An Overview of How to Search and Write a Medical Literature Review

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Without a literature review, there can be no research project. Literature reviews are necessary to learn what is known (and not known) about a topic of interest. In the respiratory care profession, the body of research is enormous, so a method to search the medical literature efficiently is needed. Selecting the correct databases, use of Boolean logic operators, and consultations with librarians are used to optimize searches. For a narrow and precise search, use PubMed, MEDLINE, Ovid, EBSCO, the Cochrane Library, or Google Scholar. Reference management tools assist with organizing the evidence found from the search. Analyzing the search results and writing the review provides an understanding of why the research question is important and its meaning. Spending time in reviewing published literature reviews can serve as a guide or model for understanding the components and style of a well-written literature review. *Key words: research; literature review; biomedical research; database; PubMed; MEDLINE; search engine; evidence; index medicus; journals; literature synthesis; bibliographies; medical literature review.* [Respir Care 2023;68(11):1576–1584.

Introduction

Chatburn,[1] in 2009, wrote that respiratory therapists (RT) should actively maintain competence and continually improve their professional practice. The most recent American Association for Respiratory Care Statement on Ethics and Conduct[2] (2015) speaks to this obligation as RTs shall "seek continuing education opportunities to improve and maintain their professional competence and document their participation accurately." Many RTs engage in various forms of research, ranging from multi-center randomized controlled trials to quality improvement projects in respiratory care departments of small community hospitals. Regardless of one's work setting, RTs are able to engage in research. One way of fulfilling this recommendation is to participate in the process of a literature review.

The internet makes this an easy process today. Start in the library, be it digital or in person. Libraries today are 21st century libraries that have embraced the digital age. Given the amount of information available online, experienced researchers understand the need and value of librarians, especially medical librarians. Most are in health science libraries located in medical centers, public and/or private universities, and community colleges that offer degrees in nursing and the health professions. If access to a medical librarian is limited, then reference librarians who specialize in science, data services, and metadata can assist. The local town library is also a resource for suggestions and offers assistance for services, for example, interlibrary loans for document delivery from other libraries.

It is valid to say that no research project begins without a plan, whether you are a novice or an experienced researcher. Knowing what has already been published is essential for a project to move forward. A literature search can reveal journal articles, conference proceedings, consensus statements, books, and other media, depending on the topic. The reason for conducting a literature review is to summarize an expansive body of evidence. When the

appropriate information is found, the literature review can allow for a summary of what is currently known on the research topic, any strengths and weaknesses of the evidence, and a justification and purpose for the new research plan in terms of what is not yet known.

Textbooks on research and medical literature are plentiful. Most suggest a systematic approach that begins with a search strategy, selecting the appropriate key words, determining the best sources to search, and critically analyzing the search results. Regardless of the many sources available, peer-reviewed data provide the best evidence for inclusion in literature reviews. A well-designed search can also reveal tools or instruments that are useful for conducting the search from the beginning to completion of the project, which is a publication that adds to the known evidence on the topic. If done well, the literature search produces answers for investigators but can also expand the research topic by revealing the need for further questions and future research. If not, expect an unorganized search with wasteful duplication of time and effort. In this overview, the purpose and structure of a literature search are presented so that writing a well-referenced summary of the research or an annotated bibliography is achievable.

Methods

The stages of a literature review are shown in Table 1.[3] The best practice is to determine a study topic or research question before beginning the literature search. To determine a study topic, consider the reasons to conduct the research, such as, is this a common question, is there uncertainty in practice, and was this question not previously or sufficiently addressed?[4] For example, at the bedside, an RT seeks clarification on the use of low-dose corticosteroids for a patient in septic shock but is not able to find the information on a smartphone. This lack of information can be the incentive to conduct a literature review. Begin with key words that are relevant to the topic in formulating the research question. If uncertain what key words may be helpful, look in medical journals below the abstracts for key words used. A well-written and focused research question yields the best sources for the literature search.[5] Furthermore, a focused research question avoids wasting time because the results of the search are more precise.

