

Beck, 2015

Research partner and search methodology expert: the role of the librarian in systematic reviews

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Abstract

The systematic review is a relatively new methodology using rigorous, standardised methods for locating and assessing studies and explicit and transparent methods to minimise bias. Originating in the health sciences systematic reviews are increasingly adopted in other disciplines to synthesise research and inform decision-making. This chapter describes how the skills of the librarian make a significant contribution to the success of the systematic review and how the academic librarian's role in this type of research is changing from support to partner. It also considers some of the challenges and opportunities the increased use of this methodology is presenting in existing service models.

Keywords

Academic libraries, reference services, librarians, research, systematic reviews

Introduction

Systematic reviews, which differ from literature reviews in their rigour and explicit methods to eliminate bias, are produced increasingly and are expanding to disciplines beyond the health sciences. Systematic reviews benefit from librarian's involvement and they provide opportunities for the professional development of librarians and for recognition of the academic libraries'

relevance to universities. This chapter aims to demonstrate that because of their expert role in systematic reviews, librarians have evolved from supporters of research to research partners.

This chapter discusses systematic reviews mainly from a health sciences standpoint. This discipline was responsible for the initial ground breaking investigations using this type of review and continues to be a leading contributor to its advancement. The chapter begins with a description of the methodology and current state of systematic reviews. It then explores the role of the librarian generally, and the academic or special librarian, in particular. It identifies the skills required and discusses some of the challenges and opportunities presented by this method of review to existing reference services. In particular it draws attention to the impact the librarian and academic research collaboration has on existing reference services.

The importance of systematic reviews

Gough, Oliver and Thomas (2012: 4) state ‘so influential has the use of research through Systematic Reviews become that their development can be considered one of the turning points in the history of science’. Systematic reviews critically appraise existing research and thereby identify poor quality research or gaps in research. They help prioritise what research needs to be done, synthesise best practice and add to the subject’s knowledge base. Systematic reviews have been described as:

the application of strategies that limit bias in the assembly, critical appraisal, and synthesis of all relevant studies on a specific topic. Meta-analysis may be, but is not necessarily, used as part of this process. Systematic reviews ... use rigorous, standardized methods for selecting and assessing articles. A systematic review differs from a meta-analysis in not including a quantitative summary of the results (Porta 2008: 217).

Higgins and Green (2011: 1.2.2) add

A systematic review attempts to collate all empirical evidence that fits pre-specified eligibility criteria in order to answer a specific research question. It uses explicit,

systematic methods that are selected with a view to minimizing bias, thus providing more reliable findings from which conclusions can be drawn and decisions made.

Background

In 1979 a call for better evidence for clinical decision-making was made by British epidemiologist, Archie Cochrane: 'It is surely a great criticism of our profession that we have not organized a critical summary, by specialty or subspecialty, adapted periodically, of all relevant randomized controlled trials' (Grant & Booth 2009: 92). This call also gave rise to the evidence based medicine (EBM) movement, and ultimately to the creation of the Cochrane Collaboration. This Collaboration was formed in 1992 'to provide an expanding resource of updateable systematic reviews of randomized controlled trials (RCTs) relating to health care' (Grant & Booth 2009: 92) and has created the gold standard for systematic reviews.

Systematic reviews are the mainstay of EBM, which Sackett, Rosenberg, Gray, Haynes and Richardson (1996: 71) define as 'the conscientious, explicit and judicious use of current evidence in making decisions about the care of individual patients' and it means 'integrating individual expertise with the best available external clinical evidence from systematic research'.

The distinction of systematic reviews is that they 'have an integral role in research knowledge and are an essential part of the process of interpreting and applying research findings to benefit society' (Gough, Oliver & Thomas 2012: 13). They are identified as the highest level of evidence in the EBM pyramid and in the Centre for Evidence Based Medicine evidence tables and are used in the creation of clinical practice guidelines and knowledge syntheses for clinical decisions as explained in a report by the Institute of Medicine (IOM), a division of the National Academies of Sciences, Engineering, and Medicine, in Washington, DC:

Healthcare decision makers in search of the best evidence to inform clinical decisions have come to rely on systematic reviews (SRs). Well-conducted SRs systematically identify, select, assess, and synthesize the relevant body of research, and will help make clear what is known and not known about the potential benefits and harms of alternative drugs, devices, and other healthcare services (Eden 2011: 1).

