009(26)	Random sample of 2000 urologists Well-described sample frame	(45%) 889/2000	Reported use
7. McAlister	Purposive	(59%)	Reported use

et al. 1999(37)	sample of 294 general Physicians. Well-described sample frame	294/521	
8. Wilson et al. 2001(16)	Purposive sample of 3,087 individuals Well-described sample frame Primary care	(45%) 1,406/3,087	Reported use
9. Young, and Ward 2001(12)	Sample of, 60 GPs Sampling frame not described	**(**100%) 60/60	Reported use
10. McCaw et al. 2007(38)	Sample of 1081 GPs and 522 pharmacists Well-described sample frame	(34%) 542/1603	Reported use
11. Kerse et al. 2001(25)	Random Sample of 459 GPs Well-described sample frame	(83%) 381/459	Reported use
12. McColl et al. 1998(14)	Random Sample of 452 GPs Well-described sample frame	(63%) 302/452	Reported use
13. Bennett et al. 2003(24)	Proportional random sample of 1491 occupational therapists	(44%) 649/1491	Reported use

	Well-described sampling frame		
14. Young and Ward, 1999(27)	Random sample of 428 GPs Well-described sampling frame	(73%) 311/428	Reported use
15. Prescott et al. 1997 (31)	Random sample of 800 GPs	(62%) 501/800	Reported use
	Well-described sample frame		
16. Jordans et al. 1998(32)	Random sample of 145 Obstetricians and 104 neonatologists Well described Sample	(90%) 224/248	Reported use
17. Ciliska et al. 1999(41)	277 who met inclusion criteria of decision makers Well-described sample	(87%) 242/277	Reported use
18. Olatunbosun et al. 1998(33)	Random sample of 190 family physicians and obstetricians Well-described sample	(76%) 148/190	Reported use
19. Melnyk et al. 2004(30)	'Convenient' sample Well described sample	(100%) 160/1600	Reported use
20. Gavgani And	Random sample	(65%) 98/150	Reported use

Mohan, 2008(34)	Well-described sample		
21. Wilson et al. 2003 (17)	All GPs in defined area. Well-described sample	(44%) 1364/3090	Reported use
22. Carey and Hall, 1999(39)	All psychiatrists in a defined area Well-defined sample	(64%) 139/216	Reported use
23. Lawrie et al. 2000(40) .	All in a defined area Well-described sample	(76%) 93/123 but just 22/123 (17%) contributed to this review	Reported use .
24. Hyde et al. 1995(42)	All subscribers to CPCD Well-described sample	71% 274/387	Reported use
25. Martis et al. 2008(13)	All in a defined area Well-described sample	NK	Reported use
26. Dobbins et al. 2004(21)	Purposeful sample Well-described sample	46/60 (77%)	Reported use
27. Dobbins et al 2007(22)	Purposeful sample Well-described sample	16/NK	Reported use

Table 3. Barrier Descriptive Findings

Barrier category	Barrier Descriptive
Knowledge barriers	Eleven studies measured lack of awareness as a possible barrier. The percentage of respondents reporting lack of awareness as a barrier was as high as 82% and as low as 1%, with a median of 55%. Eleven surveys measured lack of access as a possible barrier. The percentage of respondents identifying lack of access as a barrier was as high as 95% and as low as 3%, with a median of 55%. Seven surveys measured lack of familiarity as a possible barrier. The percentage of respondents suggesting lack of familiarity as a barrier was as high as 98 and as low as 19%, with a median of 70%.
Attitudinal barriers	Seven surveys measured lack of perceived usefulness as a possible barrier. The percentage of respondents identifying lack of usefulness as a barrier was as high as 95% and as low as 7%, with a median of 16.5%. Four studies measured lack of motivation as a possible barrier. The percentage of respondents identifying this barrier was as high as 10% and as low as 2% with a median of 3.6%.
Behaviour barriers	Five studies investigated 10 external barriers to overview uptake. More than 10% of respondents cited lack of resources, lack of positive policy climate, lack of workshop attendance, and lack of training as possible environmental barriers. Fourteen surveys looked at lack of use of overviews. The percentage of respondents reporting lack of use was as high as 99% and as low as 18% with a median of 78%.

PROTOCOL

Barriers to uptake of evidence from systematic reviews and meta-analyses: a systematic review of decision makers' perceptions

Authors: John Wallace**,** Bosah Nwosu, and Mike Clarke

Abstract

This is the protocol for a systematic review. The objectives are as follows:

1. To review all studies identifying barriers to uptake of evidence from systematic reviews, meta-analyses and the databases associated with them.
2. To assess the methodological quality of these studies.
3. To perform a systematic review of the evidence in this area.

Background

The slow and haphazard process of translating research findings into clinical practice compromises the potential benefits of clinical research. The need for effective knowledge

transfer in clinical practice is essential. However, to date, there is a consensus among the research community that most efforts in knowledge translation at a clinical level have met with little success.[1]

A systematic review is a review of a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research, and to collect and analyse data from studies that are included in the review.[2] The increased uptake of evidence from systematic reviews is advocated because of their potential to improve the quality of decision making for patient care. Systematic reviews can do this by decreasing inappropriate clinical variation and quickly expediting the application of current, effective advances to everyday practice. However, research suggests that evidence from systematic reviews has not been widely adopted by health professionals. Increasing uptake of systematic reviews and improving awareness of the advantages that the technique can bring to the field of healthcare is a major challenge.

Barriers are factors that limit or restrict uptake of research evidence in clinical practice.[3] Implementation researchers, educators, policy makers, and clinicians want to know the identity of barriers to knowledge use in healthcare contexts and also how to address them. There are specific challenges associated with the assessment of barriers. Many lessons have been learned from previous research in this area on how to address barriers to knowledge use. Cabana and colleagues identified a variety of barriers to physician adherence to clinical practice guidelines and they organised the barriers in terms of their impact on knowledge, attitudes, and physician behaviour.[3]

Context: Despite wide promulgation, systematic reviews have had limited effect on changing decision makers' behaviour. Little is known about the process and factors inhibiting the uptake of knowledge in response to exposure to a systematic review.

Objective: To identify barriers to evidence uptake from systematic reviews, meta-analyses, and their associated databases.

Search methods for identification of studies

The Cochrane Library, Medline, Embase, PsycInfo, and other electronic resources, nineteen in total, will be searched, with a special emphasis on grey literature and knowledge translation research. The reference lists from primary studies identified will be searched and also the references from related overviews. The reviewers will identify additional candidate articles by reviewing the bibliographies of articles retrieved from the search. Experts in the field will be contacted. Terms to be used will include systematic reviews, overviews, meta-analysis, and reviews. Other search terms utilised will be barriers, obstacles, impairments, knowledge translation, knowledge uptake, knowledge utilisation, and decision making.

Data collection and analysis

Articles will be included that examined at least one barrier to knowledge uptake from systematic reviews, meta-analyses, or the databases that contain them. A barrier will be defined as any factor that limits or restricts complete knowledge uptake from an overview. It is proposed to focus on barriers that could be changed by an intervention rather than age or gender. Respondents can identify barriers via responses to survey questions. For qualitative studies, major themes from focus groups or interviews could also identify barriers. All decision makers will be included.

One investigator (JW) will screen titles and abstracts, and full bibliographic citations to identify candidate articles. Two investigators (JW and BN) will then independently review the full text to exclude articles that will not meet the inclusion criteria. Differences will be resolved by discussion and consensus.

Data Extraction:

Data extraction will follow three steps. Firstly, two investigators will abstract the following information from each article: description of the barrier, the percentage of respondents describing the barrier, demographics of the respondents, and also study characteristics including sample size and response rate. Differences will be resolved by discussion and consensus. Secondly, the barriers will be grouped into common themes. Thirdly, the barriers will be organised into groups based on the knowledge, attitudes, behaviour framework.[4] Before an integrative review can affect patient outcomes, it must first affect health professional knowledge, then attitudes, and finally behaviour. Factors impacting on cognition, affect and behaviour will be considered as potential barriers. A survey will be defined as having at least one question to a group about potential barriers to knowledge uptake from a systematic review, a meta-analysis, or the databases containing them.

Assessment of risk of bias

Important flaws in individual studies such as a lack of random selection of participants, inadequate description of the sample frame, and a poor response rate will be described. For purposes of quality assessment, study characteristics will be extracted by two investigators: country of origin, year of publication, main objective of the study, design of the study, characteristics of participants, sampling strategy, response rate, and methodological approach, including data collection strategies. Differences in assessment of risk of bias will be resolved by consensus or consultation with a third party (MC). Publication bias will be minimised by the extensive search strategy.

Synthesis

We intend to bring together findings from different study designs within different methods and approaches. It is not expected that it will be possible to carry out a meta-analysis due to the high degree of anticipated heterogeneity across settings, participants, and data collection methods. A narrative synthesis with appropriate tabulation is anticipated.

The type of barrier will be tabulated, together with the comprehensiveness of surveys. How often surveys considered the full variety of barriers to knowledge uptake will be indicated. The number and characteristics of the surveys examining each barrier will be documented. The targeted populations and their location will be identified. The sample size, method of selection, and response rate will also be reported. The percentage of respondents identifying a particular barrier will also be listed. Tables will be completed outlining the study characteristics, methods and results.

Evidence synthesis is a process of combining evidence from individual studies to create a new understanding by comparing and analysing concepts and findings from different sources of evidence with a focus on the same topic of interest. The aim is to identify and extract evidence, categorise the evidence, and combine the categories to develop synthesized findings. The overall objective is to build an explanation of why people do not use knowledge from systematic reviews.

Excluded studies will be listed in a 'Characteristics of excluded studies' table with a succinct summary of why studies were excluded. On-going studies and studies awaiting classification if found will be listed.

A summary of the main results will be reported together with an assessment of the overall completeness and applicability of the evidence, together with key methodological limitations.

Aim: We are interested in improving the relevance and utility of systematic reviews. The aim of the review outlined here is to identify barriers to uptake of evidence from systematic reviews and meta-analyses. The objective is also to offer a differential diagnosis for why decision makers do not use knowledge from systematic reviews as well as providing a rational strategy aimed at improving knowledge uptake from this important source of pre-appraised, integrated evidence, together with a frame work for future research.

Potential conflict of interest
None known

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4. Woolf SH. Practice guidelines: a new reality in medicine, III: impact on patient care. Arch Intern Med. 1993;153: 2646-2655.

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Barriers to uptake of evidence from systematic reviews and meta-analyses: a systematic review of decision makers' perceptions

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PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	2
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	3
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	22
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	3
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	3
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	3
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	3
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	3
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	4
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	4
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	6
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	6

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	6
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	-
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	5
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	6
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Table 2
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Table 3
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	6
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	6
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	-
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	8
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	9
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	9
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	13

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Barriers to uptake of evidence from systematic reviews and meta-analyses: a systematic review of decision makers' perceptions

Authors: John Wallace, Bosah Nwosu, and Mike Clarke

ABSTRACT

Objective: To review the barriers to the uptake of research evidence from systematic reviews by decision makers.

Search strategy: We searched 19 databases covering the full range of publication years, utilised three search engines, and also personally contacted investigators. Reference lists of primary studies and related reviews were also consulted.

Selection criteria: Studies were included if they reported on the views and perceptions of decision makers on the uptake of evidence from systematic reviews, meta-analyses, and the databases associated with them. All study designs, settings, and decision makers were included. One investigator screened titles to identify candidate articles then two reviewers independently assessed the quality and the relevance of retrieved reports.

Data extraction: Two reviewers described the methods of included studies and extracted data that were summarised in tables and then analysed. Using a pre-established taxonomy, the barriers were organized into a framework according to their effect on knowledge, attitudes, or behaviour.

Results: Of 1,726 articles initially identified, we selected 27 unique published studies describing at least 1 barrier to the uptake of evidence from overviews. These studies included a total of 25 surveys and 2 qualitative studies. Overall, the majority of participants (n=10,218) were physicians (64%). The most commonly investigated barriers were lack of use (14/25), lack of awareness (12/25), lack of access (11/25), lack of familiarity (7/25), lack of usefulness (7/25), lack of motivation (4/25), and external barriers (5/25).

Conclusion: This systematic review reveals that strategies to improve uptake of evidence from reviews and meta-analyses will need to overcome a wide variety of obstacles. Our review describes the reasons why knowledge users, especially physicians, do not call on systematic reviews. This study can inform future approaches to enhancing systematic review uptake and also suggests potential avenues for future investigation.

INTRODUCTION

Many researchers are worried about the extent to which research knowledge is utilised.[1] An important finding from health research is the limited success in routinely transferring research knowledge into clinical practice. Studies can't ensure the utilisation of their results. While evidence does not speak for itself, researchers can increase the likelihood of their research results being used. Tackling the knowledge-to-practice deficit is challenging and entails an investigation of the numerous obstacles to knowledge uptake.[2]

The transfer of important clinical knowledge is impeded by the amount and also the on-going growth of the biomedical literature. Pre-appraised, integrative reviews diminish this problem. A systematic review is a review of 'a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research, and to collect and

analyse data from studies that are included in the review'.[3] The contribution of systematic reviews to the research literature is seen in a range of bibliographic databases such as The Cochrane Library.

A systematic review that integrates the findings of discrete studies against the background of global evidence can be considered the basic unit of evidence transfer.[4] Synthesis should help with policy formulation, the development of clinical practice guidelines, as well as informing routine decision making in clinical practice. Failure to use the findings from systematic reviews and meta-analyses can reduce healthcare efficiency and compromise quality of life.

But the mere existence of reviews does not ensure their dissemination and their application to routine practice and policy formulation. The uptake of evidence from systematic reviews has been inconsistent.[4] When unsure about diagnostic and management issues, physicians routinely consult with a colleague or read a text.[5]

While many investigations have been conducted on the barriers to the uptake of research evidence in general, little is known specifically about the determinants of uptake of systematic review evidence in particular. In the past, there have been reviews of the barriers to adherence to clinical guidelines,[6] of the barriers to the appropriate use of research evidence in policy decisions,[1] of the barriers and facilitators to implementing shared decision-making,[7] of the barriers to improving the usefulness of systematic reviews for health care managers and policy makers[8] and lastly, of the barriers and incentives to optimal health care.[9]

Systematic reviews were the focus of this investigation, rather than the more commonly investigated clinical practice guidelines or individual, primary studies. Systematic reviews are based on primary research while clinical practice guidelines are an amalgam of clinical experience, expert opinion, patient preferences, and evidence. Systematic reviews are a scientific exercise aimed at generating new knowledge and provide a summary of relevant primary research. In this way they can help keep us current. Systematic reviews have a distinct development and scientific purpose that differs from both guidelines and primary research.