Table 1. Stages of a Literature Review

Stage
1. Choose a review topic and research question.
2. Search and select appropriate articles.
3. Analyze and synthesize the literature.
4. Write a preliminary review.
5. Search again, looking for articles that were missed or published since the first review.
6. Revise the review to include new information.
7. Submit to scholarly journal.

Selecting Relevant Databases

Although the literature review should include any resource that is relevant to the research question, the priority is the most current information. Scientists were asked what timeline meets the definition of a current publication, and the consensus was articles < 5 years old. However, this varies among disciplines.[6] Internet browsers such as Internet Explorer, Safari, Firefox, and Chrome are free and useful in finding widespread evidence. Google (www.google.com) is a popular web site but key words must be narrow for a useful list of citations to be returned. If the key words are too broad, for example, "asthma," then an unmanageable and overwhelming number of citations will be returned. Furthermore, commercial algorithms are used and what is listed first is not necessarily the most important or valid result.[7] To have confidence in the literature review, searchable databases should be used that are relevant to your topic. Having at least 2 to 3 sample articles related to the research topic before starting a database search is recommended to use as a guide or verification that the search is correctly detecting references. Use databases that are known to be reliable sources to search for evidence. Wikipedia, the free encyclopedia, should be used with caution. Wikipedia has introduced a new advanced source searching tool that can provide a more comprehensive search when compared with simpler search engines.[8]

PubMed

The National Center for Biotechnology Information, as part of the National Library of Medicine, administers PubMed (https://pubmed.ncbi.nlm.nih.gov/). The home

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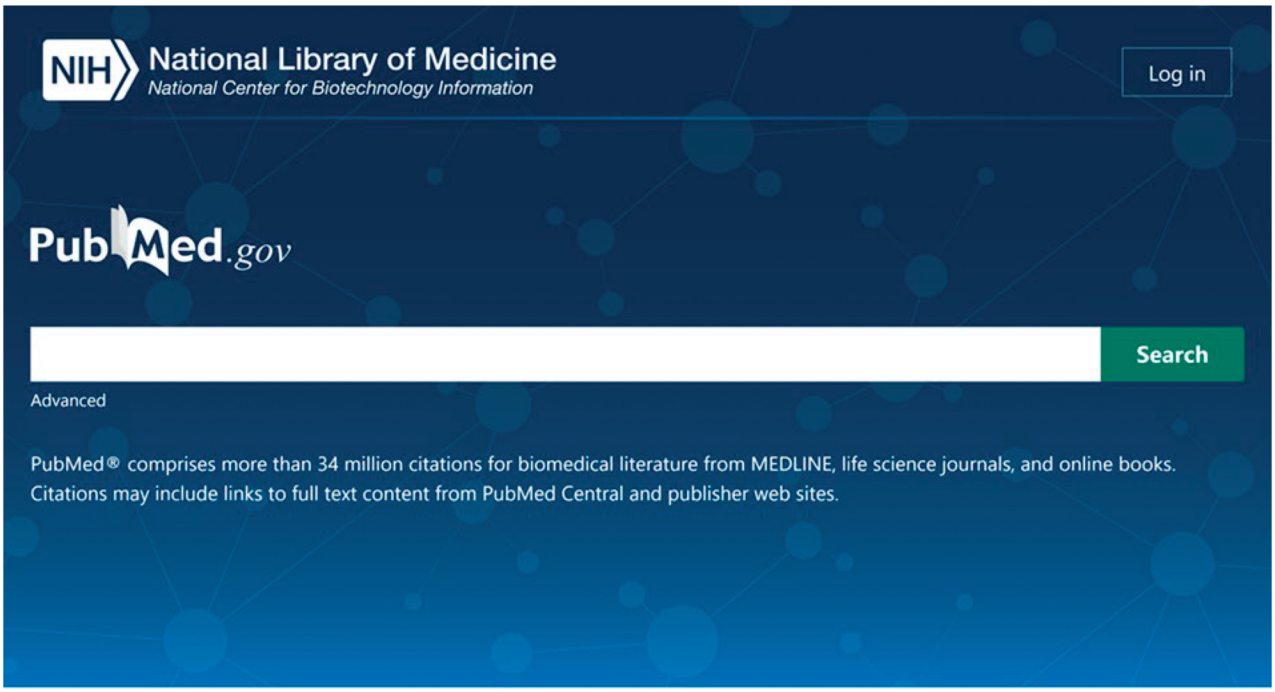

