

## VIEWPOINT

# Using Updated PubMed

## New Features and Functions to Enhance Literature Searches

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**Supplemental content**
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**PubMed** is a free web-based public access resource that supports the search and retrieval of literature from the National Library of Medicine's MEDLINE database. In the past 2 years, PubMed has been updated to improve functionality and add important new features,<sup>1-3</sup> including a set of search statements to identify COVID-19 articles and a new publication filter to allow PubMed searches to retrieve early-release preprints.<sup>4,5</sup> This Viewpoint describes how these important new PubMed features and functions could allow clinicians to use a 3-step literature searching process to obtain real-time answers to important clinical questions. A brief example of this 3-step process is in the [Supplement](#).

### Step 1: Focus the Clinical Question

Selecting appropriate medical phrases to adequately define the clinical question is an essential first step for any successful PubMed search. Key elements that define a clinical question include the patient population or disease process being studied; the intervention, exposure, disease stage, or diagnostic test of interest; a comparator intervention, exposure, or test if appropriate; and a physiologic or patient-centered outcome.

### Step 2: Use PubMed Clinical Query Filters

PubMed clinical query filters are effective search strategies that improve retrieval of relevant articles that provide answers to clinical questions about therapy, diagnosis, etiology, or prognosis.<sup>4</sup> Because each type of clinical question is best answered by a specific research study design, each PubMed clinical query filter uses a unique combination of search terms to retrieve relevant articles. Although PubMed clinical query filters have been built into PubMed since 2000, recent updates include a new process for using the important systematic review clinical query filter; also, a new clinical query category for COVID-19 articles has been added.<sup>1,4</sup>

**Identify Preappraised Resources.** A well-conducted systematic review addresses a focused clinical question and provides an objective critical appraisal of all available primary research studies. Furthermore, well-conducted systematic reviews serve as the basis for meta-analyses and evidence-based clinical practice guidelines. Clinicians may prefer these preappraised resources as a primary source of clinical information.<sup>6</sup>

The original PubMed clinical query filter for systematic reviews contained more than 20 different search terms optimized to retrieve systematic reviews, meta-analyses, and clinical practice guidelines.<sup>7</sup> In October 2020, this filter was removed from the PubMed clinical queries page.<sup>4</sup> Until it is restored, the best way to identify these important preappraised resources is by using a combination of search filter statements (systematic review[filter] OR meta-analysis[filter]), typed directly into the PubMed main page search

box,<sup>1</sup> in addition to the common medical phrases used to focus the clinical question (see [Supplement](#) for example). Using the [filter] search tag ensures that PubMed does not limit the search to the terms *systematic review* or *meta-analysis* in the abstract of articles.<sup>8</sup> Although a good systematic review or meta-analysis can provide a valid answer to a focused clinical question, it is always prudent to search for recent primary research studies.

**Search for Recent Primary Research Studies.** The updated PubMed clinical queries page is accessed via the link on the PubMed home page (under "Find"). On the PubMed clinical queries page, a drop-down menu allows the user to search for different types of primary research studies.<sup>4</sup> Each of the clinical study category filters is optimized to retrieve studies on therapy, etiology, diagnosis, or prognosis, using either a broad or narrow search strategy. Although a broad strategy is highly sensitive and will return almost all possible studies on a subject to minimize false-negative results (missed articles), a narrow strategy is highly specific and will return only a few high-quality studies, minimizing false-positive results (retrieval of inappropriate articles).

In addition to the original clinical study category filters, during late 2020 the PubMed clinical queries page was updated with a new drop-down menu that provides access to COVID-19 article clinical query filters, which retrieve reports on mechanism, transmission, diagnosis, treatment, prevention, case reports, forecasting, and general COVID-19 publications.<sup>4</sup> Furthermore, PubMed has initiated a pilot project to index select preprint servers to make early-release NIH-sponsored COVID-19 research retrievable in searches.<sup>5</sup> This is an important feature when combined with the COVID-19 articles clinical query filter and can be accessed simply by typing the term *preprint[filter]* into the clinical queries search box in addition to the common medical phrases used to focus the clinical question, and then clicking "search" (see [Supplement](#) for example). Using the [filter] search tag ensures that PubMed does not search only for the term *preprint* anywhere in the abstract.<sup>8</sup>

Although access to early-release research may appear to be particularly important during a pandemic, clinicians need to be aware that preprints have not been peer reviewed and may contain important methodological limitations<sup>9</sup> and the results must be considered preliminary. Individual preprints must be critically appraised, and their results are best interpreted in context of other published studies on related topics.