Many factors contribute to the varying uptake of evidence in general.[10] These include financial obstacles, the sheer volume of research evidence, and the difficulties in applying global evidence in a local clinical context.[11] Other barriers include limited time and awareness of evidence sources, limited critical appraisal skills and the relevance of research findings.[12] Given the considerable differences between systematic reviews, primary research, and clinical practice guidelines, we set out specifically to identifying the barriers to uptake of pre-appraised, integrative reviews and meta-analyses.

What are the barriers to the uptake of evidence from systematic reviews, meta-analyses and the databases that contain them? Here we were concerned with all decision makers, including physicians, policy makers, patients and nursing staff. Such barrier identification can aid the development of effective strategies to improve the uptake of systematic reviews and meta-analyses by decision makers. Interventions to improve the use of systematic reviews for clinical and commissioning decision making are currently being investigated.[11]

Methods

Search strategy

We conducted a systematic review of the literature to identify barriers to evidence uptake from pre-appraised, integrative reviews and meta-analyses. The primary researcher (JW) searched 19 databases and used 3 search engines, for articles, not limited to the English language, drawing on the entire range of publication years covered in each database up to Dec 2010 using a combination of index terms and text words identified from previously identified, relevant articles. The databases included The Cochrane Library, TRIP, Joanna Biggs I.N.G, National Guideline Clearing House, Health Evidence, PubMed (1950-2010), EMBASE (1980-2010), ERIC, CINAHL, PsycInfo, OpenSigle, Index to Theses in Great Britain and Ireland, and Conference Papers Index. Campbell Collaboration, Canadian Health Services Research Foundation, EPOC, KT+, McMaster University, Keenan Research Centre, and the New York Academy of Medicine. The search engines ALTA VISTA and Google scholar were also utilised. References from included primary studies and related review articles were scanned, experts in the field contacted, and bibliographies of textbooks were reviewed. The following search terms were included: obstacle, barrier, impede, utilisation, uptake, systematic review and meta-analysis.

We repeated aspects of the search for the period December 2010 to June 2012. The aim was to identify any further relevant or on-going studies to be included in 'Studies awaiting classification' or 'On-going studies' that could be used in a later update of this systematic review. We applied similar search strategies to PubMed and EMBASE, the two most productive bibliographic databases in terms of studies already identified for inclusion in the review.

Selection criteria

We included studies if they presented an original collection of data. Studies containing interviews, focus groups and surveys with all decision makers, such as doctors, nurses, occupational therapists, policy makers and patients, were eligible. Selection criteria did not specify that the inclusion of studies was restricted to those reporting, as their main purpose, the identification of obstacles specifically to systematic review uptake. No study design or language was excluded. Studies were included if they addressed perceived barriers to uptake of evidence specifically from systematic reviews, meta-analyses and the databases that contained them such as The Cochrane Library, The Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects, Cochrane Pregnancy and Childbirth Database, Oxford Database of Perinatal Trials, and the Reproductive Health Library.

A barrier was defined as any factor that impedes or obstructs uptake of evidence from systematic reviews. Barriers to evidence uptake can negatively impact on access, awareness, familiarity, intellectual adoption, and actual use of systematic reviews. Barriers can also limit the positive influence of current systematic review results on patient care. We focused on factors that could be altered or overcome rather than the gender or age of decision makers.[6] In many of the reports, participants specified obstacles via response to survey questions. For qualitative studies, major themes from focus groups or interviews identified the obstacles to uptake.

Special care was taken to identify studies that appeared in multiple publications.[13] When more than one report described a specific study and each presented the same data, then the most recent publication was included for analysis. However, if more than one publication described a single investigation but each presented novel and complementary evidence then both were utilised.

Data collection and analysis

Reports were retrieved if it appeared likely that they contained data regarding barriers to uptake of evidence from systematic reviews. The first reviewer reviewed all the citations, and followed up reference lists, while the retrieved full reports were assessed by at least two reviewers (JW and BN) for inclusion in the review. Disagreements were resolved by discussion, or adjudication by a third party (MC). Reports appearing relevant initially, but which were not, joined a list of excluded studies maintained by the author (JW).

Using a data collection form, two reviewers (JW and BN) extracted data from the included studies. Information extracted from each article included a description of the barriers identified, the percentage of participants highlighting the barrier, demographics of the respondents, and the characteristics of the included study. Where possible, we estimated the percentages of respondents affected by an obstacle as the difference between 100% and the sum of the percentage with no opinion and those not affected.[6] The data extraction sheet was created based on a taxonomy of barriers to implementing clinical practice guidelines.[6] The mechanism of action by which improved patient care is attained is believed to proceed through a number of stages.[14] Research evidence alters eventual clinical outcome through the intermediate steps of first changing clinician knowledge, then improving attitudes, and lastly, changing practitioner behaviour. This taxonomy had been used with success by other investigators. It is reported to stand up well in comparison with alternative taxonomies.[7]

Both reviewers independently read each report and identified evidence relevant to each of the main outcomes of interest. Barriers were then grouped into themes and the obstacles ordered according to the number of studies in which they were identified. The themes were organised into groups depending on whether they impacted on knowledge, attitude, or behaviour.[6] The categories drew on an ideal mechanism of a knowledge, attitudes, and behaviour framework.[14] Before a systematic review can affect patient outcome, it first affects knowledge, then attitudes, and finally, behaviour.

Lack of familiarity and awareness, for instance, were listed under the Knowledge heading; lack of motivation was listed under Attitudes; patient, review and environmental factors were grouped under the Behaviour heading. Barriers impeding review uptake through a cognitive component were considered obstacles affecting knowledge. If an affective component was identified then the barrier was listed as impeding attitude. A limitation or restriction on ability was regarded as a barrier affecting behaviour. Lack of familiarity included impaired ability to correctly answer questions about review content, as well as self-acknowledged lack of familiarity. Lack of awareness was viewed as the inability to adequately acknowledge systematic review existence.

Study characteristics were included in Table 1. Methods were outlined in Table 2; the results were tabulated in Table 3.

In order to assess the quality of the studies, study characteristics were extracted: year of publication, country of origin, main objective of the study, the design of the study, and the characteristics of participants. In particular, the sampling strategy of the primary studies, response rate, and methodological approach, including data collection strategies, were assessed.

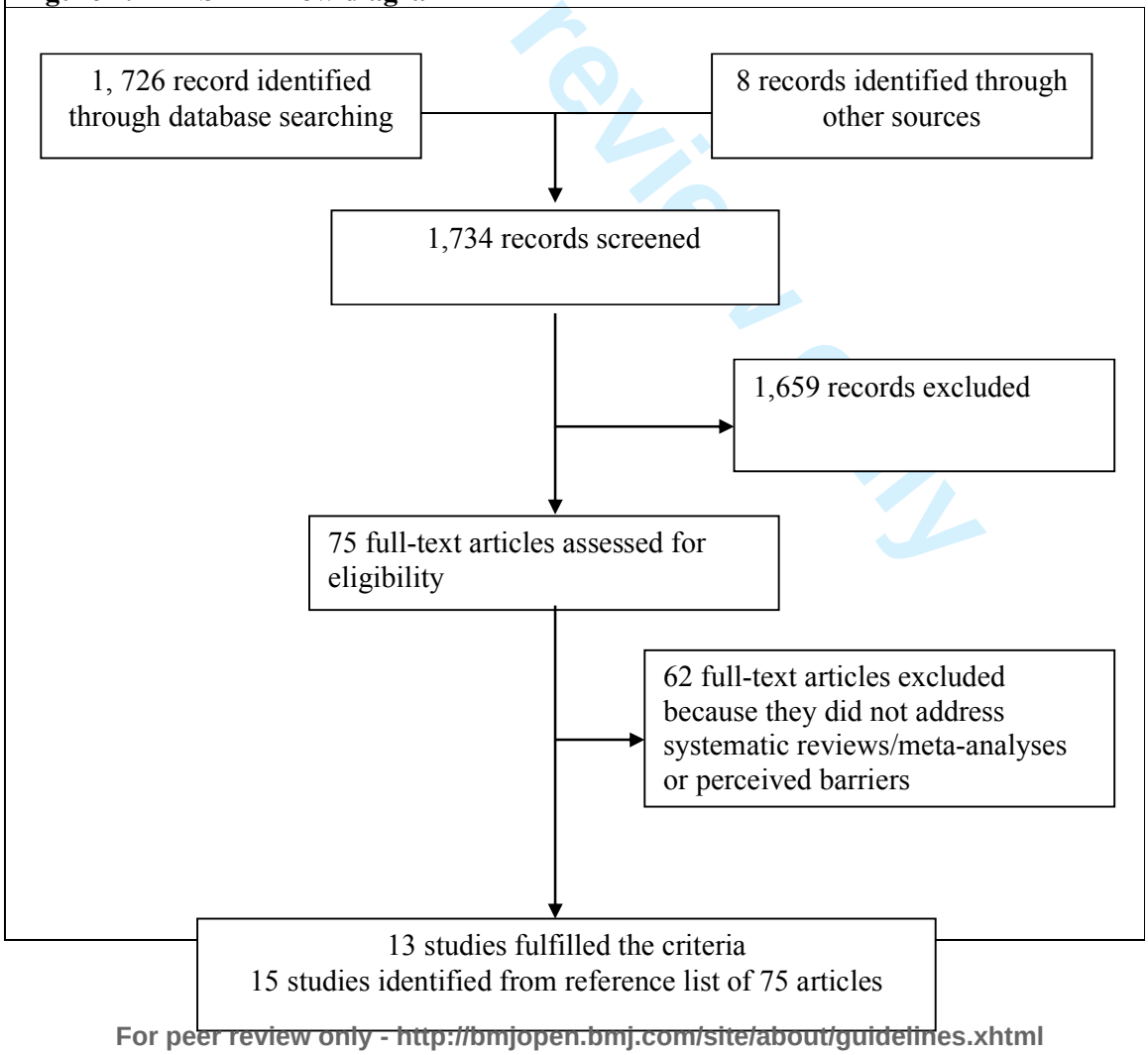
RESULTS

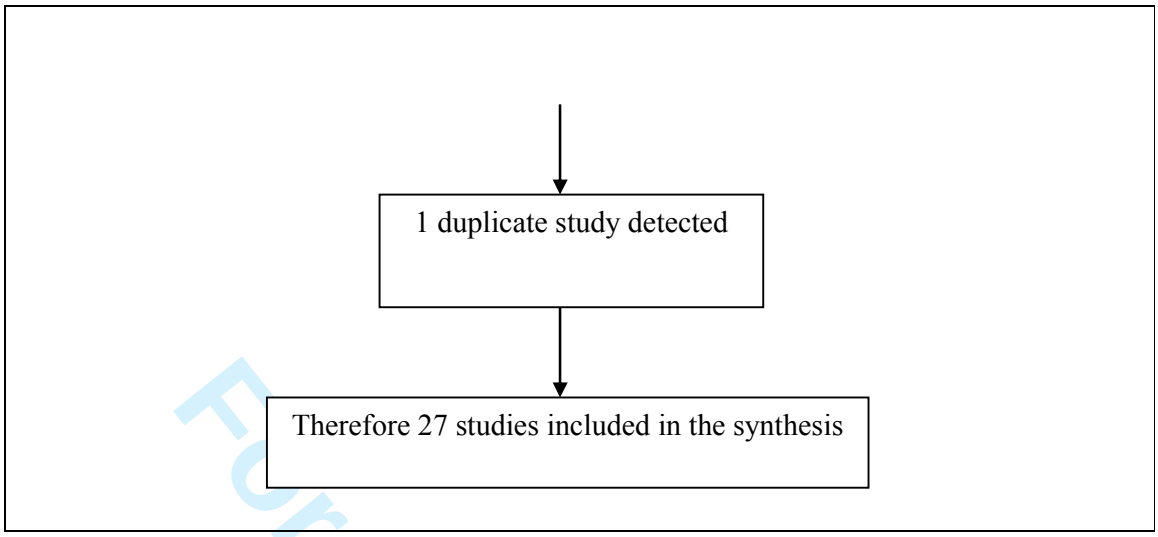
Search yield

Of 19 databases searched and three search engines utilized, there were 1,726 specific candidate articles found possibly examining barriers to uptake of evidence from systematic reviews. Some 1,651 titles were excluded after examination of the bibliographic citation. After examination of the full text of 75 articles, 13 articles fulfilled the criteria. Fifteen primary studies were detected from the reference lists of these 75 articles. A total of 28 detected reports describing 27 unique studies met inclusion criteria. Thirteen studies that might possibly be expected to be included but are not, are outlined in Table 4 together with the reasons for their exclusion. To be included, studies had to address perceived obstacles to uptake of evidence specifically from systematic reviews, meta-analyses and the databases that contained them. A search of EMBASE and PubMed from January 2011 to June 2012, failed to detect any relevant, completed or on-going studies to be added to 'Studies awaiting classification' and 'On-going studies' tables. The search terms and their combination are outlined in tables 5 and 6.

The 27 included studies encompassed 2 qualitative studies, and 25 surveys asking a total of 57 questions regarding possible barriers to uptake of evidence from systematic reviews, meta-analysis, and the databases containing them. A survey involved at least one question to a group of decisions makers about barriers to uptake of evidence from systematic reviews. Barriers were grouped into themes: 18 derived from the surveys and an additional 10 from the qualitative studies.

Figure 1. PRISMA Flow diagram





The studies were undertaken in the UK (n=9), Canada (n=5), Australia (n=4), USA (n=3), Ireland (n=1), Holland (n=1), New Zealand (n=1), Switzerland (n=1), India (n=1), and SE Asia: Indonesia, Malaysia, Thailand, the Philippines (n=1). One country, Switzerland, surveyed participants from 78 countries. Therefore, included studies reported data from decision makers in 91 countries.

Of 10,218 participants, 64% were physicians (Table 7). Two studies were concerned with the use of systematic review evidence for public health policy and programme management decisions.[24, 25] The remaining studies had a clinical practice focus concerned with investigating attitudes to evidence-based medicine. Seventeen studies (63%) were published after the year 2000.

Study Quality

The included studies were limited in terms of the quality and generalizability of their results. While all but one[15] had a well-described sampling frame, just eight of the 27 studies describe selecting a random sample of participants (Table 2). Response rates were not mentioned in two[16, 25] of the 27 studies (Table 2). The response rate was variable. The rate varied from 8.8% to 100% and 17 of the 27 studies describe a response rate of at least 60% (Table 2). Twenty-six studies reported the number of participants investigated, with the number varying from 16 to 1,406.

The number of barriers addressed by each survey varied. Of the 25 surveys, 8 (31%) examined only one type of barrier, and the average number of barriers examined was 1.7. None of the surveys examined 6 or more barriers and all studies relied on reported use, not actual use, of evidence.