Systematic reviews differ from literature reviews in a number of ways. Essentially the traditional literature review presents research findings related to a topic of interest, providing a summary of what is known, and details of the studies included without explaining the criteria used for their inclusion. The systematic review by contrast, has an explicit, rigorous and accountable method and is 'productively focused on answering questions rather than addressing topic areas' (Gough, Oliver & Thomas 2012: 6). Harris (2005: 82) explains that 'the systematic review is designed to remove bias by employing a scientific methodology to comprehensively identify, critically appraise, and synthesize all of the potentially relevant literature on a given topic'.

Bias is an inherent issue in research. Eden (2011: 87) states that publication bias presents 'the greatest obstacle to obtaining a complete collection of relevant information on the effectiveness of healthcare interventions' and describes the different forms this takes in language, location, citation selection and time-delay in publication and indexing. A key characteristic of systematic reviews is the attempt to eliminate bias in the inclusion and selection of studies reviewed. This amelioration of bias is addressed by transparency and reproducibility, which include:

- clear objectives and inclusion criteria for studies;
- explicit and reproducible search and screening methods;
- systematic search strategies to identify all eligible studies;
- assessment of studies found; and
- a systematic presentation of the synthesis of research and the review findings which address the specific question.

The systematic review process

The process used for a systematic review follows a common set of stages:

- Initiation – creation of a team knowledgeable about the question, the process, and stakeholders.
- Definition of the research question – the team then refines the research topic question, defines the conceptual framework and approach, and decides on the inclusion and exclusion criteria for evaluating the studies which will form part of the review. The

question is structured using a framework that includes the elements Patient/Problem, Intervention, Comparison/Control and Outcome, and is known as PICO. This conceptual framework helps focus the parameters of the question, guides the identification of concepts and suitable search terms, and provides the basis on which to construct a logical search strategy.

- Locating studies – based on the question, a search strategy is devised which consists of appropriate keywords and subject headings as well as planning which sources to use. The search is run in topical databases appropriate to the question or topic as well as alternate sources such as the grey literature, including theses, conference proceedings, government reports et cetera, and by contacting authors for unpublished material. These steps are necessary in the amelioration of bias. To achieve an exhaustive search, additional searches are done by forward and backward chaining of references and manual searching of major journals in the field. The results of the searches are captured in bibliographic software and duplicate records are eliminated.
- Screening – the review of the results is preferably done by teams of two, who separately first review the records at the title and abstract level, and then the full text, to determine whether they should be included using a predetermined set of inclusion and exclusion criteria. Conflicting decisions are tie-broken by a third reviewer.
- Data extraction and synthesis – the full text of the final set of studies are further examined and the data or other results are synthesized.
- Knowledge translation – the findings are published and disseminated to inform practice, research and policy.

Standards, tools and checklists

In addition to the Cochrane Collaboration's handbook and the University of York's Centre of Reviews and Dissemination's (CRD) guide, there are a number of other manuals or handbooks published by organisations and agencies that use high quality systematic reviews for their decision making, the creation of clinical practice guidelines, assessment of technology, or policy. Among these are: the Agency for Healthcare Research and Quality (AHRQ), Scottish Intercollegiate

Guidance Network (SIGN), National Institute for Health and Clinical Excellence (NICE) and Canadian Agency for Drugs and Technology in Health (CADTH).

In 2011, IOM released an extensive set of methodological and reporting standards in their report, *Finding What Works in Health Care*. The report

recommends 21 standards with 82 elements of performance, addressing the entire Systematic Review process, from the initial steps of formulating the topic, building a review team, and establishing a research protocol, to finding and assessing the individual studies that make up the body of evidence, to producing qualitative and quantitative syntheses of the body of evidence, and, finally, to developing the final Systematic Review report (Eden 2011: 4).

