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## Literature search for research planning and identification of research problem

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### Abstract

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Literature search is a key step in performing good authentic research. It helps in formulating a research question and planning the study. The available published data are enormous; therefore, choosing the appropriate articles relevant to your study in question is an art. It can be time-consuming, tiring and can lead to disinterest or even abandonment of search in between if not carried out in a step-wise manner. Various databases are available for performing literature search. This article primarily stresses on how to formulate a research question, the various types and sources for literature search, which will help make your search specific and time-saving.

**Key words:** Literature, methods, research planning

### INTRODUCTION

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Literature search is a systematic and well-organised search from the already published data to identify a breadth of good quality references on a specific topic.[1] The reasons for conducting literature search are numerous that include drawing information for making evidence-based guidelines, a step in the research method and as part of academic assessment.[2] However, the main purpose of a thorough literature search is to formulate a research question by evaluating the available literature with an eye on gaps still amenable to further research.

Research problem[3] is typically a topic of interest and of some familiarity to the researcher. It needs to be channelised by focussing on information yet to be explored. Once we have narrowed down the problem, seeking and analysing existing literature may further straighten out the research approach.

A research hypothesis[4] is a carefully created testimony of how you expect the research to proceed. It is one of the most important tools which aids to answer the research question. It should be apt containing necessary components, and raise a question that can be tested and investigated.

The literature search can be exhaustive and time-consuming, but there are some simple steps which can help you plan and manage the process. The most important are formulating the research questions and planning your search.

## FORMULATING THE RESEARCH QUESTION

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Literature search is done to identify appropriate methodology, design of the study; population sampled and sampling methods, methods of measuring concepts and techniques of analysis. It also helps in determining extraneous variables affecting the outcome and identifying faults or lacunae that could be avoided.

Formulating a well-focused question is a critical step for facilitating good clinical research.[5] There can be general questions or patient-oriented questions that arise from clinical issues. Patient-oriented questions can involve the effect of therapy or disease or examine advantage versus disadvantage for a group of patients.[6]

For example, we want to evaluate the effect of a particular drug (e.g., dexmedetomidine) for procedural sedation in day care surgery patients. While formulating a research question, one should consider certain criteria, referred as 'FINER' (F-Feasible, I-Interesting, N-Novel, E-Ethical, R-Relevant) criteria.[5] The idea should be interesting and relevant to clinical research. It should either confirm, refute or add information to already done research work. One should also keep in mind the patient population under study and the resources available in a given set up. Also the entire research process should conform to the ethical principles of research.

The patient or study population, intervention, comparison or control arm, primary outcome, timing of measurement of outcome (PICOT) is a well-known approach for framing a leading research question.[7,8] Dividing the questions into key components makes it easy and searchable. In this case scenario:

- Patients (P) – What is the important group of patients? for example, day care surgery

- Intervention (I) – What is the important intervention? for example, intravenous dexmedetomidine
- Comparison (C) – What is the important intervention of comparison? for example, intravenous ketamine
- Outcome (O) – What is the effect of intervention? for example, analgesic efficacy, procedural awareness, drug side effects
- Time (T) – Time interval for measuring the outcome: Hourly for first 4 h then 4 hourly till 24 h post-procedure.

Multiple questions can be formulated from patient's problem and concern. A well-focused question should be chosen for research according to significance for patient interest and relevance to our knowledge. Good research questions address the lacunae in available literature with an aim to impact the clinical practice in a constructive manner. There are limited outcome research and relevant resources, for example, electronic database system, database and hospital information system in India. Even when these factors are available, data about existing resources is not widely accessible.[9]

## TYPES OF MEDICAL LITERATURE

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(Further details in chapter 'Types of studies and research design' in this issue).