Characteristics of Studies

Most studies were surveys (n=25), 2 were qualitative studies with one included study using mixed methods. Data collection strategies included focus groups (n=1), individual interviews (n=1), together with mail, telephone, and web-based questionnaires (n=25).

The characteristics of each study are outlined in Table 1. We found that the surveys used a heterogeneous variety of decision-making populations, based on location or speciality. They also investigated a number of resources. The surveys looked at systematic reviews, meta-

analyses, The Cochrane Library, the Cochrane Database of Systematic Reviews (one of the six high-quality databases maintained by the Library), Database of Abstracts of Reviews of Effects, the Reproductive Health Library, also the earlier Cochrane Pregnancy and Childbirth Database and the Oxford Database of Perinatal Trials. The surveys displayed a wide range of the percentage of respondents reporting each barrier (Table 3).

Identifying barriers

After classifying possible barriers into common themes, it was found that the 57 questions about obstacles to uptake of evidence from systematic reviews encompassed 28 barriers. These were grouped according to the knowledge/attitude/behaviour framework.[14] Barriers affecting knowledge could include lack of awareness, lack of familiarity and a lack of understanding of meta-analyses. Lack of confidence, decreased motivation, a perceived lack of usefulness of systematic reviews and limited trust in them, were grouped under Attitudes. Systematic review attributes, patient issues, and environmental factors have the potential to impair usage of systematic reviews. Attributes of systematic reviews such as academic terminology, and environmental factors such as limited resources or a negative organisational climate, were grouped under Behaviour.

Knowledge

Eleven studies measured lack of awareness as a possible barrier. Sample size ranged from 248 to 8,100 (median, 475) and the response rate ranged from 8.8% to 90% (median, 66%). The percentage of respondents reporting lack of awareness as a barrier was as high as 82% (for DARE[17]) and as low as 1% (for Cochrane Library[18]) with a median of 55%. In 9 (82%) of the 11 studies, at least 10% of the respondents cited lack of awareness as a barrier.

Seven surveys measured lack of familiarity as a possible barrier. Sample size ranged from 60 to 8,100 (median, 531) and the response rate ranged from 8.8% to 100% (median, 63%). The percentage of respondents suggesting lack of familiarity as a barrier was as high as 98% (DARE[17]) and as low as 19% (systematic reviews [17]) with a median of 70%. In 7 (100%) of the 7 surveys, at least 10% of the respondents cited lack of familiarity as a barrier.

Attitude

Four studies measured lack of motivation as a possible barrier. Sample size ranged from 98 to 8,100 (median, 1,305). The percentage of respondents identifying this barrier was as high as 10% (Oxford Database of Perinatal Trials[21]) and as low as 2% (meta-analysis [22]) with a median of 3.6%. In none of the surveys did more than 10% of respondents report lack of motivation as a barrier.

Seven surveys measured lack of perceived usefulness as a possible barrier. Sample size ranged from 60 to 491 (median, 350), and the response rate ranged from 63% to 100% (median, 87%). The percentage of respondents identifying lack of usefulness as a barrier was as high as 95% (systematic reviews[17]) and as low as 7% (Cochrane Library[18]) with a median of 16.5%. In six of the seven surveys, at least 10% of the respondents cited lack of usefulness as an issue.

Behaviour

Eleven surveys measured lack of access as a possible barrier. Sample size ranged from 60 to 3,087 (median, 440), and the response rate ranged from 44% to 100% (median, 71%). The percentage of respondents identifying lack of access as a barrier was as high as 95% (lack of easy access to Cochrane Library [19] and as low as 3% (lack of access to Cochrane Library [20],

with a median of 55%. In 10 (91%) of the 11 surveys, at least 10% of the respondents cited lack of access as a barrier.

Five studies investigated 10 external barriers to overview uptake. The external barriers investigated were environment-related in 5 studies and also systematic review-related in one study, with no patient-related barriers cited. More than 10% of respondents cited lack of resources and lack of positive policy climate [23], lack of workshop attendance [16], and lack of training in Cochrane Library use [18, 20] as possible environmental barriers. Lack of time was not cited by more than 10% of participants. [18] More than 10% of respondents cited the limited range of topics covered by the Cochrane Library [18] as a possible barrier.

Fourteen surveys looked at lack of use of systematic reviews. Sample size ranged from 150 to 8,100 (median, 490) and the response rate ranged from 8.8% to 100% (median, 63%). The percentage of respondents reporting lack of use was as high as 99% (DARE [17]) and as low as 18% (Cochrane Library [16]) with a median of 78%. In 14 (100%) of the 14 surveys at least 10% of the respondents did not use systematic reviews or the databases containing them.

Qualitative studies

Two qualitative studies [24, 25] cited six important barriers to evidence uptake from systematic reviews. The two studies emphasised lack of accessibility. They also cited a lack of training in the purpose and methodology of systematic reviews as a barrier to uptake. Content issues such as lack of relevance, lack of implications for practice, and limited implementation strategies were also cited. A deficient understanding of the information needs of the target audience of systematic reviews was also raised as a major barrier.

One study had a qualitative element exploring the perceived weaknesses of the Cochrane Library. [18] Participants suggested as barriers the limited range of topics covered, poor access, the narrow focus on RCTs and meta-analysis, difficulty of use, lack of regular update, poor promotion, and the time required to use and search the database. Number of barriers investigated by each study is tabulated in Table 8.

DISCUSSION

Accessible databases are an essential resource. Access impacts on awareness and familiarity. While access is improving, The Cochrane Library is not free in all countries. In almost all the included surveys, at least 10% of the respondents still cited lack of access as a barrier.

Many review resources, such as The Cochrane Library, have achieved widespread awareness. However in the majority of the studies, more than 10% of the respondents still cited lack of awareness of systematic reviews or the databases that contained them, as a barrier to uptake.

Casual awareness does not guarantee familiarity with, or the ability to use, systematic reviews. Lack of familiarity with databases containing systematic reviews was more common than a lack of awareness. [17] In all of the seven surveys measuring lack of perceived usefulness as a possible barrier, at least 10% of the respondents cited limited usefulness of systematic reviews as a problem.

Appropriate knowledge and attitudes are necessary but not sufficient for uptake of evidence from systematic reviews. There may be review, patient, or environmental barriers that inhibit the use of this form of evidence. Content issues such as lack of relevance, lack of implications for practice, lack of implementation strategies [25] and the limited range of topics

covered in systematic reviews [18] can be barriers. More than 10% of respondents cited lack of resources, lack of appropriate policy climate, [23], and lack of training in systematic review or database searching [20] as possible environmental barriers.

The everyday usage of systematic reviews should lead to improved knowledge of, and improved attitudes to, this form of pre-appraised evidence. However, in all of the 14 surveys that looked at this issue, at least 10% of the respondents did not use systematic reviews or the databases containing them, with the percentage of respondents reporting lack of use as high as 99%. [17]

Interestingly, in contrast to work on the uptake of research evidence in general, lack of time did not emerge as a major barrier to uptake of evidence specifically from systematic reviews. No patient-related barriers, such as inability to reconcile patient preferences with review evidence, were highlighted in our study. Nor, importantly, did lack of motivation to use systematic reviews emerge as a major issue.

Limitations

The extensive and systematic literature search is one of the strengths of this systematic review. Explicit inclusion criteria and a transparent approach to collecting data were also utilised. Each included study was assessed by at least two of the authors. The limitations of our systematic review largely reflect the shortcomings of the reports reviewed.

All the 27 included studies, except the two qualitative studies, were surveys using closed-ended questions. This meant that the obstacles addressed were dependent very much on investigator preference. A fear of being outside a consensus for instance, was not specifically investigated as a barrier. Use of a different taxonomy may have altered our findings. But the taxonomy selected and utilised here compares well to other taxonomies. [26]

Because much of the research in the knowledge translation field is poorly indexed in electronic databases and spread over many disciplines, relevant studies may have been overlooked, though searching the reference lists of related studies yielded additional reports.

Another potential defect is the use of participant self-ratings. The individual studies depended on the decision maker's perceptions and views. Actual clinical practice was not assessed. Whether an obstacle is real or perceived may affect the strategy required to address the identified barrier.

Some of the included studies were limited with respect to sampling and generalizability. Some surveys were small and used non-random samples confined to specific groups. This limits the extent to which the findings can be generalised. [27] A well-described sampling frame and a good response rate improve our confidence in a study's results. [28] A low response rate in some of the surveys increases the potential for selection bias. The external validity of the studies can be questioned as a poor response rate increases the impact of non-responder bias in the survey results. [29] However, by including a wide range of decision makers in our systematic review, this increases our appreciation of how differences in health-care systems can impact on review uptake.

Implications

This analysis offers a list of reasons for understanding why decision makers may be disinclined to use systematic reviews. A number of the barriers already cited by Cabana and

colleagues[6] to guideline adherence were identified, though in our study time constraints, limited motivation and patient related factors were not highlighted. The results of this review have a number of implications for systematic review uptake in particular and evidence uptake in general.

Despite the high regard in which systematic reviews and The Cochrane Library are held, there are a variety of barriers to systematic review uptake. These include lack of access, lack of awareness, lack of familiarity, lack of perceived usefulness, limited actual use in practice and finally, a number of external barriers to do with systematic review content, presentation, and wider organisational factors.

Few studies however, consider the full variety of barriers that must be overcome to achieve enhanced uptake. The average number of barriers examined was 1.7. By not investigating a full variety of barriers, strategies to improve use are less likely to address all the important factors inhibiting systematic review uptake and, as a result, are less likely to be successful.[6] Interventions designed to change practice should be based on an accurate assessment of the factors that support targeted health outcomes. The accuracy of this assessment is directly related to the future impact of the intervention.[45] If we accept this finding, then it is vital to identify the factors that influence the uptake of evidence from systematic reviews in order to help develop targeted interventions to enhance information uptake from this important resource.[9] Future research needs to address a fuller range of impediments to evidence uptake.

Awareness of important resources, such as systematic reviews and the databases containing them, appears to be restricted. Limited self-reported understanding of systematic reviews indicates a potential limitation in the ability of many clinicians to critically appraise the literature. [22] More work needs to be carried out to promote a better understanding of systematic review terminology and related concepts.

Access to The Cochrane Library is critical in order to advance evidence-based healthcare. [30] Connectivity seems to have increased [20] but access and use of evidence databases needs to be improved. Even different professionals working in the same clinical setting can have different levels of access to the same database, an issue deserving of further investigation. [20] If most of those who have access to the database then go on to actually use the Cochrane Library then access may be an important issue to be investigated further. Strategies to assist those least likely to use Cochrane databases may help the move towards evidence-based practice. [28]

Conclusion

Much work has been done on the barriers to uptake of evidence from clinical practice guidelines.[6] The barriers that Cabana and colleagues identified to guideline adherence were lack of awareness and familiarity, lack of belief in a good outcome after adopting the guideline, and the inertia of previous practice, including lack of motivation.

Lack of motivation to use systematic reviews did not emerge as a major obstacle to systematic review uptake in our study. However, in common with research on the uptake of evidence in general, lack of access and limited awareness continue to be significant perceived barriers to systematic review uptake. Importantly, lack of practical use of systematic reviews continues to present a major challenge to evidence uptake. To become familiar with an innovation, it must be used. For systematic reviews, this is not happening often enough.

Strategies to improve uptake of reviews should emphasize the usefulness of reviews for research and clinical practice. They should also provide a practical opportunity to use and become familiar with systematic reviews and the databases containing them, preferably in an organizational climate that values research.

To our knowledge, this study represents the first systematic review, of a diverse group of decision makers, of barriers to the uptake of evidence from systematic reviews, meta-analyses and their related databases. This investigation attempted to bring together the views of 10,218 decision makers from 91 countries, 64% of whom were physicians. From the 27 primary studies included in this systematic review, it is apparent that the barriers exist across different countries and impact on a variety of professional disciplines.

The results presented here have immediate and practical relevance for clinicians and organisations that are trying to improve access to the best available evidence and enhance its use in routine practice. These findings provide a sound basis on which to plan future interventions to enhance the uptake of evidence from systematic reviews and meta-analyses among physicians and other decision makers, leading to improved care for the individual patient.

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Competing interests

All authors declare that they have no conflicting interests.

All authors have completed the Unified Competing Interest form and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

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Table 1 Characteristics of included studies

Year Published,	Objective	Design and	Participants	Date Conducted

Country		focus		
1. Wilson, P. Watt, I. and Hardman, P. 2001[18] UK	To determine attitudes on the importance of effectiveness information	Postal questionnaire Cochrane Library	338 Medical directors	1999
2. Paterson -Brown et al. 1995[21] UK	To establish the availability of meta-analytic overviews and to find out how obstetricians keep up to date.	Telephone survey Oxford Database of Perinatal Trials	98 Obstetricians	1993
3. Hanson, Bhandari, Audige, . and Helfet, 2004[37] Switzerland	To determine current understanding of study methodology and critical appraisal.	Questionnaire, self-administered Meta-analysis	532 Surgeons and allied professionals from 78 countries	2002
4. Poolman et al. 2007[38] Holland	They examined perceptions and competence in EBM	Postal survey Meta-analysis Systematic reviews Cochrane Library	366 Orthopedic Surgeons	2005
5. Sur et al. 2005[22] USA	Investigated the attitudes of urologists toward EBM	Web-based survey Cochrane Database of Systematic Reviews	714 Urologists	2005
6. Dahn et al. 2009[29] USA	To investigate the attitudes of urologists to EBM	Mail survey Meta-analyses CDSRs	889 Urologists	2006
7. McAlister et al. 1999[39] Canada	To assess the attitudes of general internists to EBM.	Postal Survey Cochrane Database of Systematic Reviews	294 Physicians	1997