Over time a variety of tools and checklists have been developed to assess and standardise the quality and reporting of reviews and their search processes. To assist with critical appraisal and ensure the integrity of systematic reviews the CRD's handbook, mentioned above, provides the following checklist of criteria that need to be satisfied by a review:

- Was the review question clearly defined in terms of population, interventions, comparators, outcomes and study designs (PICOS)?
- Was the search strategy adequate and appropriate? Were there any restrictions on language, publication status or publication date?
- Were preventative steps taken to minimise bias and errors in the study selection process?
- Were appropriate criteria used to assess the quality of the primary studies, and were preventative steps taken to minimise bias and errors in the quality assessment process?
- Were preventative steps taken to minimise bias and errors in the data extraction process?
- Were appropriate methods used for data synthesis? Were differences between studies assessed? Were the studies pooled, and if so was it appropriate and meaningful to do so?
- Do the authors' conclusions accurately reflect the evidence that was reviewed?

(Centre for Reviews and Dissemination 2009: Box 1.1)

The CRD also provides examples of how to describe the search process in Appendix 3 of the guide.

The identification of sub-optimal reporting of reviews by several studies prompted the creation of the Preferred Reporting of Systematic Reviews and Meta Analysis (PRISMA) approach, in order to standardise and improve reviews. PRISMA provides a 27- point checklist of items to include in the report and requires a flowchart to depict the flow of information through the different phases of a systematic review. It records the number of studies identified, included and excluded (Moher, Liberati, Tetzlaff, Altman, & PRISMA Group 2009: 332-336). The checklist has been endorsed by over 170 journal publishers as a requirement for systematic review submissions. Other methodological quality tools are: Meta-analysis Of Observational Studies in Epidemiology (MOOSE), and Assessment of Multiple Systematic Reviews (AMSTAR).

Sparse and inconsistent reporting of the search strategies used in reviews have led to the creation of the Peer Review of Electronic Search Strategies (PRESS) checklist (Sampson, McGowan, Cogo, Grimshaw, Moher, & Lefebvre 2009: 944-952) and a forum of librarian peer reviewers helps to evaluate search strategies in progress.

Use of systematic reviews in other disciplines

Although originally developed for summaries of effectiveness using randomised controlled trials, systematic review methodology has been adopted and adapted for the other study domains relevant to medical research: diagnostic, prognostic and causative studies, and also other areas of health research such as public health and epidemiology. It has also evolved into synthesised reviews in qualitative studies, and extended into subject areas such as the social sciences and policy. For example, Gough, Oliver and Thomas (2012: vii) list the additional fields in which the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI Centre) conducts systematic reviewing and synthesis: The topics include: crime and justice, education, employment, health promotion, social welfare, transport and the environment.

The results of the following search strategy further illustrate the burgeoning number of disciplines employing systematic reviews. This search, using synonyms for systematic reviews, was run by the author in Web of Science on June 24, 2015:

TS=("systematic review" OR "scoping review" OR "knowledge synthesis") OR

TI=("systematic review" OR "scoping review" OR "knowledge synthesis")

The results were analysed by research area which revealed that systematic reviews were found in subject areas, unrelated to health or social research, including forestry, materials science, computer science, engineering, economics, and business, among others.

As the standard systematic review methodology does not exactly meet the needs or purposes of these other domains, the systematic approach has exploded into a number of different types of review. Grant and Booth (2009) identify and describe 14 different types of reviews. In the area of policy research Arksey and O'Malley (2005) have written a seminal paper on the scoping review. More recently debate has arisen about the emergence of the rapid review (Featherstone, et al 2015).

While each of these different reviews adheres to a systematic approach, their process and level of rigour differ. According to Gough, Thomas, and Oliver (2012: 28) the 'proliferation of types of systematic reviews [is creating] challenges for the terminology for describing such reviews' and to clarify the distinctions they identify three major types of determinants of difference. As systematic reviews continue to be undertaken by other disciplines, it is anticipated that new forms of reviews will increase and the debate is set to continue.

Rate of increase in the use of systematic review methodology

The same search for systematic reviews and syntheses in the Web of Science described above was limited to the 10 years, 2005-2014, and yielded a total of 52,380 results. The breakdown by year of publication demonstrates the exponential growth in this type of review (Table 1).