Fig. 1. PubMed web home page.

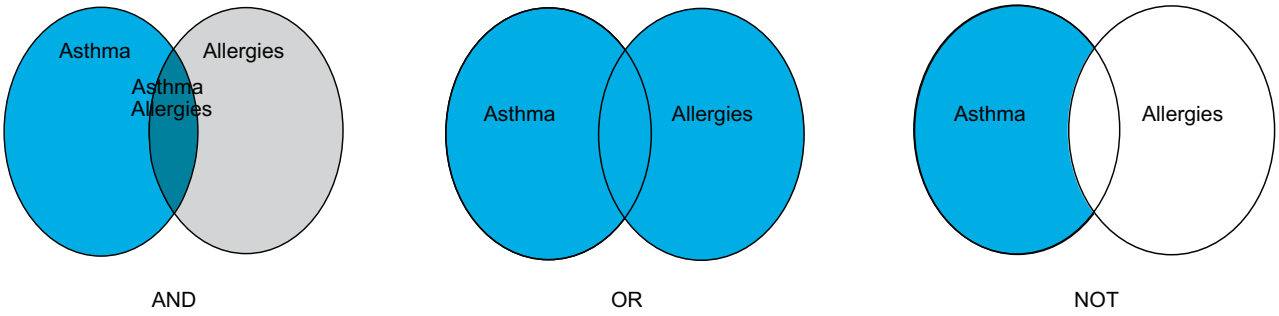

Fig. 2. Boolean operators.

web page of PubMed (Fig. 1) provides a free search engine to locate biomedical information through MEDLINE and other sources. PubMed is a large database with an index, or an electronic system, for finding specific data based on limits. The search methods used by PubMed are key words or terms entered in the search box that match against journals, an author index, and a collaborator index.

If a literature search is conducted without the assistance of a librarian, then some understanding of Boolean logic is needed. Operators are used that allow one to set connections between key words or concepts when searching. The most common operators or commands included in most literature search software are the terms and, or, and not.[1,9] Shown in Figure 2, in visual form, is how these operators narrow, expand, and exclude articles and citations based on

Table 2. MeSH: Asthma

MeSH Vocabulary Type	Example
Headings	Respiratory hypersensitivity, inflammation, airway obstruction, wheezing, dyspnea paroxysmal
Subheadings	Diagnosis, drug therapy, prevention, genetics, control
Supplementary categories	Mechanical ventilation, acute respiratory failure, action plan
Publication types	Randomized control trials, practice guidelines, asthma protocols

MeSH = Medical Subject Headings

these limits that saves time and effort. When a match is found by a term or phrase, the mapping process returns or posts a list of citations. Also, PubMed allows researchers to view details of each query under the History on the Advanced Search web page.[10]

Another search strategy from the National Library of Medicine is the use of Medical Subject Headings or MeSH. MeSH is a standardized vocabulary for indexing articles in PubMed. Using MeSH terms may require a consultation with a librarian, but tutorials are available on the PubMed web site.[10] MeSH vocabulary words that use the term asthma as a subject heading are provided in Table 2. By adding additional key words to the MeSH search, subheadings, supplementary categories, and publication types are listed as elements of the search results. See PubMed for details of a full branching logic MeSH search for asthma.[11]