8. Wilson et al. 2001[19] UK	To identify current methods of making research evidence accessible	Postal survey Cochrane Library	1406 General practitioners	1999
9. Young, J and Ward, J. 2001[15] Australia	Examine views about EBM	Postal Survey and Semi-structured Interviews Cochrane Library	60 GPs	1999
10. McCaw et al. 2007[40] Ireland	Gain an insight into the use of Internet	Postal survey Cochrane Library	542 Community pharmacists (178) GPs (364)	2005
11. Kerse, N et al. 2001[28] NZ	Access to Internet and Cochrane Library	Cross-sectional postal and fax survey Cochrane Library	381 GPs	1999-2000
12. McColl et al. 1998[17] UK	To determine the attitude to EBM and perceived usefulness of databases	Postal questionnaire Systematic reviews Meta-analysis Cochrane Library CDSRs DARE	302 GP principals	1997
13. Bennett et al. 2003[27] Australia	To find out about attitudes to EBP and implementation barriers	Postal questionnaire Cochrane Library	649 Occupational Therapists	2000
14. Young and Ward 1999[30] Australia	To determine awareness and use of the Cochrane Library and access to the Internet	Postal Questionnaire Cochrane Library	311 General practitioners	1997
15. Prescott	To establish the	Self-administered,	800	1996

et al. 1997[33] UK	awareness of research evidence	postal questionnaire survey CDSRs	GPs	
16. Jordans et al. 1998[34] Australia	To determine the proportion who report using systematic reviews	Cross-sectional telephone survey obstetricians Systematic reviews	224 neonatologists	1995
17. Ciliska, et al. 1999[43] Canada	To gain an understanding of research needs, perceptions of barriers to research utilisation, and attitudes towards systematic reviews	Telephone questionnaire survey Systematic reviews	226 decision makers in public health Included doctors	NK
18. Olatunbosun et al. 1998[35] Canada	To examine views of EBM	Self-administered, two-page questionnaire Cochrane Library Cochrane Pregnancy And Childbirth Database	190 physicians in obstetric practice	1996
19. Melnyk et al. 2004[32] USA	Describe major barriers and facilitators to EBP.	Limited survey CDSRs	160 nurses	2003
20. Gavgani, V. and Mohan, 2008[36] India.	Directed at exploring attitudes towards EBM	Survey method Cochrane Library CDSRs	98 physicians	2008
21. Wilson, et al. 2003[20] UK	To assess the awareness and use of NHSnet	Postal survey questionnaire Cochrane Library	1364 GPs: 441 Nurses: 325 Practice Managers: 556	2001
22. Carey, et al. 1999[41]	To determine the attitudes of towards the practice of EBM	Postal questionnaire Cochrane Library	139 Psychiatrists	1998

UK				
23. Lawrie et al. 2000[42] UK	To examine attitudes to evidence - based psychiatry	Survey, postal CDSRs	93 Senior psychiatrists	NK
24. Hyde et al. 1995[44] UK	To examine use of Cochrane Pregnancy and Childbirth Database	Postal survey CPCD Cochrane Library	274 subscribers to CPCD Included doctors	1994
25. Martis et al. 2008[16] Asia	The aim was to assess current knowledge of evidence-based practice	Survey, postal Reproductive Health Library Cochrane Library	660 health care professionals Included doctors	2005
26. Dobbins, et al. 2007[25] Canada	The purpose was to identify preferences for the transfer and exchange of research knowledge.	Semi-structured interviews Systematic reviews	16 Policy decision-makers Included a doctor	2001
27. Dobbins, et al. 2004[24] Canada	To discover public health decision makers' preferences for content, format, and channels for receiving research knowledge	One-hour focus groups Systematic reviews	46 Policy makers Included doctors	2002- 2003

Table 2 **Methods and Quality**

Study.	**Sample frame**	**Response rate**	**Measurement of use of evidence**
1. Wilson	Purposive	(69%)	Reported use

et al. 2001[18]	sample of 491 Medical directors Well-described sample	338/491	
2. Paterson -Brown et al. 1995[21]	Purposive sample of 98 obstetricians Well-described sample	(100%) 98/98	Reported use
3. Hanson et al. 2004[37]	Purposive sample of 1,064 surgeons/others Well-described sample	(50%) 532/1,064	Reported use
4. Poolman et al. 2007[38]	Purposive sample of 611 orthopaedic surgeons Well-described	(60%) 366/611	Reported use
5. Sur et al. 2006[22]	Purposive sample of 8,100 urologists Well-described sample frame	(8.8%) 714/8,100	Reported use
6. Dahm et al. 2009[29]	Random sample of 2000 urologists Well-described sample frame	(45%) 889/2000	Reported use
7. McAlister et al. 1999[39]	Purposive sample of 294 general Physicians. Well-described sample frame	(59%) 294/521	Reported use
8. Wilson et al. 2001[18]	Purposive sample of 3,087 individuals Well-described sample frame Primary care	(45%) 1,406/3,087	Reported use

9. Young, and Ward 2001[15]	Sample of, 60 GPs Sampling frame not described	(100%) 60/60	Reported use
10. McCaw et al. 2007[40]	Sample of 1081 GPs and 522 pharmacists Well-described sample frame	(34%) 542/1603	Reported use
11. Kerse et al. 2001[28]	Random Sample of 459 GPs Well-described sample frame	(83%) 381/459	Reported use
12. McColl et al. 1998[17]	Random Sample of 452 GPs Well-described sample frame	(63%) 302/452	Reported use
13. Bennett et al. 2003[27]	Proportional random sample of 1491 occupational therapists Well-described sampling frame	(44%) 649/1491	Reported use
14. Young and Ward, 1999[30]	Random sample of 428 GPs Well-described sampling frame	(73%) 311/428	Reported use
15. Prescott et	Random sample	(62%) 501/800	Reported use

al. 1997[33]	of 800 GPs Well-described sample frame		
16. Jordans et al. 1998[34]	Random sample of 145 Obstetricians and 104 neonatologists Well described Sample	(90%) 224/248	Reported use
17. Ciliska et al. 1999[43]	277 who met inclusion criteria of decision makers Well-described sample	(87%) 242/277	Reported use
18. Olatunbosun et al. 1998[35]	Random sample of 190 family physicians and obstetricians Well-described sample	(76%) 148/190	Reported use
19. Melnyk et al. 2004[32]	'Convenient' sample Well described sample	(100%) 160/1600	Reported use
20. Gavgani And Mohan, 2008[36]	Random sample Well-described sample	(65%) 98/150	Reported use
21. Wilson et al. 2003[20]	All GPs in defined area. Well-described sample	(44%) 1364/3090	Reported use
22. Carey and Hall,	All psychiatrists in a defined area Well-defined sample	(64%) 139/216	Reported use

1999[41]			
23. Lawrie et al. 2000[42]	All in a defined area Well-described sample	(76%) 93/123 but just 22/123 (17%) contributed to this review	Reported use
24. Hyde et al. 1995[44]	All subscribers to CPCD Well-described sample	71% 274/387	Reported use
25. Martis et al. 2008[16]	All in a defined area Well-described sample	NK	Reported use
26. Dobbins et al. 2004[24]	Purposeful sample Well-described sample	46/60 (77%)	Reported use
27. Dobbins et al 2007[25]	Purposeful sample Well-described sample	16/NK	Reported use

Table 3. Barrier Descriptive Findings

Barrier category	Barrier Descriptive
Knowledge barriers	Eleven studies measured lack of awareness as a possible barrier. The percentage of respondents reporting lack of awareness as a barrier was as high as 82% and as low as 1%, with a median of 55%. Eleven surveys measured lack of access as a possible barrier. The percentage of respondents identifying lack of access as a barrier was as high as 95% and as low as 3%, with a median of 55%. Seven surveys measured lack of

familiarity as a possible barrier. The percentage of respondents suggesting lack of familiarity as a barrier was as high as 98 and as low as 19%, with a median of 70%.

Attitudinal barriers Seven surveys measured lack of perceived usefulness as a possible barrier. The percentage of respondents identifying lack of usefulness as a barrier was as high as 95% and as low as 7%, with a median of 16.5%. Four studies measured lack of motivation as a possible barrier. The percentage of respondents identifying this barrier was as high as 10% and as low as 2% with a median of 3.6%.

Behaviour barriers Five studies investigated 10 external barriers to review uptake. More than 10% of respondents cited lack of resources, lack of positive policy climate, lack of workshop attendance, and lack of training as possible environmental barriers. Fourteen surveys looked at lack of use of systematic reviews. The percentage of respondents reporting lack of use was as high as 99% and as low as 18% with a median of 78%.

Table 4. Excluded studies

Lavis, John. Research, Public Policymaking and Knowledge-translation Processes. Journal of Continuing Education in the Health Professions. 2006 26. 37-45. Not a survey, focus group or interview, or an intervention.

Glasziou P, Guyatt GH, Dans AL, Straus S, Sackett DL. Applying the results of trials and systematic reviews to individual patients. Evidence-Based Medicine 1998 3(6). 165-6. Not a survey, focus group or interview study, or an intervention.

Grimshaw J, Santesso N, Cumston M, Mayhew A, McGowen J. Knowledge for knowledge translation: the role of the Cochrane Collaboration HLWIKA 2006 26(1): 55-62. Not a survey, focus group or interview study, or an intervention.

Lavis J, Davies H, Gruen R, Walshe K, Farquhar CM. Working within and beyond the Cochrane Collaboration to make systematic reviews more useful to healthcare managers and policy makers. Health Policy 20061(2): 21-33. Not a survey, focus group or interview study, or an intervention.

Dobbins M, Ciliska D, Cockerill R, Barnsley J, DiCenso A. A framework for the dissemination and utilisation of research for healthcare policy and practice. J Know Synth Nurs 2002 18;9:7. Not a survey, focus group or interview study, or an intervention.

Petticrew M, Whitehead M, Macintyre SJ, Graham H, Egan M. Evidence for public health policies on inequalities. Journal of Epidemiological Community Health. 2004 58:811-6. Not specifically related to systematic reviews.

Silagy CA, Weller DP, Middleton PF and Doust JA. General practitioners' use of evidence databases. Med J Aust. 1999 April 19;170(8):393
A comment on previous studies.

Sheldon T. Making evidence synthesis more useful for management and policy making. J Health Serv Res Policy. 2005 Vol 10, Suppl 1, July

An essay, not a survey, focus group, or an interview, or an intervention.

Gruen R, Morris P, McDonald E and Bailie. Making systematic reviews more useful for policy makers. Bulletin of the World Health Organization. 2005 June, 83(6). A letter/essay.

Melnyk B, Fineout-Overholt E, Feinstein N, Sadler L, Hernandez C. Nurse Practitioner Educators' Perceived Knowledge, Beliefs and Teaching Strategies Regarding Evidence-Based Practice: Implications for Accelerating the Integration of Evidenec-based Practice into Graduate Programmes.Journal of Professional Nursing, 2008 Vol 24, Issue 1, p 7-13. Does not address systematic reviews.

Volmink J, Siegfried N, Robertson K and Gulmezoglu M. Research Synthesis and Dissemination as a Bridge to Knowledge Management: the Cochrane Collororation. Bulletin of the Worlds Health Organisation 2004 82: 778-783. An essay. Not a survey, a focus group, an interview, or an intervention.

Mayer J, and Pitman L. The Attitudes of Australian GPs to Evidence-based Medicine: a Focus Group Study. Family Practice 1999 16: 627-632. Does not address systematic reviews.

Cranney M and Walley T. Same information, different decisions: the influence of evidence on the management of hypertension in the elderly. The British Journal of General Practice 1996 46(412): 661-663. Not specifically about systematic reviews.

Table 5. PubMed was searched from December 2010 to June 2012 using the advanced search facility

Search	Query	Items found
1	systematic review AND barriers AND knowledge uptake	1
2	meta-analysis AND barriers AND knowledge uptake	1
3	systematic review AND obstacles AND knowledge uptake	1
4	meta-analysis AND obstacles AND knowledge uptake	0
5	systematic review AND barriers AND knowledge utilisation	3
6	meta-analysis AND barriers and knowledge utilisation	2
7	systematic review AND obstacles AND knowledge utilisation	0
8	meta-analysis AND obstacle AND knowledge utilisation	0
9	overview* OR review* AND impairment* AND knowledge translation	13
10	systematic review* OR meta-analys* AND barrier* AND decision making	16

37 citations were returned, none of which met inclusion criteria

Table 6. Embase was searched from December 2010 to June 2012 using the advanced search facility

Search	Query	Items found
1	systematic review AND barriers AND knowledge uptake	14
2	meta-analysis AND barriers AND knowledge uptake	5
3	systematic review AND obstacles AND knowledge uptake	0
4	meta-analysis AND obstacles AND knowledge uptake	0

5	**systematic review AND barriers AND knowledge utilisation**	**14**
6	**meta-analysis AND barriers and knowledge utilisation**	**0**
7	**systematic review AND obstacles AND knowledge utilisation**	**0**
8	**meta-analysis AND obstacle AND knowledge utilisation**	**0**
9	**overview* OR review* AND impairment* AND knowledge translation**	**0**
10	**systematic review* OR meta-analys* AND barrier* AND decision making**	**0**

32 citations were returned, 1 full text article retrieved, no report met inclusion criteria

Table 7. Disciplines participating

Doctors: 6,549
Nurses: 1,494
Practice managers: 785
Occupational therapists: 649
Midwives: 202
Pharmacists: 178
General practice staff: 91
Surgical allied professions: *69*
Policy makers: 62
Information specialists: 56
Others: 83

Total: 10,218

TABLE 8: Number of barriers investigated by each study to uptake of evidence from systematic reviews, meta-analyses, and the databases containing them

Surveys	**Number of barriers addressed by each study**
Wilson et al. (2001)	4: lack of access, awareness, use, and training
Paterson-Brown et al. (1995)	2: lack of access, awareness
Hanson et al. (2004)	2: lack of trust, training
Poolman et al. (2007)	2: lack of understanding, use
Sur et al. (2006)	3: Lack of awareness, use, and understanding
Dahm et al. (2009)	3: Lack of awareness, use, and understanding,
McAlister et al. (1999)	1: Lack of use
Wilson et al. (2001)	1: Lack of access
WardandYoung (2001)	3: Lack of access, understanding, usefulness,
McCaw et al. (2007)	1: Lack of use
Kerse et al. (2001)	3: Lack of access, awareness, use
McColl et al. (1998	3: Lack of awareness, access, and understanding
Bennett et al. (2001)	1: Lack of confidence
Young and Ward (1999)	3: Lack of awareness, access, use
Paterson-Brown (1993)	3: Lack of awareness, availability, and need
Prescott et al. (1999)	2. Lack of use, awareness

Jordan et al. (1999)	3: Lack of use, awareness, access
Ciliska et al. (1999)	4: Lack of awareness, use, policy climate, resources .
Olatunbosun et al. (1998)	1: Lack of access
Melnyk et al. (2004)	1: Lack of use
Gavgani et al. (2008)	2: Lack of use, usefulness
Wilson et al. (2003)	4: Lack of access, awareness, use, and training
Carey and Hall, (1999)	1: Access
Lawrie et al. (2000)	1: Ability to search
Hyde et al. (1995)	1: Ability to search
Martis et al. (2008)	5: Lack of access, awareness, use, usefulness, training,
Qualitative studies:	
Dobbins et al. (2004)	2: Lack of access, training
Dobbins et al. (2007) . .	4: Lack of relevance, implications, implementation strategies, understanding of the information needs of the target audience.
Wilson et al. (2001)	7. Limited range, access, focus, use, up-datedness, promotion and time

PROTOCOL

Barriers to uptake of evidence from systematic reviews and meta-analyses: a systematic review of decision makers' perceptions

Authors: John Wallace**,** Bosah Nwosu, and Mike Clarke

Abstract

This is the protocol for a systematic review. The objectives are as follows:

1. To review all studies identifying barriers to uptake of evidence from systematic reviews, meta-analyses and the databases associated with them.
2. To assess the methodological quality of these studies.
3. To perform a systematic review of the evidence in this area.