Table 1: Number of systematic reviews by year (Web of Science 2015)

Publication date	Record count	% of total count (52380)
2014	10925	20.86
2013	9375	17.90
2012	7503	14.32

2011	5945	11.35
2010	4749	9.07
2009	4155	7.93
2008	3225	6.16
2007	2727	5.21
2006	2077	3.97
2005	1699	3.24

Skill sets of librarians in systematic reviews

McKibbin (2006: 205) noted that systematic reviews are important to librarians and librarianship for the following reasons. Library professionals conducting systematic reviews in the library field ‘help us build and make sense of our own research base’ and thereby help make the case to either implement or justify services that are effective, or eliminate those that are not. Additionally, the librarian’s role and application of skills on systematic reviews in research areas beyond library and information science ensures the quality of evidence gathered for analysis. Rethlefsen, Murad, and Livingston (2014: 1000) agree:

Medical librarians bring expertise to the review process based on their understanding of the medical literature, search methods, and review guidelines and standards. Their neutrality and expertise can help minimize bias in the review process, leading to more robust and unbiased review articles.

Health Sciences librarians are increasingly involved in systematic reviews. Figure 1, depicts the stages of the systematic review at which librarians are typically involved.

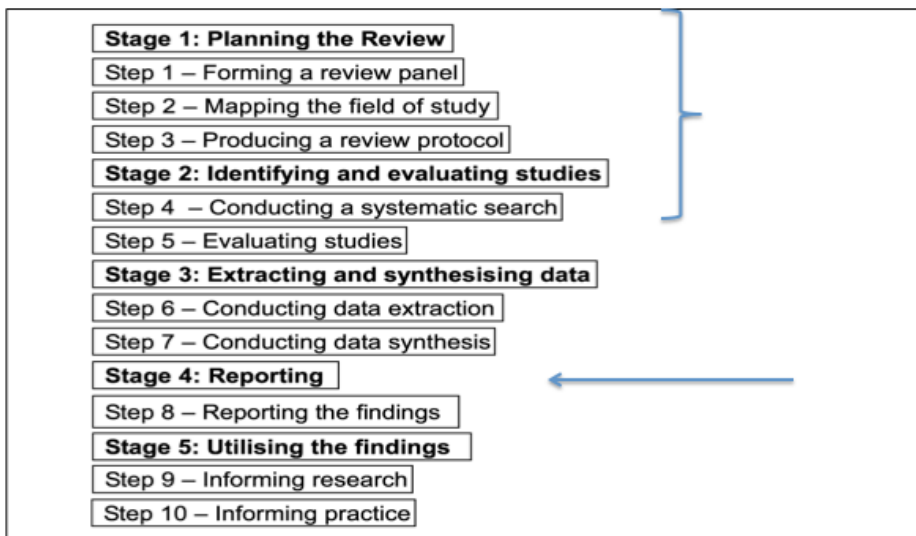


Figure 1: Librarian involvement in the systematic review process. Based on Tranfield (2004)

In addition to this role in individual systematic reviews, librarians have also contributed to the development and improvement of the methodology as a whole. Librarians have created and validated hedges and filters, including a qualitative filter in PsycINFO (McKibbon, Wilczynski, & Haynes 2006: 440-454). Through assessments, they have identified compliance issues regarding process. Examples are: the examination of the quality of reporting in Cochrane Systematic Reviews (Yoshii, Plaut, McGraw, Anderson, & Wellik 2009: 21-29), and the identification of the need for a tool to assess search strategies. The latter has been satisfied by the creation of the PRESS checklist for conducting the search strategy quality review (Sampson, McGowan, Lefebvre, Moher & Grimshaw 2008).

In a case study, Harris (2005) identified a number of skills required by librarians, or information scientists, when working on a systematic review. These, together with practical examples, are listed below.

1. The ability to interact with investigators and researchers

It is essential to the success of the systematic review for the librarian to be confident and an effective team player. The process of identifying questions and concepts, and the iterative nature

of search strategy development, requires clear communication and exchange of ideas. The librarian adds value to the discussion by using reference interview techniques to assist the team, or individual researcher, to gain improved insight into what the specific question is and provides knowledge about how to translate this into search concepts. For example, in a question involving exercise and cognitive function, this process will elicit suitable search terms for the broad concept 'cognitive function', as well as for specific cognitive abilities such as perception, memory, decision-making, et cetera. Furthermore, a librarian well versed in systematic reviews should have the confidence to advise on conducting a question analysis and on which conceptual framework to use. While PICO is suitable for therapeutic interventions, and is the most well known, other frameworks have been developed for other subject areas or study types. Examples of alternative frameworks include: Person, Environments, Stakeholders, Intervention, Comparison, and Outcomes (PESICO) in speech pathology (Schlosser & Pirozzi 2006: 5-10) and Sample, Phenomenon of Interest, Design, Evaluation, Research type (SPIDER) for qualitative studies (Cooke, Smith, & Booth 2012: 1435-1443).