PubMed Central is a newer database from the National Library of Medicine in that it provides entry to open access journals. Studies funded by federal government agencies are required to be open access after publication for at least 12–18 months. However, after December 31, 2025, the policy will be that any taxpayer-supported research will be immediately available to the American public at no cost and without an embargo.[12] If not a federal agency, then publishers or editors of journals make an application to be accepted into PubMed Central so that their journals can seek a broader audience. PubMed Central is a free and full-text biomedical and life science journal database with most content, but not all, indexed or searchable in PubMed. PubMed Central is akin to the traditional library role of providing public access to information in a free and unrestricted way, in this case, to anyone who has access to the internet.[13] Also, the National Library of Medicine requires a mechanism to preserve content for journals listed in PubMed to ensure long-term access to digitally stored information. For online-only journals, for example, Respiratory Care, PubMed Central provides an option for digital preservation. The content of Respiratory Care is digitally preserved in PubMed Central, but it is embargoed for 1 year unless the research is supported by federal funding or the author pays for open access (Hess D, personal communication on May 8, 2023).

It can be confusing, but PubMed should not be equated to MEDLINE. PubMed is the means of accessing the MEDLINE database.[9] An account to access MEDLINE is required or access through an institutional subscription. MEDLINE can be considered the authoritative database for health-care professionals in that it includes original peer-reviewed publications that date back to 1948.[5] MEDLINE includes abstracts, full-text articles, references to books, and peer-reviewed information ahead of print. Respiratory Care is indexed in MEDLINE at https://www.ncbi.nlm.nih.gov/nlmcatalog/7510357.

MEDLINE searches are useful in tracking the refinement or narrowing of a literature review. This process is required for publications such as a clinical practice guideline or meta-analyses. To manage and efficiently limit the search, filters can be used, which are found on the search page just under the PubMed logo. Filters include the type of text availability (article, free full text, full text), article type (books, clinical trial, randomized control trial, systematic review), and publication date (1 year, 5 years, 10 years, or custom).

An initial review when "literature review" is searched with $>$ 3 million results returned is shown in Figure 3. The results when "systematic literature review" is searched and filters added, such as MeSH words and time limits are in Figure 4. This decreased the search results by 89%. The final search term "systematic literature review – pediatric asthma in Denmark" with more limits and further refinement, which revealed a manageable 37 results is shown in Figure 5. In this example, $>$3 refinements searches were performed but these figures show how useful MEDLINE can be in searching the medical literature. If needed, consult a librarian to manage the considerable number of citations. Be aware that MEDLINE is not as easy to search as are Google or Google Scholar. Also, literature not formally published, such as citations for book chapters or conference proceedings, is not indexed in MEDLINE. This is known as gray literature.[6]

MEDLINE also interfaces with proprietary databases with commercial publishers paying a fee to PubMed. In this case, MEDLINE content can be accessed on the publisher's web interface, which may have different search features and capabilities than PubMed. For example, Wolters Klumer is the commercial publisher for Ovid. Ovid MEDLINE is more international in terms of search results, so a wider range of journals are available. Ovid is also recommended when more advanced literature reviews are required such as comprehensive and structured systematic reviews. More information is available at www.ovid.com.

EBSCO (www.ebsco.com), which is the abbreviation for Elton Bryson Stephens company, is an electronic encyclopedic database that is linked with MEDLINE and other search

Fig. 3. Initial search - literature review.