Background

The slow and haphazard process of translating research findings into clinical practice compromises the potential benefits of clinical research. The need for effective knowledge transfer in clinical practice is essential. However, to date, there is a consensus among the research community that most efforts in knowledge translation at a clinical level have met with little success.[1]

A systematic review is a review of a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research, and to collect and analyse data from studies that are included in the review.[2] The increased uptake of evidence from systematic reviews is advocated because of their potential to improve the quality of decision making for patient care. Systematic reviews can do this by decreasing inappropriate clinical variation and quickly expediting the application of current, effective advances to everyday practice. However, research suggests that evidence from systematic reviews has not been widely adopted by health professionals. Increasing uptake of systematic reviews and

improving awareness of the advantages that the technique can bring to the field of healthcare is a major challenge.

Barriers are factors that limit or restrict uptake of research evidence in clinical practice.[3] Implementation researchers, educators, policy makers, and clinicians want to know the identity of barriers to knowledge use in healthcare contexts and also how to address them. There are specific challenges associated with the assessment of barriers. Many lessons have been learned from previous research in this area on how to address barriers to knowledge use. Cabana and colleagues identified a variety of barriers to physician adherence to clinical practice guidelines and they organised the barriers in terms of their impact on knowledge, attitudes, and physician behaviour.[3]

Context: Despite wide promulgation, systematic reviews have had limited effect on changing decision makers' behaviour. Little is known about the process and factors inhibiting the uptake of knowledge in response to exposure to a systematic review.

Objective: To identify barriers to evidence uptake from systematic reviews, meta-analyses, and their associated databases.

Search methods for identification of studies

The Cochrane Library, Medline, Embase, PsycInfo, and other electronic resources, nineteen in total, will be searched, with a special emphasis on grey literature and knowledge translation research. The reference lists from primary studies identified will be searched and also the references from related overviews. The reviewers will identify additional candidate articles by reviewing the bibliographies of articles retrieved from the search. Experts in the field will be contacted. Terms to be used will include systematic reviews, overviews, meta-analysis, and reviews. Other search terms utilised will be barriers, obstacles, impairments, knowledge translation, knowledge uptake, knowledge utilisation, and decision making.

Data collection and analysis

Articles will be included that examined at least one barrier to knowledge uptake from systematic reviews, meta-analyses, or the databases that contain them. A barrier will be defined as any factor that limits or restricts complete knowledge uptake from an overview. It is proposed to focus on barriers that could be changed by an intervention rather than age or gender. Respondents can identify barriers via responses to survey questions. For qualitative studies, major themes from focus groups or interviews could also identify barriers. All decision makers will be included.

One investigator (JW) will screen titles and abstracts, and full bibliographic citations to identify candidate articles. Two investigators (JW and BN) will then independently review the full text to exclude articles that will not meet the inclusion criteria. Differences will be resolved by discussion and consensus.

Data Extraction:

Data extraction will follow three steps. Firstly, two investigators will abstract the following information from each article: description of the barrier, the percentage of respondents describing the barrier, demographics of the respondents, and also study characteristics including sample size and response rate. Differences will be resolved by discussion and consensus. Secondly, the barriers will be grouped into common themes. Thirdly, the barriers will be organised into groups based on the knowledge, attitudes, behaviour framework.[4]

Before an integrative review can affect patient outcomes, it must first affect health professional knowledge, then attitudes, and finally behaviour. Factors impacting on cognition, affect and behaviour will be considered as potential barriers. A survey will be defined as having at least one question to a group about potential barriers to knowledge uptake from a systematic review, a meta-analysis, or the databases containing them.

Assessment of risk of bias

Important flaws in individual studies such as a lack of random selection of participants, inadequate description of the sample frame, and a poor response rate will be described. For purposes of quality assessment, study characteristics will be extracted by two investigators: country of origin, year of publication, main objective of the study, design of the study, characteristics of participants, sampling strategy, response rate, and methodological approach, including data collection strategies. Differences in assessment of risk of bias will be resolved by consensus or consultation with a third party (MC). Publication bias will be minimised by the extensive search strategy.

Synthesis

We intend to bring together findings from different study designs within different methods and approaches. It is not expected that it will be possible to carry out a meta-analysis due to the high degree of anticipated heterogeneity across settings, participants, and data collection methods. A narrative synthesis with appropriate tabulation is anticipated.

The type of barrier will be tabulated, together with the comprehensiveness of surveys. How often surveys considered the full variety of barriers to knowledge uptake will be indicated. The number and characteristics of the surveys examining each barrier will be documented. The targeted populations and their location will be identified. The sample size, method of selection, and response rate will also be reported. The percentage of respondents identifying a particular barrier will also be listed. Tables will be completed outlining the study characteristics, methods and results.

Evidence synthesis is a process of combining evidence from individual studies to create a new understanding by comparing and analysing concepts and findings from different sources of evidence with a focus on the same topic of interest. The aim is to identify and extract evidence, categorise the evidence, and combine the categories to develop synthesized findings. The overall objective is to build an explanation of why people do not use knowledge from systematic reviews.

Excluded studies will be listed in a ‘Characteristics of excluded studies’ table with a succinct summary of why studies were excluded. On-going studies and studies awaiting classification if found will be listed.

A summary of the main results will be reported together with an assessment of the overall completeness and applicability of the evidence, together with key methodological limitations.

Aim: We are interested in improving the relevance and utility of systematic reviews. The aim of the review outlined here is to identify barriers to uptake of evidence from systematic reviews and meta-analyses. The objective is also to offer a differential diagnosis for why decision makers do not use knowledge from systematic reviews as well as providing a rational strategy aimed at improving knowledge uptake from this important source of pre-appraised, integrated evidence, together with a frame work for future research.

Potential conflict of interest
None known

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Barriers to uptake of evidence from systematic reviews and meta-analyses: a systematic review of decision makers' perceptions

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PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	2
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	3
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	22
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	3
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	3
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	3
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	3
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	3
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	4
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	4
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	6
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	6

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	6
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	-
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	5
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	6
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Table 2
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Table 3
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	6
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	6
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	-
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	8
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	9
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	9
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	13

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Barriers to uptake of evidence from systematic reviews and meta-analyses: a systematic review of decision makers' perceptions

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ABSTRACT

Objective: To review the barriers to the uptake of research evidence from systematic reviews by decision makers.

Search strategy: We searched 19 databases covering the full range of publication years, utilised three search engines, and also personally contacted investigators. Reference lists of primary studies and related reviews were also consulted.

Selection criteria: Studies were included if they reported on the views and perceptions of decision makers on the uptake of evidence from systematic reviews, meta-analyses, and the databases associated with them. All study designs, settings, and decision makers were included. One investigator screened titles to identify candidate articles then two reviewers independently assessed the quality and the relevance of retrieved reports.

Data extraction: Two reviewers described the methods of included studies and extracted data that were summarised in tables and then analysed. Using a pre-established taxonomy, the barriers were organized into a framework according to their effect on knowledge, attitudes, or behaviour.

Results: Of 1,726 articles initially identified, we selected 27 unique published studies describing at least 1 barrier to the uptake of evidence from systematic reviews. These studies included a total of 25 surveys and 2 qualitative studies. Overall, the majority of participants (n=10,218) were physicians (64%). The most commonly investigated barriers were lack of use (14/25), lack of awareness (12/25), lack of access (11/25), lack of familiarity (7/25), lack of usefulness (7/25), lack of motivation (4/25), and external barriers (5/25).

Conclusion: This systematic review reveals that strategies to improve uptake of evidence from reviews and meta-analyses will need to overcome a wide variety of obstacles. Our review describes the reasons why knowledge users, especially physicians, do not call on systematic reviews. This study can inform future approaches to enhancing systematic review uptake and also suggests potential avenues for future investigation.

INTRODUCTION

Many researchers are worried about the extent to which research knowledge is utilised.[1] An important finding from health research is the limited success in routinely transferring research knowledge into clinical practice. Tackling the knowledge-to-practice deficit is challenging and entails an investigation of the numerous obstacles to knowledge uptake.[2]

The transfer of important clinical knowledge is impeded by the amount and also the on-going growth of the biomedical literature. Systematic reviews diminish this problem. A systematic review is a review of 'a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research, and to collect and analyse data from studies that are included in the review'.[3] The contribution of systematic reviews to the research literature is seen in a range of bibliographic databases such as The Cochrane Library.

A systematic review that integrates the findings of discrete studies against the background of global evidence can be considered the basic unit of evidence transfer.[4] Synthesis should help with policy formulation, the development of clinical practice guidelines, as well as informing routine decision making in clinical practice. Failure to use the findings from systematic reviews and meta-analyses can reduce healthcare efficiency and compromise quality of life.

However, the mere existence of reviews does not ensure their dissemination and their application to routine practice and policy formulation. The uptake of evidence from systematic reviews has been inconsistent.[4] When unsure about diagnostic and management issues, physicians routinely consult with a colleague or read a text.[5]

While many investigations have been conducted on the barriers to the uptake of research evidence in general, little is known specifically about the determinants of uptake of systematic review evidence in particular. In the past, there have been reviews of the barriers to adherence to clinical guidelines,[6] of the barriers to the appropriate use of research evidence in policy decisions,[1] of the barriers and facilitators to implementing shared decision-making,[7] of the barriers to improving the usefulness of systematic reviews for health care managers and policy makers,[8] and lastly, of the barriers and incentives to optimal health care.[9]

Systematic reviews were the focus of this investigation, rather than the more commonly investigated clinical practice guidelines or indeed individual, primary studies. Systematic reviews are based on primary research while clinical practice guidelines are an amalgam of clinical experience, expert opinion, patient preferences, and evidence. Systematic reviews are a scientific exercise aimed at generating new knowledge and they provide a summary of relevant primary research. In this way, they can help keep us current. Systematic reviews have a distinct development and scientific purpose that differs from both guidelines and primary research.

Many factors contribute to the varying uptake of evidence in general.[10] These include financial obstacles, the sheer volume of research evidence, and the difficulties in applying global evidence in a local clinical context.[11] Other barriers include limited time and impaired awareness of evidence sources, limited critical appraisal skills and the limited relevance of research findings.[12] Given the considerable differences between systematic reviews, primary

research, and clinical practice guidelines, we set out specifically to identify the barriers to uptake of systematic reviews and meta-analyses.

What are the barriers to the uptake of evidence from systematic reviews, meta-analyses and the databases that contain them? Here we were concerned with all decision makers, including physicians, policy makers, patients and nursing staff. Such barrier identification can aid the development of effective strategies to improve the uptake of systematic reviews and meta-analyses by decision makers. Interventions to improve the use of systematic reviews for clinical and commissioning decision making are currently being investigated.[11]

Methods

Search strategy

We conducted a systematic review of the literature to identify barriers to evidence uptake from systematic reviews and meta-analyses. The primary researcher (JW) searched 19 databases and used 3 search engines, for articles, not limited to the English language, drawing on the entire range of publication years covered in each database up to Dec 2010 using a combination of index terms and text words identified from previously identified, relevant articles. The databases included The Cochrane Library, TRIP, Joanna Biggs I.N.G, National Guideline Clearing House, Health Evidence, PubMed (1950-2010), EMBASE (1980-2010), ERIC, CINAHL, PsycInfo, OpenSigle, Index to Theses in Great Britain and Ireland, and Conference Papers Index. Campbell Collaboration, Canadian Health Services Research Foundation, EPOC, KT+, McMaster University, Keenan Research Centre, and the New York Academy of Medicine. The search engines ALTA VISTA and Google scholar were also utilised. References from included primary studies and related review articles were scanned, experts in the field contacted, and bibliographies of textbooks were reviewed. The following search terms were included: obstacle, barrier, impede, utilisation, uptake, systematic review and meta-analysis.

We repeated aspects of the search for the period December 2010 to June 2012. The aim was to identify any further relevant or on-going studies to be included in 'Studies awaiting classification' or 'On-going studies' that could be used in a later update of this systematic review. We applied similar search strategies to PubMed and EMBASE, the two most productive bibliographic databases in terms of studies already identified for inclusion in the review.

Selection criteria

We included studies if they presented an original collection of data. Studies containing interviews, focus groups and surveys with all decision makers, such as doctors, nurses, occupational therapists, policy makers and patients, were eligible. Selection criteria did not specify that the inclusion of studies was restricted to those reporting, as their main purpose, the identification of obstacles specifically to systematic review uptake. No study design or language was excluded. Studies were included if they addressed perceived barriers to uptake of evidence specifically from systematic reviews, meta-analyses and the databases that contained them such as The Cochrane Library, The Cochrane Database of Systematic Reviews, Database of Abstracts of Reviews of Effects, Cochrane Pregnancy and Childbirth Database, Oxford Database of Perinatal Trials, and the Reproductive Health Library.

A barrier was defined as any factor that impedes or obstructs uptake of evidence from systematic reviews. Barriers to evidence uptake can negatively impact on access, awareness, familiarity, intellectual adoption, and actual use of systematic reviews. Barriers can also limit

the positive influence of current systematic review results on patient care. We focused on factors that could be altered or overcome rather than the gender or age of decision makers.[6] In many of the reports, participants specified obstacles via response to survey questions. For qualitative studies, major themes from focus groups or interviews identified the obstacles to uptake.

Special care was taken to identify studies that appeared in multiple publications.[13] When more than one report described a specific study and each presented the same data, then the most recent publication was included for analysis. However, if more than one publication described a single investigation but each presented novel and complementary evidence then both were utilised.

Data collection and analysis

Reports were retrieved if it appeared likely that they contained data regarding barriers to uptake of evidence from systematic reviews. The first reviewer reviewed all the citations, and followed up reference lists, while the retrieved full reports were assessed by at least two reviewers (JW and BN) for inclusion in the review. Disagreements were resolved by discussion, or adjudication by a third party (MC). Reports appearing relevant initially, but which were not, joined a list of excluded studies maintained by the author (JW).

Using a data collection form, two reviewers (JW and BN) extracted data from the included studies. Information extracted from each article included a description of the barriers identified, the percentage of participants highlighting the barrier, demographics of the respondents, and the characteristics of the included study. Where possible, we estimated the percentages of respondents affected by an obstacle as the difference between 100% and the sum of the percentage with no opinion and those not affected.[6] The data extraction sheet was created based on a taxonomy of barriers to implementing clinical practice guidelines.[6] The mechanism of action by which improved patient care is attained is believed to proceed through a number of stages.[14] Research evidence alters eventual clinical outcome through the intermediate steps of first changing clinician knowledge, then improving attitudes, and lastly, changing practitioner behaviour. This taxonomy had been used with success by other investigators. It is reported to stand up well in comparison with alternative taxonomies.[7]

Both reviewers independently read each report and identified evidence relevant to each of the main outcomes of interest. Barriers were then grouped into themes and the obstacles ordered according to the number of studies in which they were identified. The themes were organised into groups depending on whether they impacted on knowledge, attitude, or behaviour.[6] The categories drew on an ideal mechanism of a knowledge, attitudes, and behaviour framework.[14] Before a systematic review can affect patient outcome, it first affects knowledge, then attitudes, and finally, behaviour.