2. A solid knowledge of how to develop a comprehensive search strategy

The need for an effective and robust search strategy to conduct an exhaustive search requires deductive reasoning to effectively translate the operational definitions of concepts into the appropriate combinations. It also requires judgment and search experience to balance sensitivity (recall) and specificity (precision) when deciding which inclusion and exclusion criteria need to be accounted for in the search strategy. Recognition that the development of the initial search strategy is a time-consuming and iterative process requiring experimentation and frequently referring the target research back to the team helps lower unrealistic expectations and stress. Several organisations, which are involved in the production of practice guidelines, health technology assessment or aiding effective and quick searching in evidence based decision-making, have created hedges, or search filters, to facilitate searching. Examples of these organisations are: Scottish Intercollegiate Guidelines Network (SIGN), Health Information Research Unit (HIRU) at McMaster University, and Canadian Agency for Drugs and Technology in Health (CADTH). These hedges are useful for hastening search strategy development, but they need to be applied judiciously and the librarian can advise on which to use. In general, by

staying abreast of database changes, best practices and new tools, the librarian brings efficiency and effectiveness to the review.

3. Expert knowledge of the content, date coverage and indexing conventions of databases

This knowledge is fundamental to ensuring the correct retrieval of suitable studies. The successful development of the search strategy requires practical knowledge of the different databases, as well as the different applications of subject headings and keywords in each. Typically, in health related systematic reviews, a ‘blueprint’ search is created in Medline. After testing and validation, this is then ‘translated’ for searching in other databases and on different platforms. This translation is necessary in subject heading searching to account for the differences in thesauri and controlled vocabulary among the databases. In keyword searching it is vital to use the appropriate truncation, wildcard and proximity symbols for the specific search engine.

An understanding of indexing conventions in the different subject databases is crucial for developing an accurate strategy. For example, Medline’s Medical Subject Heading (MeSH) database has a medical focus and its controlled vocabulary is less refined or specific for rehabilitation concepts than the Cumulative Index for Nursing and Allied Health Literature (CINAHL) thesaurus, which has a more developed vocabulary for allied health concepts. Likewise, the strength of terminology in PsycINFO for psychosocial topics is stronger than that in Medline. Researchers are generally unaware of these variances and librarians’ knowledge of these differences and their expertise in applying them provide a unique contribution for the accurate retrieval of appropriate studies and thus to the success of the review.

Multi-file searching and discovery tools, such as Summon, while seeming to offer efficiency, are not adequate for comprehensive searching or for the accurate recording of the process. The librarian can advise accordingly.

4. The identification of appropriate resources

This includes the selection of databases as well search tools. Knowing which suite of databases is needed ensures comprehensive coverage of the topic. Databases differ in the journals they cover and since many research topics are interdisciplinary in nature and researchers publish in journals outside their own discipline, a broad range of databases needs to be considered. For example, at a minimum Medline/Pubmed, Embase and CINAHL need to be searched for rehabilitation topics. Depending on the area of interest, additional databases may also need to be consulted. For school related topics, the Education Resource Information Center (ERIC) database might be added and for studies about motivation, PsycINFO.

Monroe-Gulick, O'Brien and White (2013) describe how they used an evidence-based approach to identify suitable databases. By using pre-identified significant papers in their research area they searched *Ulrichs Periodical Database* to identify in which databases the journals were indexed. They then used this information to reduce duplication and to identify unique, or little known source.

Citation tracking is important as reference lists and in-text citations can provide leads to relevant, unique or elusive items. 'Cited by' searches are invaluable in locating recent and subsequent studies. A number of citation tracking databases have become available recently. In addition to Web of Science, there are Google Scholar, Scopus and PubReMiner. Publishers are now offering tracking within their stable of journal titles. Knowing that each captures unique results and that there can be little overlap among them, the librarian is able to advise on which to use.