### Primary literature

Primary sources are the authentic publication of an expert's new evidence, conclusions and proposals (case reports, clinical trials, etc) and are usually published in a peer-reviewed journal. Preliminary reports, congress papers and preprints also constitute primary literature.[2]

### Secondary literature

Secondary sources are systematic review articles or meta-analyses where material derived from primary source literature are inferred and evaluated.[2]

### Tertiary literature

Tertiary literature consists of collections that compile information from primary or secondary literature (eg., reference books).[2]

## METHODS OF LITERATURE SEARCH

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There are various methods of literature search that are used alone or in combination [Table 1]. For past few decades, searching the local as well as national library for books, journals, etc., was the usual practice and still physical literature exploration is an important component of any systematic review search process.[10,11] With the advancement of technology, the Internet is now the gateway to

the maze of vast medical literature.[12] Conducting a literature review involves web-based search engines, i.e., Google, Google Scholar, etc., [Table 2], or using various electronic research databases to identify materials that describe the research topic or those homologous to it.[13,14]

The various databases available for literature search include databases for original published articles in the journals [Table 2] and evidence-based databases for integrated information available as systematic reviews and abstracts [Table 3].[12,14] Most of these are not freely available to the individual user. PubMed (<http://www.ncbi.nlm.nih.gov/pubmed/>) is the largest available resource since 1996; however, a large number of sources now provide free access to literature in the biomedical field.[15] More than 26 million citations from Medline, life science journals and online books are included in PubMed. Links to the full-text material are included in citations from PubMed Central and publisher web sites.[16] The choice of databases depends on the subject of interest and potential coverage by the different databases. Education Resources Information Centre is a free online digital library of education research and information sponsored by the Institute of Education Sciences of the U.S. Department of Education, available at <http://eric.ed.gov/>. No one database can search all the medical literature. There is need to search several different databases. At a minimum, PubMed or Medline, Embase and the Cochrane central trials Registry need to be searched. When searching these databases, emphasis should be given to meta-analysis, systematic reviews randomised controlled trials and landmark studies.

Time allocated to the search needs attention as exploring and selecting data are early steps in the research method and research conducted as part of academic assessment have narrow timeframes.[17] In Indian scenario, limited outcome research and accessibility to data leads to less thorough knowledge of nature of research problem. This results in the formulation of the inappropriate research question and increases the time to literature search.

## TYPES OF SEARCH

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Type of search can be described in different forms according to the subject of interest. It increases the chances of retrieving relevant information from a search.

### Translating research question to keywords

This will provide results based on any of the words specified; hence, they are the cornerstone of an effective search. Synonyms/alternate terms should be considered to elicit further information, i.e., barbiturates in place of thiopentone. Spellings should also be taken into account, i.e., anesthesia in place of anaesthesia (American and British). Most databases use controlled word-stock to establish common search terms (or keywords). Some of these alternative keywords can be looked from database thesaurus.[4] Another strategy is combining keywords with Boolean operators. It is important to keep a note of keywords and methods used in exploring the literature as these will need to be described later in the design of search process.

‘Medical Subject Heading (MeSH) is the National Library of Medicine's controlled hierarchical vocabulary that is used for indexing articles in PubMed, with more specific terms organised underneath more general terms’.[17] This provides a reliable way to retrieve citations that use different terminology for identical ideas, as it indexes articles based on content. Two features of PubMed that can increase yield of specific articles are ‘Automatic term mapping’ and ‘automatic term explosion’.[4]

For example, if the search keyword is heart attack, this term will match with MeSH transcription table heading and then explode into various subheadings. This helps to construct the search by adding and selecting MeSH subheadings and families of MeSH by use of hyperlinks.[4]

We can set limits to a clinical trial for retrieving higher level of evidence (i.e., randomised controlled clinical trial). Furthermore, one can browse through the link entitled ‘Related Articles’. This PubMed feature searches for similar citations using an intricate algorithm that scans titles, abstracts and MeSH terms.[4]

### Phrase search

This will provide pages with only the words typed in the phrase, in that exact order and with no words in between them.

### Boolean operators

AND, OR and NOT are the three Boolean operators named after the mathematician George Boole.[18] Combining two words using ‘AND’ will fetch articles that mention both the words. Using ‘OR’ will widen the search and fetch more articles that mention either subject. While using the term ‘NOT’ to combine words will fetch articles containing the first word but not the second, thus narrowing the search.

### Filters

Filters can also be used to refine the search, for example, article types, text availability, language, age, sex and journal categories.