Lack of familiarity and awareness, for instance, were listed under the Knowledge heading; lack of motivation was listed under Attitudes; patient, review and environmental factors were grouped under the Behaviour heading. Barriers impeding review uptake through a cognitive component were considered obstacles affecting knowledge. If an affective component was identified then the barrier was listed as impeding attitude. A limitation or restriction on ability was regarded as a barrier affecting behaviour. Lack of familiarity included impaired ability to correctly answer questions about review content, as well as self-acknowledged lack of familiarity. Lack of awareness was viewed as the inability to adequately acknowledge systematic review existence.

Study characteristics were included in Table 1. Methods were outlined in Table 2; the results were tabulated in Table 3.

In order to assess the quality of the studies, study characteristics were extracted: year of publication, country of origin, main objective of the study, the design of the study, and the characteristics of participants. In particular, the sampling strategy of the primary studies, response rate, and methodological approach, including data collection strategies, were assessed.

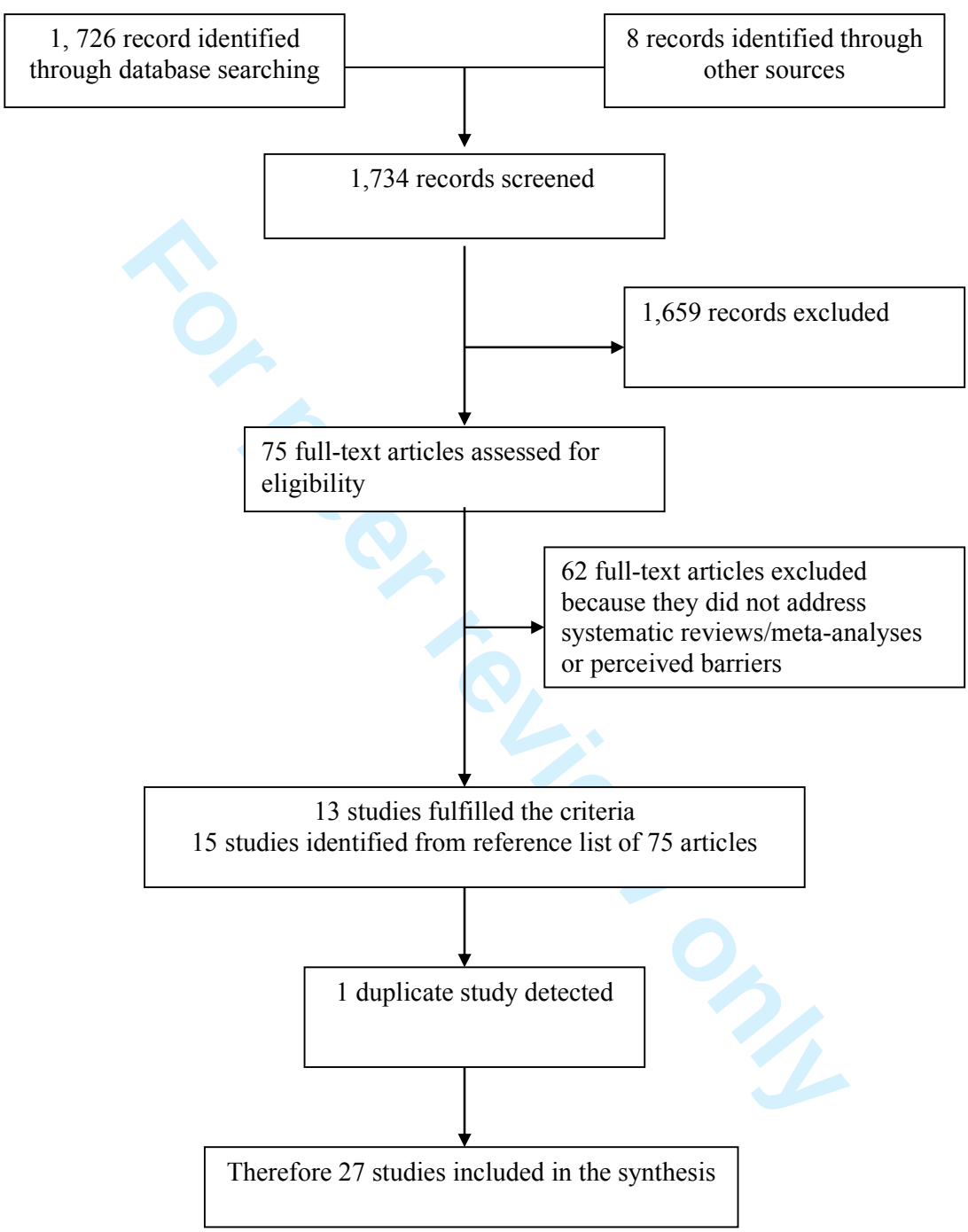
RESULTS

Search yield

Of 19 databases searched and three search engines utilized, there were 1,726 specific candidate articles found possibly examining barriers to uptake of evidence from systematic reviews. Some 1,651 titles were excluded after examination of the bibliographic citation. After examination of the full text of 75 articles, 13 articles fulfilled the criteria. Fifteen primary studies were detected from the reference lists of these 75 articles. A total of 28 detected reports describing 27 unique studies met inclusion criteria. Thirteen studies that might possibly be expected to be included but are not, are outlined in Table 4 together with the reasons for their exclusion. To be included, studies had to address perceived obstacles to uptake of evidence specifically from systematic reviews, meta-analyses and the databases that contained them. A search of EMBASE and PubMed from January 2011 to June 2012, failed to detect any relevant, completed or on-going studies to be added to 'Studies awaiting classification' and 'On-going studies' tables. The search terms and their combination are outlined in Table 5.

The 27 included studies encompassed 2 qualitative studies, and 25 surveys asking a total of 57 questions regarding possible barriers to uptake of evidence from systematic reviews, meta-analysis, and the databases containing them. A survey involved at least one question to a group of decisions makers about barriers to uptake of evidence from systematic reviews. Barriers were grouped into themes: 18 derived from the surveys and an additional 10 from the qualitative studies.

Figure 1. PRISMA Flow diagram



The studies were undertaken in the UK (n=9), Canada (n=5), Australia (n=4), USA (n=3), Ireland (n=1), Holland (n=1), New Zealand (n=1), Switzerland (n=1), India (n=1), and SE Asia: Indonesia, Malaysia, Thailand, the Philippines (n=1). One country, Switzerland, surveyed participants from 78 countries. Therefore, included studies reported data from decision makers in 91 countries.

Of 10,218 participants, 64% were physicians (Table 6). Two studies were concerned with the use of systematic review evidence for public health policy and programme management decisions.[24, 25] The remaining studies had a clinical practice focus concerned with investigating attitudes to evidence-based medicine. Seventeen studies (63%) were published after the year 2000.

Study Quality

The included studies were limited in terms of the quality and generalizability of their results. While all but one[15] had a well-described sampling frame, just eight of the 27 studies describe selecting a random sample of participants (Table 2). Response rates were not mentioned in two[16, 25] of the 27 studies (Table 2). The response rate was variable. The rate varied from 8.8% to 100% and 17 of the 27 studies describe a response rate of at least 60% (Table 2). Twenty-six studies reported the number of participants investigated, with the number varying from 16 to 1,406.

The number of barriers addressed by each survey varied. Of the 25 surveys, 8 (31%) examined only one type of barrier, and the average number of barriers examined was 1.7. None of the surveys examined 6 or more barriers and all studies relied on reported use, not actual use, of evidence.

Characteristics of Studies

Most studies were surveys (n=25), 2 were qualitative studies with one included study using mixed methods. Data collection strategies included focus groups (n=1), individual interviews (n=1), together with mail, telephone, and web-based questionnaires (n=25).

The characteristics of each study are outlined in Table 1. We found that the surveys used a heterogeneous variety of decision-making populations, based on location or speciality. They also investigated a number of resources. The surveys looked at systematic reviews, meta-analyses, The Cochrane Library, the Cochrane Database of Systematic Reviews (one of the six high-quality databases maintained by the Library), Database of Abstracts of Reviews of Effects, the Reproductive Health Library, also the earlier Cochrane Pregnancy and Childbirth Database and the Oxford Database of Perinatal Trials. The surveys displayed a wide range of the percentage of respondents reporting each barrier (Table 3).

Identifying barriers

After classifying possible barriers into common themes, it was found that the 57 questions about obstacles to uptake of evidence from systematic reviews encompassed 28 barriers. These were grouped according to the knowledge/attitude/behaviour framework.[14] Barriers affecting knowledge could include lack of awareness, lack of familiarity and a lack of understanding of meta-analyses. Lack of confidence, decreased motivation, a perceived lack of usefulness of systematic reviews and limited trust in them, were grouped under Attitudes. Systematic review attributes, patient issues, and environmental factors have the potential to impair usage of systematic reviews. Attributes of systematic reviews such as academic terminology, and environmental factors such as limited resources or a negative organisational climate, were grouped under Behaviour.

Knowledge

Eleven studies measured lack of awareness as a possible barrier. Sample size ranged from 248 to 8,100 (median, 475) and the response rate ranged from 8.8% to 90% (median, 66%).

The percentage of respondents reporting lack of awareness as a barrier was as high as 82% (for DARE[17]) and as low as 1% (for Cochrane Library[18]) with a median of 55%. In 9 (82%) of the 11 studies, at least 10% of the respondents cited lack of awareness as a barrier.

Seven surveys measured lack of familiarity as a possible barrier. Sample size ranged from 60 to 8,100 (median, 531) and the response rate ranged from 8.8% to 100% (median, 63%). The percentage of respondents suggesting lack of familiarity as a barrier was as high as 98% (DARE[17]) and as low as 19% (systematic reviews [17]) with a median of 70%. In 7 (100%) of the 7 surveys, at least 10% of the respondents cited lack of familiarity as a barrier.

Attitude

Four studies measured lack of motivation as a possible barrier. Sample size ranged from 98 to 8,100 (median, 1,305). The percentage of respondents identifying this barrier was as high as 10% (Oxford Database of Perinatal Trials[21]) and as low as 2% (meta-analysis [22]) with a median of 3.6%. In none of the surveys did more than 10% of respondents report lack of motivation as a barrier.

Seven surveys measured lack of perceived usefulness as a possible barrier. Sample size ranged from 60 to 491 (median, 350), and the response rate ranged from 63% to 100% (median, 87%). The percentage of respondents identifying lack of usefulness as a barrier was as high as 95% (systematic reviews[17]) and as low as 7% (Cochrane Library[18]) with a median of 16.5%. In six of the seven surveys, at least 10% of the respondents cited lack of usefulness as an issue.

Behaviour

Eleven surveys measured lack of access as a possible barrier. Sample size ranged from 60 to 3,087 (median, 440), and the response rate ranged from 44% to 100% (median, 71%). The percentage of respondents identifying lack of access as a barrier was as high as 95% (lack of easy access to Cochrane Library [19]) and as low as 3% (lack of access to Cochrane Library [20]), with a median of 55%. In 10 (91%) of the 11 surveys, at least 10% of the respondents cited lack of access as a barrier.

Five studies investigated 10 external barriers to overview uptake. The external barriers investigated were environment-related in 5 studies and also systematic review-related in one study, with no patient-related barriers cited. More than 10% of respondents cited lack of resources and lack of positive policy climate [23], lack of workshop attendance [16] , and lack of training in Cochrane Library use [18 , 20] as possible environmental barriers. Lack of time was not cited by more than 10% of participants. [18] More than 10% of respondents cited the limited range of topics covered by the Cochrane Library [18] as a possible barrier.

Fourteen surveys looked at lack of use of systematic reviews. Sample size ranged from 150 to 8,100 (median, 490) and the response rate ranged from 8.8% to 100% (median, 63%). The percentage of respondents reporting lack of use was as high as 99% (DARE [17]) and as low as 18% (Cochrane Library [16]) with a median of 78%. In 14 (100%) of the 14 surveys at least 10% of the respondents did not use systematic reviews or the databases containing them.

Qualitative studies

Two qualitative studies [24, 25] cited six important barriers to evidence uptake from systematic reviews. The two studies emphasised lack of accessibility. They also cited a lack of training in the purpose and methodology of systematic reviews as a barrier to uptake. Content issues

such as lack of relevance, lack of implications for practice, and limited implementation strategies were also cited. A deficient understanding of the information needs of the target audience of systematic reviews was also raised as a major barrier.

One study had a qualitative element exploring the perceived weaknesses of the Cochrane Library. [18] Participants suggested as barriers the limited range of topics covered, poor access, the narrow focus on RCTs and meta-analysis, difficulty of use, lack of regular update, poor promotion, and the time required to use and search the database. Number of barriers investigated by each study is tabulated in Table 7.

DISCUSSION

While access is improving, The Cochrane Library is still not free in all countries and lack of access is still seen as a significant barrier. Access, of course, impacts on awareness and familiarity. While The Cochrane Library has achieved widespread awareness, in the majority of the studies, more than 10% of participants still cited lack of awareness of systematic reviews, or the databases that contain them, as a barrier.

Casual awareness does not guarantee familiarity with systematic reviews. Lack of familiarity was more common than lack of awareness.[17] Furthermore, at least 10% of the respondents cited the lack of usefulness of systematic reviews as a significant obstacle.

A negative attitude and a lack of knowledge may inhibit the uptake of systematic reviews. However, factors related to the review itself, the patient, or wider environmental barriers may also impair uptake. Limited relevance and a paucity of implications for practice were seen as barriers[25] together with the limited range of topics covered.[18] More than 10% of respondents cited lack of a receptive policy climate[23] and lack of training in database searching[20] as possible environmental barriers.

The everyday usage of systematic reviews should improve attitudes to this form of evidence. However, there is considerable evidence that this is not happening.[17] Surprisingly, lack of time and motivation did not emerge as major barriers to systematic reviews uptake.

Limitations

The extensive and systematic literature search is one of the strengths of this systematic review. Explicit inclusion criteria and a transparent approach to collecting data were also utilised. Each included study was assessed by at least two of the authors. The limitations of our systematic review largely reflect the shortcomings of the reports reviewed.