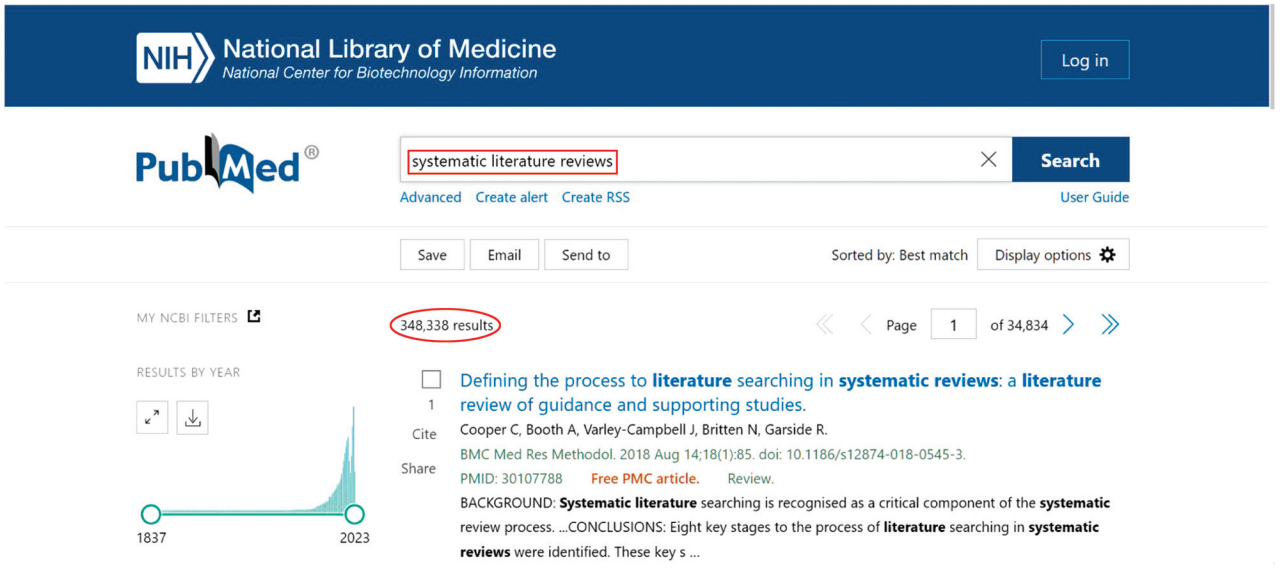

Fig. 4. Secondary search with filters - systematic literature review.

databases. Access is free but institutional subscriptions allow for more advanced search results. CINAHL Index, or Cumulative Index to Nursing and Allied Health Literature, is hosted by EBSCO or EBSCO Host, a database targeted to nursing and the health professions. CINAHL Plus allows for full-text PDF downloads of articles with an additional subscription fee. CINAHL includes other publication products such as dissertations, test and evaluation instruments, and patient education materials. The American Psychological Association (APA) offers a database called Psych INFO which covers content in the areas of behavioral science and mental health. Psych INFO uses a controlled vocabulary of key words relevant to the search. Also, there are other science-related titles available for search in EBSCO but access via a library is needed to view them. ECRI, or Emergency Care Research Institute. ECRI replaced the National Clinical Practice Guidelines Clearinghouse when federal funding was eliminated in 2018. ECRI is a searchable database for clinical practice guidelines. Since 2021, clinical practice guidelines published in Respiratory Care have been submitted to ECRI for posting and are graded in terms of the strength of evidence for recommendations. See www.ecri.org for access.