5. The ability to identify and search sources beyond electronically available published literature

This ability is important in the amelioration of bias. As mentioned earlier, there is inherent bias in the published literature. Saleh, Ratajeski, and Bertolet (2014: 30) state 'The IOM standards 3.2.1 and 3.2.4 call for the inclusion of grey literature searches in all systematic reviews and handsearching of selected journal and conference abstracts ...[and librarians] must be prepared to search the grey literature or at least provide guidance on resources and search strategies'. By including information found in less successful trials, and in government reports, dissertations and

theses, or conference proceedings the accuracy and quality of the review is improved.

6. *Use of information management skills to manage the results and document the process*

In accordance with PRISMA, the information flow for each stage of the review needs to be described. This requires the results of each of the searches to be captured in bibliographic software and tallied before and after duplicates are removed. For transparency and reproducibility, each stage of the search and retrieval process is documented and written up in the methodology in the final report. This documentation includes the full description of the databases and other sources searched, and the search terms, techniques and strategy used.

Subsequent studies and recommendations reinforce the applicability and importance of these skills. Their impact has been noted in recent systematic review assessments which suggest that in those reviews in which a librarian, or some other professional searcher was employed, had better reporting of the process and used more complex search strategies (Rethlefsen, Farrell, Osterhaus Trzasko & Brigham 2015: 617-626). Librarians' involvement is 'strongly associated with the use of many recommended search methods and could improve the quality of the review, [by] contributing to the replicability and robustness of meta-analytic findings' (Koffel 2015: e0125931).

The appreciation of the skill set and its value to the process is evident in the following recommendations from the various authors of the Cochrane Collaboration Handbook, Institute of Medicine Standards, Agency for Healthcare Research and Quality (AHRQ) and Canadian Institutes of Health Research (CIHR) respectively:

- Seek the guidance of a local healthcare librarian or information specialist, where possible one with experience of conducting searches for systematic reviews (Higgins & Green 2011: 6.1.1.1).
- Standard 3.1.1– Work with a librarian or other information specialist trained in performing systematic reviews to plan the search strategy and

Standard 3.1.3 – Use an independent librarian or other information specialist to peer review the search strategy (Eden 2011: 8).

- Librarian involvement in the initial stages of the process, including reading the background materials that are prepared as the topic is developed, is an essential first step to understanding the key questions and crafting a pilot search (Relevo & Balslem 2011: 1170).
- Your team should have the required skills for each area of the project. It is strongly recommended that each team includes an expert in the content area(s) covered by the synthesis, an expert in synthesis methods and an information scientist or librarian (Canadian Institutes of Health Research 2013: 2.2).

Role of the academic or special librarian

In addition to the roles outlined above, the academic librarian's specific involvement in systematic reviews can be instructor, advisor, consultant or member of a research team. At universities, systematic reviews are conducted for reasons of education and for research. They are viewed as an important part of the education process for masters and doctoral students. As such, systematic reviews are frequently assigned as a research project, or as the methodology for the dissertation's literature review. Systematic reviews are also undertaken as original research for knowledge syntheses and for information gathering preparatory to a research project. Liaison, or reference, librarians are involved in both types to varying degrees.

Instructor

According to Gough, Oliver and Thomas (2013: 28) 'systematic reviews are a relatively new method and are not taught on most research methods courses. Many academics do not have such specialist training and skills'. In consultations with masters and doctoral students, the librarian is instructor as well as consultant and advisor. It is often necessary to teach the methodology of the whole systematic review as well as those processes related to the location of studies. Instruction includes advising on checking that the proposed project is unique, submitting the protocol to Prospectively Registered Systematic Reviews in health and social care (PROSPERO), advising on

PRISMA and how to manage the recording of the review, guiding the expression of the research question into a conceptual framework and teaching how to build effective searches in databases and other resources. Reviewing search strategies and troubleshooting access issues provide further support.

Many research coordinators hire undergraduate students as research assistants to do systematic reviews. Most of these students have minimal searching and research skills and need to be coached on elementary search techniques, the existence of databases, and even lateral thinking. The role of the academic librarian in these instances is to clarify the research topic (often from a secondary source); advise on the variety of sources to use, and help brainstorm the concepts and relevant search terms. It is also necessary to provide training on the intricacies of developing sensitive search strategies with subject headings and keywords combined with Boolean operators, and the judicious application of limits, filters or hedges. In addition the assistants often require training on bibliographic software to manage the process.