All the 27 included studies, except the two qualitative studies, were surveys using closed-ended questions. This meant that the obstacles addressed were dependent very much on investigator preference. A fear of being outside a consensus for instance, was not specifically investigated as a barrier. Use of a different taxonomy may have altered our findings. But the taxonomy selected and utilised here compares well to other taxonomies. [26]

Because much of the research in the knowledge translation field is poorly indexed in electronic databases and spread over many disciplines, relevant studies may have been overlooked, though searching the reference lists of related studies yielded additional reports.

Another potential defect is the use of participant self-ratings. The individual studies depended on the decision maker's perceptions and views. Actual clinical practice was not

assessed. Whether an obstacle is real or perceived may affect the strategy required to address the identified barrier.

Some of the included studies were limited with respect to sampling and generalizability. Some surveys were small and used non-random samples confined to specific groups. This limits the extent to which the findings can be generalised. [27] A well-described sampling frame and a good response rate improve our confidence in a study's results. [28] A low response rate in some of the surveys increases the potential for selection bias. The external validity of the studies can be questioned as a poor response rate increases the impact of non-responder bias in the survey results. [29] However, by including a wide range of decision makers in our systematic review, this increases our appreciation of how differences in health-care systems can impact on review uptake.

Implications

This analysis offers a list of reasons for understanding why decision makers may be disinclined to use systematic reviews. A number of the barriers already cited by Cabana and colleagues[6] to guideline adherence were identified, though in our study, time constraints, limited motivation and patient related factors were not highlighted. The results of this review have a number of implications for systematic review uptake in particular and evidence uptake in general.

Despite the high regard in which systematic reviews and The Cochrane Library are held, there are a variety of barriers to systematic review uptake. These include lack of access, lack of awareness, lack of familiarity, lack of perceived usefulness, limited actual use in practice and finally, a number of external barriers to do with systematic review content, presentation, and wider organisational factors.

Few studies however, consider the full variety of barriers that must be overcome to achieve enhanced uptake. The average number of barriers examined was 1.7. By not investigating a full variety of barriers, strategies to improve use are less likely to address all the important factors inhibiting systematic review uptake and, as a result, are less likely to be successful.[6] Interventions designed to change practice should be based on an accurate assessment of the factors that support targeted health outcomes. The accuracy of this assessment is directly related to the future impact of the intervention.[45] If we accept this finding, then it is vital to identify the factors that influence the uptake of evidence from systematic reviews in order to help develop targeted interventions to enhance information uptake from this important resource.[9] Future research needs to address a fuller range of impediments to evidence uptake, with practical difficulties encountered in using systematic reviews observed and documented by researchers through 'user testing' of this source of evidence by participants.[46]

Access to The Cochrane Library is critical in order to advance evidence-based healthcare. [30] Connectivity seems to have increased [20] but access and use of databases needs to be improved. Even different professionals working in the same clinical setting can have different levels of access to the same database, an issue deserving of further investigation. [20] If most of those who have access to the database then go on to actually use the Cochrane Library then access may be an important issue to be investigated further. Strategies to assist those least likely to use Cochrane databases may help the move towards evidence-based practice. [28]

Conclusion

Much work has been done on the barriers to uptake of evidence from clinical practice guidelines.[6] The barriers that Cabana and colleagues commonly identified to guideline adherence were lack of awareness and familiarity, lack of belief in a good outcome after adopting the guideline, and the inertia of previous practice including lack of motivation.

Lack of motivation to use systematic reviews did not emerge as a major obstacle to systematic review uptake in our study. However, in common with research on the uptake of evidence in general, lack of access and limited awareness continue to be significant perceived barriers to systematic review uptake. Importantly, lack of practical use of systematic reviews continues to present a major challenge to evidence uptake. To become familiar with an innovation, it must be used. For systematic reviews, this is not happening often enough.

Strategies to improve uptake of reviews should emphasize the usefulness of reviews for research and clinical practice. They should also provide a practical opportunity to use and become familiar with systematic reviews and the databases containing them, preferably in an organizational climate that values research.

To our knowledge, this study represents the first systematic review, of a diverse group of decision makers, of barriers to the uptake of evidence from systematic reviews, meta-analyses and their related databases. The results presented here have immediate and practical relevance for clinicians and organisations that are trying to improve access to the best available evidence and enhance its use in routine practice. These findings provide a sound basis on which to plan future interventions to enhance the uptake of evidence from systematic reviews and meta-analyses among physicians and other decision makers, leading to improved care for the individual patient.

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Competing interests

All authors declare that they have no conflicting interests.

All authors have completed the Unified Competing Interest form and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

Table 1 Characteristics of included studies

Year Published, Country	Objective	Design and focus	Participants	Date Conducted
1. Wilson, P. Watt, I. and Hardman, P. 2001[18] UK	To determine attitudes on the importance of effectiveness information	Postal questionnaire Cochrane Library	338 Medical directors	1999
2. Paterson -Brown et al. 1995[21] UK	To establish the availability of meta-analytic overviews and to find out how obstetricians keep up to date.	Telephone survey Oxford Database of Perinatal Trials	98 Obstetricians	1993
3. Hanson, Bhandari, Audige, . and Helfet, 2004[37] Switzerland	To determine current understanding of study methodology and critical appraisal.	Questionnaire, self-administered Meta-analysis	532 Surgeons and allied professionals from 78 countries	2002
4. Poolman et al. 2007[38] Holland	They examined perceptions and competence in EBM	Postal survey Meta-analysis Systematic reviews Cochrane Library	366 Orthopedic Surgeons	2005
5. Sur et al. 2005[22] USA	Investigated the attitudes of urologists toward EBM	Web-based survey Cochrane Database of Systematic Reviews	714 Urologists	2005
6. Dahn	To investigate the	Mail survey	889	2006

et al. 2009[29] USA	attitudes of urologists to EBM	Meta-analyses CDSRs	Urologists	
7. McAlister et al. 1999[39] Canada	To assess the attitudes of general internists to EBM.	Postal Survey Cochrane Database of Systematic Reviews	294 Physicians	1997
8. Wilson et al. 2001[19] UK	To identify current methods of making research evidence accessible	Postal survey Cochrane Library	1406 General practitioners	1999
9. Young, J and Ward, J. 2001[15] Australia	Examine views about EBM	Postal Survey and Semi-structured Interviews Cochrane Library	60 GPs	1999
10. McCaw et al. 2007[40] Ireland	Gain an insight into the use of Internet	Postal survey Cochrane Library	542 Community pharmacists (178) GPs (364)	2005
11. Kerse, N et al. 2001[28] NZ	Access to Internet and Cochrane Library	Cross-sectional postal and fax survey Cochrane Library	381 GPs	1999-2000
12. McColl et al. 1998[17] UK	To determine the attitude to EBM and perceived usefulness of databases	Postal questionnaire Systematic reviews Meta-analysis Cochrane Library CDSRs DARE	302 GP principals	1997
13. Bennett et al. 2003[27]	To find out about attitudes to EBP and implementation	Postal questionnaire Cochrane Library	649 Occupational Therapists	2000

Australia	barriers			
14. Young and Ward 1999[30] Australia	To determine awareness and use of the Cochrane Library and access to the Internet	Postal Questionnaire Cochrane Library	311 General practitioners	1997
15. Prescott et al. 1997[33] UK	To establish the awareness of research evidence	Self-administered, postal questionnaire survey CDSRs	800 GPs	1996
16. Jordans et al. 1998[34] Australia	To determine the proportion who report using systematic reviews	Cross-sectional telephone survey obstetricians Systematic reviews	224 neonatologists	1995
17. Ciliska, et al. 1999[43] Canada	To gain an understanding of research needs, perceptions of barriers to research utilisation, and attitudes towards systematic reviews	Telephone questionnaire survey Systematic reviews	226 decision makers in public health Included doctors	NK
18. Olatunbosun et al. 1998[35] Canada	To examine views of EBM	Self-administered, two-page questionnaire Cochrane Library Cochrane Pregnancy And Childbirth Database	190 physicians in obstetric practice	1996
19. Melnyk et al. 2004[32] USA	Describe major barriers and facilitators to EBP.	Limited survey CDSRs	160 nurses	2003
20. Gavgani, V. and Mohan, 2008[36] India.	Directed at exploring attitudes towards EBM	Survey method Cochrane Library CDSRs	98 physicians	2008
21.				

Wilson, et al. 2003[20] UK	To assess the awareness and use of NHSnet	Postal survey questionnaire Cochrane Library	1364 GPs: 441 Nurses: 325 Practice Managers: 556	2001
22. Carey, et al. 1999[41] UK	To determine the attitudes of towards the practice of EBM	Postal questionnaire Cochrane Library	139 Psychiatrists	1998
23. Lawrie et al. 2000[42] UK	To examine attitudes to evidence - based psychiatry	Survey, postal CDSRs	93 Senior psychiatrists	NK
24. Hyde et al. 1995[44] UK	To examine use of Cochrane Pregnancy and Childbirth Database	Postal survey CPCD Cochrane Library	274 subscribers to CPCD Included doctors	1994
25. Martis et al. 2008[16] Asia	The aim was to assess current knowledge of evidence-based practice	Survey, postal Reproductive Health Library Cochrane Library	660 health care professionals Included doctors	2005
26. Dobbins, et al. 2007[25] Canada	The purpose was to identify preferences for the transfer and exchange of research knowledge.	Semi-structured interviews Systematic reviews	16 Policy decision-makers Included a doctor	2001
27. Dobbins, et al. 2004[24] Canada	To discover public health decision makers' preferences for content,	One-hour focus groups Systematic reviews	46 Policy makers Included doctors	2002- 2003

format, and channels for receiving research knowledge

Table 2 Methods and Quality

Study.	Sample frame	Response rate	Measurement of use of evidence
1. Wilson et al. 2001[18]	Purposive sample of 491 Medical directors Well-described sample	(69%) 338/491	Reported use
2. Paterson-Brown et al. 1995[21]	Purposive sample of 98 obstetricians Well-described sample	(100%) 98/98	Reported use
3. Hanson et al. 2004[37]	Purposive sample of 1,064 surgeons/others Well-described sample	(50%) 532/1,064	Reported use
4. Poolman et al. 2007[38]	Purposive sample of 611 orthopaedic surgeons Well-described	(60%) 366/611	Reported use
5. Sur et al. 2006[22]	Purposive sample of 8,100 urologists Well-described sample frame	(8.8%) 714/8,100	Reported use
6. Dahm et al. 2009[29]	Random sample of 2000 urologists Well-described sample frame	(45%) 889/2000	Reported use
7. McAlister et al.	Purposive sample of 294	(59%) 294/521	Reported use

1999[39]	general Physicians. Well-described sample frame		
8. Wilson et al. 2001[18]	Purposive sample of 3,087 individuals Well-described sample frame Primary care	(45%) 1,406/3,087	Reported use
9. Young, and Ward 2001[15]	Sample of, 60 GPs Sampling frame not described	(100%) 60/60	Reported use
10. McCaw et al. 2007[40]	Sample of 1081 GPs and 522 pharmacists Well-described sample frame	(34%) 542/1603	Reported use
11. Kerse et al. 2001[28]	Random Sample of 459 GPs Well-described sample frame	(83%) 381/459	Reported use
12. McColl et al. 1998[17]	Random Sample of 452 GPs Well-described sample frame	(63%) 302/452	Reported use
13. Bennett et al. 2003[27]	Proportional random sample of 1491 occupational therapists Well-described sampling frame	(44%) 649/1491	Reported use

14. Young and Ward, 1999[30]	Random sample of 428 GPs Well-described sampling frame	(73%) 311/428	Reported use
15. Prescott et al. 1997[33]	Random sample of 800 GPs Well-described sample frame	(62%) 501/800	Reported use
16. Jordans et al. 1998[34]	Random sample of 145 Obstetricians and 104 neonatologists Well described Sample	(90%) 224/248	Reported use
17. Ciliska et al. 1999[43]	277 who met inclusion criteria of decision makers Well-described sample	(87%) 242/277	Reported use
18. Olatunbosun et al. 1998[35]	Random sample of 190 family physicians and obstetricians Well-described sample	(76%) 148/190	Reported use
19. Melnyk et al. 2004[32]	'Convenient' sample Well described sample	(100%) 160/1600	Reported use
20. Gavgani And Mohan, 2008[36]	Random sample Well-described sample	(65%) 98/150	Reported use

21. Wilson et al. 2003[20]	All GPs in defined area. Well-described sample	(44%) 1364/3090	Reported use
22. Carey and Hall, 1999[41]	All psychiatrists in a defined area Well-defined sample	(64%) 139/216	Reported use
23. Lawrie et al. 2000[42]	All in a defined area Well-described sample	(76%) 93/123 but just 22/123 (17%) contributed to this review	Reported use
24. Hyde et al. 1995[44]	All subscribers to CPCD Well-described sample	71% 274/387	Reported use
25. Martis et al. 2008[16]	All in a defined area Well-described sample	NK	Reported use
26. Dobbins et al. 2004[24]	Purposeful sample Well-described sample	46/60 (77%)	Reported use
27. Dobbins et al 2007[25]	Purposeful sample Well-described sample	16/NK	Reported use

Table 3. Barrier Descriptive Findings

Barrier category	Barrier Descriptive
Knowledge barriers	Eleven studies measured lack of awareness as a possible barrier. The percentage of respondents reporting lack of awareness as a barrier was as high as 82% and as low as 1%, with a median of 55%. Eleven surveys measured lack of access as a possible barrier. The percentage of respondents identifying lack of access as a barrier was as high as 95% and as low as 3%, with a median of 55%. Seven surveys measured lack of familiarity as a possible barrier. The percentage of respondents suggesting lack of familiarity as a barrier was as high as 98 and as low as 19%, with a median of 70%.
Attitudinal barriers	Seven surveys measured lack of perceived usefulness as a possible barrier. The percentage of respondents identifying lack of usefulness as a barrier was as high as 95% and as low as 7%, with a median of 16.5%. Four studies measured lack of motivation as a possible barrier. The percentage of respondents identifying this barrier was as high as 10% and as low as 2% with a median of 3.6%.
Behaviour barriers	Five studies investigated 10 external barriers to review uptake. More than 10% of respondents cited lack of resources, lack of positive policy climate, lack of workshop attendance, and lack of training as possible environmental barriers. Fourteen surveys looked at lack of use of systematic reviews. The percentage of respondents reporting lack of use was as high as 99% and as low as 18% with a median of 78%.

Table 4. Excluded studies

Lavis, John. Research, Public Policymaking and Knowledge-translation Processes. Journal of Continuing Education in the Health Professions. 2006 26. 37-45. Not a survey, focus group or interview, or an intervention.

Glasziou P, Guyatt GH, Dans AL, Straus S, Sackett DL. Applying the results of trials and systematic reviews to individual patients. Evidence-Based Medicine 1998 3(6). 165-6. Not a survey, focus group or interview study, or an intervention.