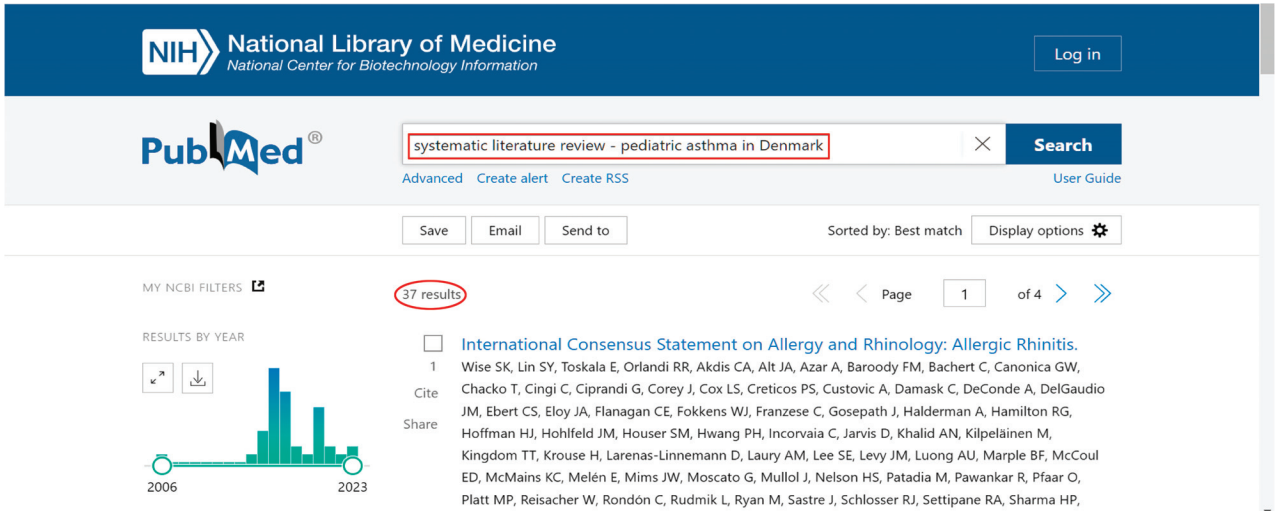

Fig. 5. Final search - pediatric asthma in Denmark.

The Cochrane Library is a collection of 6 databases that include sources to inform health-care decision making. The databases are the Cochrane Database of Systematic Reviews, Cochrane Central Registry of Controlled Trials, Cochrane Methodology Register, Database of Abstracts of Reviews of Effects, Health Technology Assessment Database, and National Health Service Economic Evaluation Database. Access requires an institutional subscription but often the best evidence is presented for literature reviews. See https://www.cochranelibrary.com for access via the John Wiley & Sons, Inc. platform. Each review posted is a peer-reviewed systematic review by a Cochrane Review Group. For example, one systematic review was found in the Database of Systematic Reviews that included the search term "respiratory therapist." Janjua et al[14] published "Telehealth interventions: remote monitoring and consultations for people with chronic obstructive pulmonary disease (COPD)." This is an extensive review that consists of 160 pages that included 29 studies with 5,654 participants. Rigorous details are provided but, nonetheless, no evidence that telehealth technologies help improve the health of people who have COPD was found.

Google Scholar is a subset of Google and is available at http://scholar.google.com. The use of Google in literature review requires caution, but Google Scholar can be helpful in finding scholarly publications across disciplines. One nice feature is how the citations are retrieved: by author, how often, and how recently the article was cited. Although not related to literature reviews, Google Scholar provides metrics for researchers in regards to their publications. This includes the overall number of citations, an accumulative h-index (Hirsch index), and the i10 index. The h-index, quantifies as a single-number criterion the scientific output of a single researcher.[15] and the i10 index refers to the number of papers with $\geq$ 10 citations.[16]

Scopus (www.scopus.com), from the publisher Elsevier, is a scientific, technical, medical, and social sciences literature citation database that searches journal articles, and conference papers. This includes ERIC (www.eric.ed.gov), an educational literature search finder for journal articles, book chapters, and reports from the Association of American Medical Colleges. These 2 additional databases may be helpful and wise to know about. These sources for selecting databases are the most common and are very helpful, but this is not an exhaustive list. One final remark about the internet; it is the most used form of communication and currently there is no published policy to control the quality of information posted in this media. In 1996, Health on the Net Foundation introduced a code of conduct, the HON code for the medical and health domains. Unfortunately, in 2022, Health on the Net permanently discontinued their efforts because it was no longer possible to maintain the web site. It is worth noting that the HON code aimed to raise awareness of data value and to identify web sites that were maintained by qualified individuals and that contained reliable data.[17]

Evaluating the Search Results

Preliminary criteria should be considered as the search results are first reviewed. Ask what type of publication this is. Is it a scholarly journal, a web site, or an academic textbook? Where is this citation indexed? Who published this article and how long has this journal been in publication? Look at the reference list to determine if other authors are citing this material and how frequently? Is this current information consistent with other relevant material? Also think of cross references that entail identifying a recent paper, then reviewing the reference list by using the similar articles feature in PubMed. This is helpful when the search yields too few citations because the search terms are too specific. To expand