Research partner

As noted above it is clear that librarians' involvement in systematic reviews is integral to the production of the review. On grant funded projects, such as the knowledge synthesis grants from the Canadian Institutes of Health Research (CIHR), a liaison librarian often assists with the initial grant application by doing the preliminary scoping search to confirm the topic is unique and to ascertain the scope of work and range of resources required for the project's budget. If the grant is successful, the librarian may be on the team as the information specialist, or may be involved in an advisory and training role. In either capacity, the librarian's intellectual input to develop the search strategy, to know which sources to use, to guide the management of the results, and the writing up of the search methodology in the report, make for a unique and significant contribution. By staying abreast of best practices the librarian is also advisor on emerging processes and new tools and software.

The unique expertise and skills required for the exhaustive search to locate studies elevate this participation to a partnership, rather than a supporting role. This level of inclusion is underscored

in CIHR funded projects where the librarian, or information specialist, is designated the role of ‘collaborator’. It can be argued that, even where the actual search and management of results is undertaken at a remove by students, or research assistants, the contribution of expertise, the intellectual input and the commitment of time positions the librarian as partner.

Co-author

It is clear that ‘the individual nature and inherent complexity of each systematic review demands close collaboration between librarians, academics and clinicians’ (Swinkels, Briddon & Hall 2006: 248). Tannery and Maggio (2012: 143) conclude that as a librarian’s ‘efforts are a necessary component of the research ... a librarian who takes responsibility for the design and execution of a literature search should be included as an author of the publication’ in accordance with the authorship guidelines of the International Committee of Medical Journal Editors (ICMJE).

The impact of systematic reviews on existing academic library reference services

The rise of the systematic review and the increasing involvement by librarians presents both challenges and opportunities to existing academic library reference services.

Increasing demand

As already mentioned many systematic review standards recommend the involvement of the librarian, or information scientist. This puts additional pressure on academic reference services already experiencing staff reductions (Campbell & Dorgan 2015: 11-19). Systematic reviews, no longer the preserve of health care, are becoming increasingly prevalent in other disciplines and the increases seen in health and social research are likely to be experienced in other areas too. A poster presented at the Canadian Health Libraries Association annual conference in 2014 reported on a study conducted at the University of Waterloo. The aim was to gain a better understanding of the systematic review environment and the possibilities for librarian involvement. Of 83 faculty and doctoral students who responded 80% anticipated authoring or co-authoring a systematic review in the next five years and 90% of the faculty surveyed claimed that

they would include liaison librarians to some degree (Stapleton, Gordon, Davies, & Hutchison 2014).

Opportunities for continuing education and professional development

Systematic review methodology demands that librarians be knowledgeable in all aspects of their production, including the process, tools, databases, search methods and trends. A recent survey by Murphy and Boden (2015: 74) on Canadian health sciences librarians' participation in systematic reviews indicates that knowledge is 'pretty good' or 'extensive' in the traditional librarian type roles, namely those of search strategy developer, database selector, research question formulator, citation manager and document supplier.

Health sciences librarians have contributed to, and avail themselves of, a growing knowledge base. Training opportunities present themselves through increasing continuing education (CE) opportunities. As demonstrated in 2014 Saleh Ratajeski and Bertolet (2014: 28) counted eight CE offerings in the Medical Library Association Education Clearinghouse and as of June 2015 this has increased to eleven. These CE opportunities are available at conferences, local institutions, or online. Content varies widely, from developing expert search skills in specific databases to the process of conducting a systematic or other type of review. An example described by Conte et al (2015: 72)

... prepares librarians to understand the role of systematic reviews in evidence-based health care and provides training in 'conducting an exhaustive and reproducible literature search, documenting the search process, and delivering organized and complete results'. Additionally, the development of a personalized strategic plan prepares librarians to promote their skills in systematic reviews in their home institutions.