Overall, the recommendations for methodology of literature search can be as below (Creswell)[19]

- Identify keywords and use them to search articles from library and internet resources as described above
- Search several databases to search articles related to your topic
- Use thesaurus to identify terms to locate your articles
- Find an article that is similar to your topic; then look at the terms used to describe it, and use them for your search
- Use databases that provide full-text articles (free through academic libraries, Internet or for a fee) as much as possible so that you can save time searching for your articles

- If you are examining a topic for the first time and unaware of the research on it, start with broad syntheses of the literature, such as overviews, summaries of the literature on your topic or review articles
- Start with the most recent issues of the journals, and look for studies about your topic and then work backward in time. Follow-up on references at the end of the articles for more sources to examine
- Refer books on a single topic by a single author or group of authors or books that contain chapters written by different authors
- Next look for recent conference papers. Often, conference papers report the latest research developments. Contact authors of pertinent studies. Write or phone them, asking if they know of studies related to your area of interest
- The easy access and ability to capture entire articles from the web make it attractive. However, check these articles carefully for authenticity and quality and be cautious about whether they represent systematic research.

The whole process of literature search[20] is summarised in [Figure 1](#).

## SUMMARY

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Literature search provides not only an opportunity to learn more about a given topic but provides insight on how the topic was studied by previous analysts. It helps to interpret ideas, detect shortcomings and recognise opportunities. In short, systematic and well-organised research may help in designing a novel research.

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### Conflicts of interest

There are no conflicts of interest.

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[PubMed: 23874189]