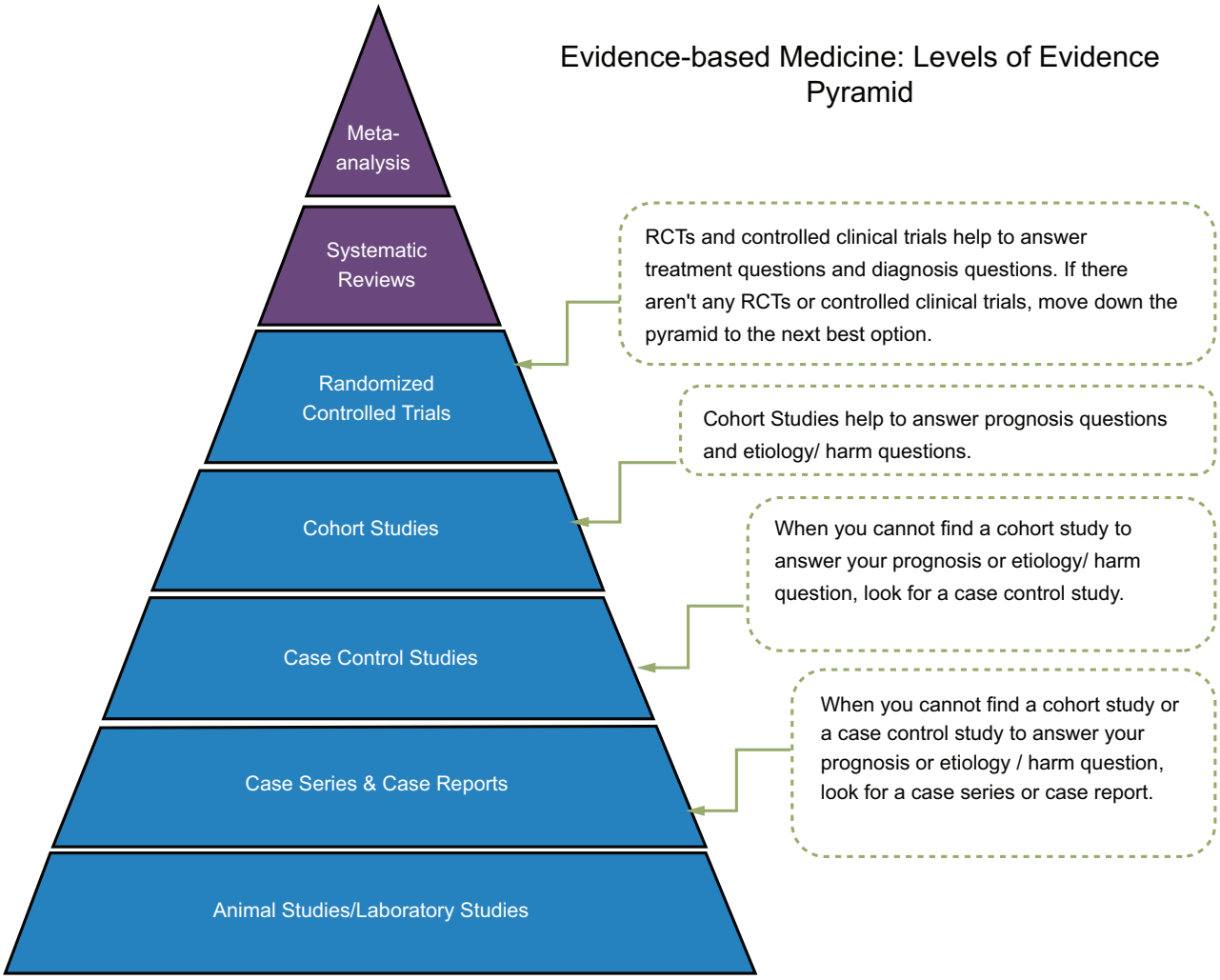

Fig. 6. The evidence pyramid. RCTs = randomized controlled trials.