In addition to training opportunities, participation in systematic reviews also provides prospects for professional development. Beverley, Booth and Bath (2003: 65-74) describe ten possible roles for information specialists in the systematic review process namely: project manager, literature searcher, reference manager, document supplier, critical appraiser, data extractor, data synthesiser,

report writer and disseminator. In the survey mentioned above, Murphy and Borden (2015) included these and added two more, research question formulator and database selector. While respondents in the survey claimed that lack of training in these ‘newer’ roles was a barrier, Murphy and Borden (2015: 76) state that ‘it is significant to note that some level of assistance or participation [by librarians] was reported for all SR roles’.

Time constraints

Like Murphy and Boden (2015: 73-78), Crum and Cooper (2013: 278) report that time is a barrier to expanding librarians’ roles. The development of a search strategy is an iterative and time-consuming process and requires dedicated time. As a team member, the librarian is at the behest of the research team’s timetable making it difficult to co-ordinate meeting all team members concurrently. In addition, liaison librarians’ teaching responsibilities, when integrated in professional and graduate curricula, are often in conflict with the workflow and time commitment required for a research project.

Estimating time on systematic reviews and their related reviews is an important question for project management as well as for estimating librarian time. Saleh, Ratejeski and Bertolet (2014: 28-50) provide a useful exposition of time reporting studies. The results from their literature review demonstrate that these studies are highly variable and are influenced by the type of study, specific actions, and searcher skill or expertise. Their own study to investigate the time it takes to include grey literature searching as part of the process revealed that ‘the average total time spent searching electronic databases and hand searching the literature for a systematic review was 24 hours with a range of 2-113 hours’ (Saleh, Ratejeski & Bertolet 2014: 36). As is evident from the widely different range identified, no definitive time can be pre-determined.

Anecdotally it is common for systematic review consultations to average three hours over two or more sessions. With follow up email and search strategy review this can increase to five hours and for a more broad scoping review, which attempts to map the literature, this involvement can expand to over ten hours.

Changes in service model

Increased demand and expansion of the systematic review methodology to other disciplines means the current reference models need to be reviewed in order to embrace this opportunity.

Suggestions and strategies include those of:

- Swinkels, Briddon and Hall (2006: 248) who found collaboration between researchers and librarian to be mutually beneficial, stating: ‘in addition to enhancing the reviews themselves, there are many other personal and institutional benefits of collaborative working. Consideration needs to be given to library staff structures and roles if these benefits are to be maximized and sustained’.
- Murphy and Boden (2015: 77) who suggest that ‘Canadian university health sciences library administrators need to acknowledge this new role and determine ways to manage its growth (e.g. inclusion in job descriptions, adjustments in assigned duties)’.
- Monroe-Gulick, O'Brien and White (2013: 386) who propose that researchers need ‘to appreciate the value and expertise of librarians to their projects and to begin to create line items in their budgets for libraries’.

Campbell and Dorgan (2015: 11-19) describe an action plan consisting of eight strategies undertaken at the John W. Scott Health Sciences Library at the University of Alberta. These include freeing librarians’ time, building searcher capacity in the library community, lobbying for positions, redefining service policies, improving the organisation of support services, liaising with faculty about systematic review assignments, requiring users to come prepared to consultations and providing systematic review workshops for researchers. While many of these strategies have had an immediate effect in streamlining processes and freeing librarians to focus on complex searching to meet internal users’ needs, the authors conclude that it is not known when the demand for these services will peak and that ‘it will be necessary to continue applying these strategies, adapting them and evaluating them as we go forward’ (Campbell & Dorgan 2015: 13).

Like the University of Alberta, Woodward Library, University of British Columbia offers systematic review workshops two to three times per year. These are well attended and attract researchers from a wide array of disciplines and programs. In addition, in response to increasing demand for participation in knowledge synthesis projects, Woodward Library launched the Enhanced Consultation Research Support Service (ECRS) on a trial basis. The aim of this service is to be able to respond to the needs of the research community on a grant-funded basis and create a self-sustaining position over time.

Conclusion

The increasing and growing evolution of systematic reviews in academic research provides the library with an opportunity to prove its relevance to the academic mission. The importance of reviews done systematically and well is the foundation of clinical, social and policy decision-making. As members of the systematic review team, librarians have specialised knowledge and skills which contribute to knowledge creation and the body of research. Their role has changed from supporter to partner. Increasing demand and expansion of systematic reviews methodology to other disciplines is impacting current reference models and changes to these models need to be explored.

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