Grimshaw J, Santesso N, Cumston M, Mayhew A, McGowen J. Knowledge for knowledge translation: the role of the Cochrane Collaboration HLWIKA 2006 26(1): 55-62. Not a survey, focus group or interview study, or an intervention.

Lavis J, Davies H, Gruen R, Walshe K, Farquhar CM. Working within and beyond the Cochrane Collaboration to make systematic reviews more useful to healthcare managers and policy makers. Health Policy 20061(2): 21-33. Not a survey, focus group or interview study, or an intervention.

Dobbins M, Ciliska D, Cockerill R, Barnsley J, DiCenso A. A framework for the dissemination and utilisation of research for healthcare policy and practice. J Know Synth Nurs 2002 18;9:7. Not a survey, focus group or interview study, or an intervention.

Petticrew M, Whitehead M, Macintyre SJ, Graham H, Egan M. Evidence for public health policies on inequalities. Journal of Epidemiological Community Health. 2004 58:811-6. Not specifically related to systematic reviews.

Silagy CA, Weller DP, Middleton PF and Doust JA. General practitioners' use of evidence databases. Med J Aust. 1999 April 19;170(8):393
A comment on previous studies.

Sheldon T. Making evidence synthesis more useful for management and policy making. J Health Serv Res Policy. 2005 Vol 10, Suppl 1, July
An essay, not a survey, focus group, or an interview, or an intervention.

Gruen R, Morris P, McDonald E and Bailie. Making systematic reviews more useful for policy makers. Bulletin of the World Health Organization. 2005 June, 83(6). A letter/essay.

Melnyk B, Fineout-Overholt E, Feinstein N, Sadler L, Hernandez C. Nurse Practitioner Educators' Perceived Knowledge, Beliefs and Teaching Strategies Regarding Evidence-Based Practice: Implications for Accelerating the Integration of Evidenec-based Practice into Graduate Programmes.Journal of Professional Nursing, 2008 Vol 24, Issue 1, p 7-13. Does not address systematic reviews.

Volmink J, Siegfried N, Robertson K and Gulmezoglu M. Research Synthesis and Dissemination as a Bridge to Knowledge Management: the Cochrane Collororation. Bulletin of the Worlds Health Organisation 2004 82: 778-783. An essay. Not a survey, a focus group, an interview, or an intervention.

Mayer J and Pitman L. The Attitudes of Australian GPs to Evidence-based Medicine: a Focus Group Study. Family Practice 1999 16: 627-632. Does not address systematic reviews.

Cranney M and Walley T. Same information, different decisions: the influence of evidence on the management of hypertension in the elderly. The British Journal of General Practice 1996 46(412): 661-663. Not specifically about systematic reviews.

Table 5. Search of PubMed and Embase

PubMed was searched from December 2010 to June 2012 using the advanced search facility

Search	Query	Items found
1	systematic review AND barriers AND knowledge uptake	1
2	meta-analysis AND barriers AND knowledge uptake	1
3	systematic review AND obstacles AND knowledge uptake	1
4	meta-analysis AND obstacles AND knowledge uptake	0
5	systematic review AND barriers AND knowledge utilisation	3
6	meta-analysis AND barriers and knowledge utilisation	2
7	systematic review AND obstacles AND knowledge utilisation	0
8	meta-analysis AND obstacle AND knowledge utilisation	0
9	overview* OR review* AND impairment* AND knowledge translation	13
10	systematic review* OR meta-analys* AND barrier* AND decision making	16

37 citations were returned, none of which met inclusion criteria

Embase was searched from December 2010 to June 2012 using the advanced search facility

Search	Query	Items found
1	systematic review AND barriers AND knowledge uptake	14
2	meta-analysis AND barriers AND knowledge uptake	5
3	systematic review AND obstacles AND knowledge uptake	0
4	meta-analysis AND obstacles AND knowledge uptake	0
5	systematic review AND barriers AND knowledge utilisation	14
6	meta-analysis AND barriers and knowledge utilisation	0
7	systematic review AND obstacles AND knowledge utilisation	0
8	meta-analysis AND obstacle AND knowledge utilisation	0
9	overview* OR review* AND impairment* AND knowledge translation	0
10	systematic review* OR meta-analys* AND barrier* AND decision making	0

32 citations were returned, 1 full text article retrieved, no report met inclusion criteria

Table 6. Disciplines participating

Doctors: 6,549
Nurses: 1,494
Practice managers: 785
Occupational therapists: 649
Midwives: 202
Pharmacists: 178
General practice staff: 91
Surgical allied professions: *69*
Policy makers: 62
Information specialists: 56
Others: 83

Total: 10,218

TABLE 7: Number of barriers investigated by each study to uptake of evidence from systematic reviews, meta-analyses, and the databases containing them

Surveys	Number of barriers addressed by each study
Wilson et al. (2001)	4: lack of access, awareness, use, and training
Paterson-Brown et al. (1995)	2: lack of access, awareness
Hanson et al. (2004)	2: lack of trust, training
Poolman et al. (2007)	2: lack of understanding, use
Sur et al. (2006)	3: Lack of awareness, use, and understanding
Dahm et al. (2009)	3: Lack of awareness, use, and understanding,
McAlister et al. (1999)	1: Lack of use
Wilson et al. (2001)	1: Lack of access

WardandYoung (2001)	3: Lack of access, understanding, usefulness,
McCaw et al. (2007)	1: Lack of use
Kerse et al. (2001)	3: Lack of access, awareness, use
McColl et al. (1998	3: Lack of awareness, access, and understanding
Bennett et al. (2001)	1: Lack of confidence
Young and Ward (1999)	3: Lack of awareness, access, use
Paterson-Brown (1993)	3: Lack of awareness, availability, and need
Prescott et al. (1999)	2. Lack of use, awareness
Jordan et al. (1999)	3: Lack of use, awareness, access
Ciliska et al. (1999)	4: Lack of awareness, use, policy climate, resources .
Olatunbosun et al. (1998)	1: Lack of access
Melnyk et al. (2004)	1: Lack of use
Gavgani et al. (2008)	2: Lack of use, usefulness
Wilson et al. (2003)	4: Lack of access, awareness, use, and training
Carey and Hall, (1999)	1: Access
Lawrie et al. (2000)	1: Ability to search
Hyde et al. (1995)	1: Ability to search
Martis et al. (2008)	5: Lack of access, awareness, use, usefulness, training,
Qualitative studies:	
Dobbins et al. (2004)	2: Lack of access, training
Dobbins et al. (2007) . .	4: Lack of relevance, implications, implementation . strategies, understanding of the information needs of . the target audience.
Wilson et al. (2001)	7. Limited range, access, focus, use, up-datedness, promotion and time

PROTOCOL

Barriers to uptake of evidence from systematic reviews and meta-analyses: a systematic review of decision makers' perceptions

Authors: John Wallace**,** Bosah Nwosu, and Mike Clarke

Abstract

This is the protocol for a systematic review. The objectives are as follows:

1. To review all studies identifying barriers to uptake of evidence from systematic reviews, meta-analyses and the databases associated with them.
2. To assess the methodological quality of these studies.
3. To perform a systematic review of the evidence in this area.

Background

The slow and haphazard process of translating research findings into clinical practice compromises the potential benefits of clinical research. The need for effective knowledge transfer in clinical practice is essential. However, to date, there is a consensus among the research community that most efforts in knowledge translation at a clinical level have met with little success.[1]

A systematic review is a review of a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research, and to collect and analyse data from studies that are included in the review.[2] The increased uptake of evidence from systematic reviews is advocated because of their potential to improve the quality of decision making for patient care. Systematic reviews can do this by decreasing inappropriate clinical variation and quickly expediting the application of current, effective advances to everyday practice. However, research suggests that evidence from systematic reviews has not been widely adopted by health professionals. Increasing uptake of systematic reviews and improving awareness of the advantages that the technique can bring to the field of healthcare is a major challenge.

Barriers are factors that limit or restrict uptake of research evidence in clinical practice.[3] Implementation researchers, educators, policy makers, and clinicians want to know the identity of barriers to knowledge use in healthcare contexts and also how to address them. There are specific challenges associated with the assessment of barriers. Many lessons have been learned from previous research in this area on how to address barriers to knowledge use. Cabana and colleagues identified a variety of barriers to physician adherence to clinical practice guidelines and they organised the barriers in terms of their impact on knowledge, attitudes, and physician behaviour.[3]

Context: Despite wide promulgation, systematic reviews have had limited effect on changing decision makers' behaviour. Little is known about the process and factors inhibiting the uptake of knowledge in response to exposure to a systematic review.

Objective: To identify barriers to evidence uptake from systematic reviews, meta-analyses, and their associated databases.

Search methods for identification of studies

The Cochrane Library, Medline, Embase, PsycInfo, and other electronic resources, nineteen in total, will be searched, with a special emphasis on grey literature and knowledge translation research. The reference lists from primary studies identified will be searched and also the references from related overviews. The reviewers will identify additional candidate articles by reviewing the bibliographies of articles retrieved from the search. Experts in the field will be contacted. Terms to be used will include systematic reviews, overviews, meta-analysis, and reviews. Other search terms utilised will be barriers, obstacles, impairments, knowledge translation, knowledge uptake, knowledge utilisation, and decision making.

Data collection and analysis

Articles will be included that examined at least one barrier to knowledge uptake from systematic reviews, meta-analyses, or the databases that contain them. A barrier will be defined as any factor that limits or restricts complete knowledge uptake from an overview. It is proposed to focus on barriers that could be changed by an intervention rather than age or gender. Respondents can identify barriers via responses to survey questions. For qualitative studies, major themes from focus groups or interviews could also identify barriers. All decision makers will be included.

One investigator (JW) will screen titles and abstracts, and full bibliographic citations to identify candidate articles. Two investigators (JW and BN) will then independently review the full text to exclude articles that will not meet the inclusion criteria. Differences will be resolved by discussion and consensus.

Data Extraction:
Data extraction will follow three steps. Firstly, two investigators will abstract the following information from each article: description of the barrier, the percentage of respondents describing the barrier, demographics of the respondents, and also study characteristics including sample size and response rate. Differences will be resolved by discussion and consensus. Secondly, the barriers will be grouped into common themes. Thirdly, the barriers will be organised into groups based on the knowledge, attitudes, behaviour framework.[4] Before an integrative review can affect patient outcomes, it must first affect health professional knowledge, then attitudes, and finally behaviour. Factors impacting on cognition, affect and behaviour will be considered as potential barriers. A survey will be defined as having at least one question to a group about potential barriers to knowledge uptake from a systematic review, a meta-analysis, or the databases containing them.

Assessment of risk of bias
Important flaws in individual studies such as a lack of random selection of participants, inadequate description of the sample frame, and a poor response rate will be described. For purposes of quality assessment, study characteristics will be extracted by two investigators: country of origin, year of publication, main objective of the study, design of the study, characteristics of participants, sampling strategy, response rate, and methodological approach, including data collection strategies. Differences in assessment of risk of bias will be resolved by consensus or consultation with a third party (MC). Publication bias will be minimised by the extensive search strategy.

Synthesis
We intend to bring together findings from different study designs within different methods and approaches. It is not expected that it will be possible to carry out a meta-analysis due to the high degree of anticipated heterogeneity across settings, participants, and data collection methods. A narrative synthesis with appropriate tabulation is anticipated.

The type of barrier will be tabulated, together with the comprehensiveness of surveys. How often surveys considered the full variety of barriers to knowledge uptake will be indicated. The number and characteristics of the surveys examining each barrier will be documented. The targeted populations and their location will be identified. The sample size, method of selection, and response rate will also be reported. The percentage of respondents identifying a particular barrier will also be listed. Tables will be completed outlining the study characteristics, methods and results.

Evidence synthesis is a process of combining evidence from individual studies to create a new understanding by comparing and analysing concepts and findings from different sources of evidence with a focus on the same topic of interest. The aim is to identify and extract evidence, categorise the evidence, and combine the categories to develop synthesized findings. The overall objective is to build an explanation of why people do not use knowledge from systematic reviews.

Excluded studies will be listed in a ‘Characteristics of excluded studies’ table with a succinct summary of why studies were excluded. On-going studies and studies awaiting classification if found will be listed.

A summary of the main results will be reported together with an assessment of the overall completeness and applicability of the evidence, together with key methodological limitations.

Aim: We are interested in improving the relevance and utility of systematic reviews. The aim of the review outlined here is to identify barriers to uptake of evidence from systematic reviews and meta-analyses. The objective is also to offer a differential diagnosis for why decision makers do not use knowledge from systematic reviews as well as providing a rational strategy aimed at improving knowledge uptake from this important source of pre-appraised, integrated evidence, together with a frame work for future research.

Potential conflict of interest
None known

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3. Cabana M, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud PAC, Rubin HR. Why don't physicians follow clinical practice guidelines? A framework for improvement**.** JAMA 1999; 282(15):1458-1465.

4. Woolf SH. Practice guidelines: a new reality in medicine, III: impact on patient care. Arch Intern Med. 1993;153: 2646-2655.

FULL LIST OF EXCLUDED STUDIES, SUPPLEMENTARY FILE

BERO, L. A., GRILLI, R., GRIMSHAW, J. M., HARVEY, E., OXMAN, A. D. & THOMSON, M. A. 1998. Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings. The Cochrane Effective Practice and Organization of Care Review Group. *BMJ,* 317**,** 465-8.

BROWNER, W. S., BARON, R. B., SOLKOWITZ, S., ADLER, L. J. & GULLION, D. S. 1994. Physician management of hypercholesterolemia. A randomized trial of continuing medical education. *West J Med,* 161**,** 572-8.

BRUNTON, G. 2003. *Children and physical activity : a systematic review of barriers and facilitators,* London, EPPI-Centre.

CABANA, M. D., RAND, C. S., POWE, N. R., WU, A. W., WILSON, M. H., ABBOUD, P. A. & RUBIN, H. R. 1999. Why don't physicians follow clinical practice guidelines? A framework for improvement. *JAMA,* 282**,** 1458-65.

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COCHRANE, L. J., OLSON, C. A., MURRAY, S., DUPUIS, M., TOOMAN, T. & HAYES, S. 2007. Gaps between knowing and doing: understanding and assessing the barriers to optimal health care. *J Contin Educ Health Prof,* 27**,** 94-102.

COPPUS, S. F., EMPARANZA, J. I., HADLEY, J., KULIER, R., WEINBRENNER, S., ARVANITIS, T. N., BURLS, A., CABELLO, J. B., DECSI, T., HORVATH, A. R., KACZOR, M., ZANREI, G., PIERER, K., STAWIARZ, K., KUNZ, R., MOL, B. W. & KHAN, K. S. 2007. A clinically integrated curriculum in evidence-based medicine for just-in-time learning through on-the-job training: the EU-EBM project. *BMC Med Educ,* 7**,** 46.

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