the search, on the abstract page, the similar articles section offers a pre-calculated set of additional PubMed citations. Once this scoping review or scope of available relevant literature is complete, the next step is sorting and screening studies that relate to the research topic. Full-text articles are reviewed to identify gaps between what is known and not known. In evaluating the search results, the evidence pyramid that ranks the levels of evidence-based medicine is shown in Figure 6. Discerning how rigorous the literature review results may be for one's topic can produce confidence in the search results. The hierarchy of evidence states that systematic review and meta-analyses are the highest level of evidence and are the most time consuming, purposeful, and clinically relevant. Although animal and laboratory studies provide the lowest level of evidence for human subjects, these types of studies are typically not included in medical literature review searches.

If a large amount of literature is found during the evaluation of the search results, despite using filters, MeSH, and librarians, consider a reference management tool. This is good practice for researchers who intend to engage in systematic reviews and meta-analyses over an extended period of time. EndNote (www.endnote.com; Clarivate PLC, London, United Kingdom), Covidence (www.covidence.org; Covidence, Melbourne, Australia), Cochrane Reference Manager or RevMan (http://revman.cochrane.org; Cochrane, London, United Kingdom), and Zotero (www.zotero.com; Corporation for Digital Scholarship, Vienna, VA) are the most commonly used tools. When deciding which tool most closely fits the research need, considerations include cost, ease of downloading citations, or manual additions of citations. Free sources provide a basic set of reference styles, but, depending on the word processor used, these tools may incorporate a citation feature for use while writing. There are limitations to this feature, for example, citations cannot be stored for another use; so, buyer beware.[5] If using Endnote, the Respiratory Care reference style can be formatted as well as other styles, that is,

APA, etc. A good practice is to stay organized with a reliable system that stores unlimited references and has tools to help you manage citations with ease and speed. Keep track of your search strategy by databases searched and other sources.

Writing the Literature Review

A written literature review offers a discussion of previous research, not a list of references. Writing the literature review entails a summary of what is known and not known in the research topic area. Literature reviews begin with an introduction that includes the research question or topic, followed by all databases used, key words, and search strategies. Next, the results are summarized with emphasis on key points for discussion. Review any gaps in knowledge from existing resources and include any areas of weakness or controversy. A good practice is to emphasize pertinent points of your research question and provide the context for which your topic was formed. This allows readers to understand why answering this research question is important and the project's likely significance.

A quick search in Respiratory Care yielded > 38 literature review articles with the search term "year in review," so examples are abundant and accessible.[18] Studying published literature reviews is helpful in terms of their content and how they are written. A well-written literature review provides subject matter in an organized and structured manner that the reader sees as a refined contribution to the known evidence. Submitting a medical literature review to a scholarly journal is the final step in the literature review process. The reviews by Pettenuzzo and Fan,[19] Varekojis,[20] and Davis and Smallwood[21] are examples of well-written reviews. Literature reviews not only serve to assist students in research methods as part of their entry to practice education but also practicing RTs who rely on published literature reviews for the most up-to-date information. Previously published articles and articles published in this issue are from a series of master class research papers and are good up-to-date sources to refer to before beginning a research project.[22-26]

Summary

Literature reviews are a key component of any research project. Without a literature review, there can be no research project. The best literature reviews by novice and experienced researchers are concise and comprehensive. It is important to distinguish what is known and point to the areas in which knowledge does not exist. Electronic databases are available to assist in completing a narrow and precise search via PubMed, MEDLINE, Ovid, EBSCO, the Cochrane Library, and others. For the best results in understanding methods to search the literature, it is recommended to consult with medical librarians for the best findings. In writing the results, the focus should be to help the reader with understanding the research topic and the reason for conducting the literature review.

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