## Figures and Tables

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**Table 1**

## Methods of literature search

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**Protocol driven**

Hand search of journal

Electronic search of databases

**Snowballing**

Reference chasing

Tracking citations

**Personal knowledge**

Existing theories and basics

Particular contacts and academic system

Offhand discovery: Such as finding a suitable paper when looking

**Table 2**

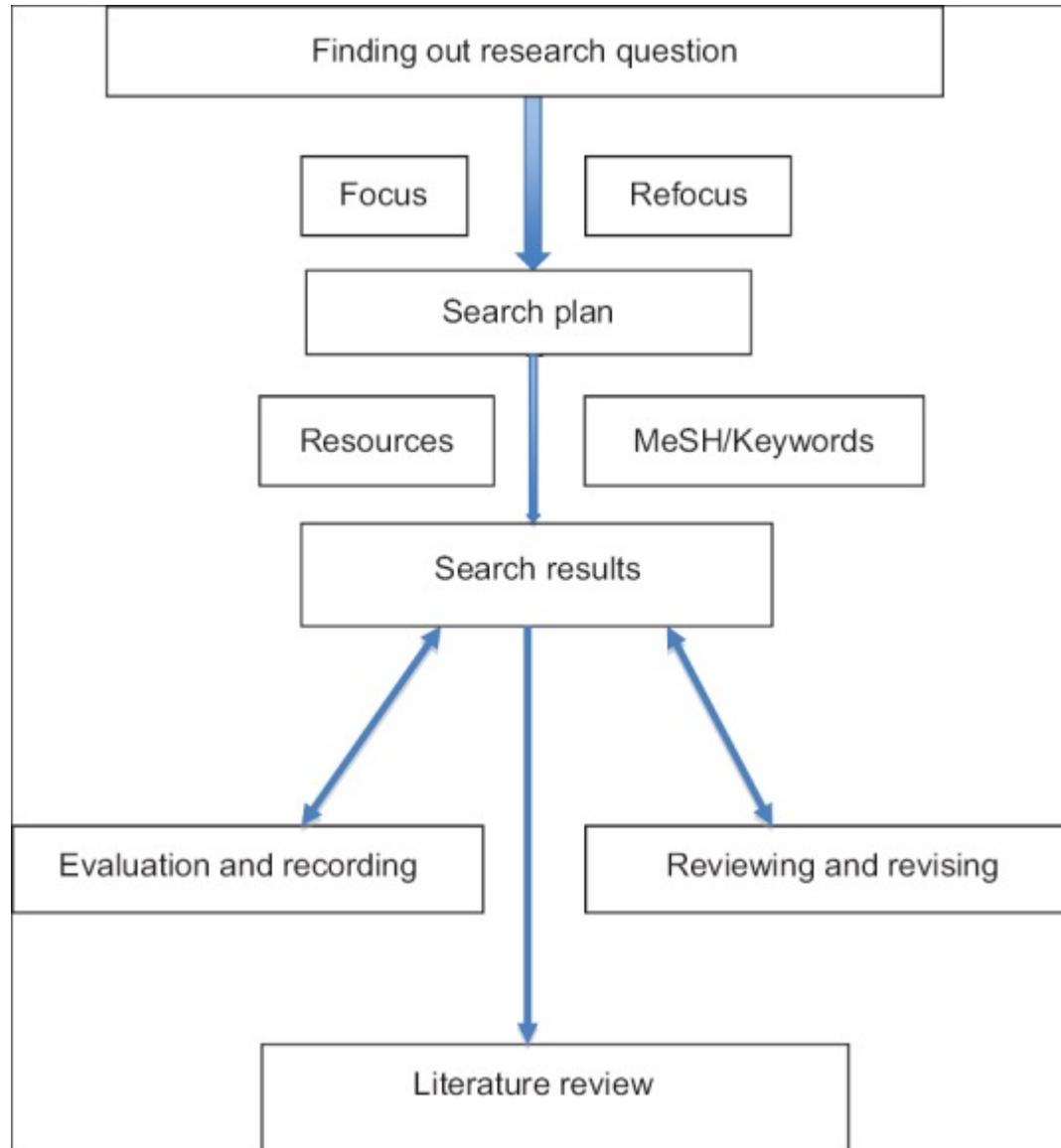
Web based methods of literature search

<b>Resource</b>	<b>Web address</b>
Search engines	
Google	<a href="http://www.google.com">http://www.google.com</a>
Google Scholar	<a href="http://www.scholar.google.com">http://www.scholar.google.com</a>
Yahoo	<a href="http://www.yahoo.com">http://www.yahoo.com</a>
Electronic source of database	
PubMed	<a href="https://www.nlm.nih.gov/pubmed">https://www.nlm.nih.gov/pubmed</a>
MeSH	<a href="http://www.ncbi.nlm.nih.gov/mesh">http://www.ncbi.nlm.nih.gov/mesh</a>
Medline (Medical Literature Analysis and Retrieval System Online)	<a href="https://www.nlm.nih.gov">https://www.nlm.nih.gov</a>
CINAHL (The Cumulative Index to Nursing and Allied Health)	<a href="https://www.cinahl.com">https://www.cinahl.com</a>
Embase (Excerpta Medica Database)	<a href="https://store.elsevier.com/embase">https://store.elsevier.com/embase</a>
SCOPUS	<a href="https://www.scopus.com/">https://www.scopus.com/</a>
Ind Med: Indian Database	<a href="https://www.medind.nic.in">https://www.medind.nic.in</a>
ERIC	<a href="https://www.eric.ed.gov">https://www.eric.ed.gov</a>
ProQuest	<a href="http://proquest.com">http://proquest.com</a>

**Table 3**

Electronic source of Evidence-Based Database

<b>Resource</b>	<b>Web address</b>
The Cochrane Database of Systematic Reviews	<a href="http://www.cochranelibrary.com/">http://www.cochranelibrary.com/</a>
The ACP Journal Club	<a href="http://search.ebscohost.com/">http://search.ebscohost.com/</a>
Dartmouth EBM Database	<a href="http://www.dartmouth.edu/~library/biomed/resources/ejournals.html">http://www.dartmouth.edu/~library/biomed/resources/ejournals.html</a>
Evidence updates	<a href="http://plus.mcmaster.ca/evidenceupdates/">http://plus.mcmaster.ca/evidenceupdates/</a>
e Medicine	<a href="http://emedicine.medscape.com/">http://emedicine.medscape.com/</a>
National Guideline Clearinghouse	<a href="http://www.guideline.gov/">http://www.guideline.gov/</a>
Ovid Medline	<a href="http://www.dartmouth.edu/~library/biomed/resources/ovid.html">http://www.dartmouth.edu/~library/biomed/resources/ovid.html</a>
PubMed	<a href="http://www.ncbi.nlm.nih.gov/pubmed/">http://www.ncbi.nlm.nih.gov/pubmed/</a>
TRIP (Turning Research into Practice) Database Plus	<a href="https://www.tripdatabase.com/">https://www.tripdatabase.com/</a>
UpToDate	<a href="http://www.uptodate.com/online">http://www.uptodate.com/online</a>

**Figure 1**

[Open in a separate window](#)

Process of literature search

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