### Step 3: Refine the Search Terms

The National Library of Medicine uses a hierarchically organized and controlled vocabulary, called Medical Subject Headings (MeSH), to describe every article indexed on MEDLINE. To ensure that this controlled

vocabulary is appropriately applied when searches are conducted, PubMed uses natural language processing to translate common medical phrases to appropriate MeSH terms. For example, PubMed's artificial intelligence–based algorithms will translate common phrases such as *heart attack* to “myocardial infarction” [MeSH terms], *heart burn [sic]* to “heartburn” [MeSH terms], and *angina* to “angina pectoris” [MeSH terms]. These algorithms also correct typographic errors and translate UK to US spelling, and vice versa. PubMed will then search using the appropriate translated MeSH term and the common medical phrase in both UK and US spelling.

Although PubMed's automatic translation process works well with most common medical phrases, it is not perfect. For example, many people use the phrase *transient loss of consciousness* interchangeably with the term *syncope*; however, PubMed does not translate *transient loss of consciousness* to the expected MeSH term “syncope” [MeSH terms]. Because PubMed's translation algorithms do not always work as expected, each search must be checked to understand whether the artificial intelligence–based algorithms are working appropriately. In 2019, PubMed changed the location of these important search details.<sup>2</sup>

### Using the Advanced Link to Evaluate Your Search Strategy

To access search details after performing a search, click on the “advanced” link found immediately below the search box on the main results page. When the “advanced” page opens, scroll down to the “history and search details” section and click the arrow tab (>) in front of the search statement to evaluate. PubMed automatically translates the phrase *heart attack* to the more complete search statement “myocardial infarction” [MeSH terms] OR (“myocardial” [all fields] AND “infarction” [all fields]) OR “myocardial infarction” [all fields] OR (“heart” [all fields] AND “attack” [all fields]) OR “heart attack” [all fields]. Thus, although the user types only the common medical phrase *heart attack* into the search box, PubMed's artificial intelligence–based translation algorithms generate a syntactically correct complex search strategy that contains the appropriate MeSH term and includes the common medical phrase originally typed into the search box.

If the search details section shows that the common medical phrase used to conduct the search does not map to an appropriate MeSH term, repeat the search using an alternative common medical term and then recheck after performing the new search.

### Conclusion

PubMed is a widely available web-based resource that supports the search and retrieval of literature from the National Library of Medicine's

### Effective PubMed Searching in 3 Simple Steps

#### Step 1: Focus the Clinical Question

- Use the PICO format (patient, intervention, comparator, outcome) to concisely express the type of clinical question to be answered (eg, therapy, diagnosis, etiology, prognosis).
- Start by writing down common medical phrases that describe each PICO component of the clinical question.

#### Step 2: Use PubMed Clinical Query Filters

- PubMed clinical query filters are complex, multiterm search strategies implemented by using simple key terms or drop-down menus.
- Identify updated systematic reviews or meta-analyses with key search phrases and the statement (systematic review[filter] OR meta-analysis[filter]) typed into the main PubMed search page.
- Search for recent primary research studies with the clinical study categories filter most appropriate for the clinical question type (therapy, diagnosis, etiology, or prognosis) from the [clinical queries page](#) drop-down menu.
- Search for content related to COVID-19 with the COVID-19 search filter from the [clinical queries page](#) drop-down menu.
- To explicitly search for NIH-sponsored COVID-19 preprints, use key search phrases and the term *preprint*[filter] typed into any PubMed search box.

#### Step 3: Refine the Search Terms

- Every PubMed article is indexed with a controlled medical vocabulary called MeSH. PubMed automatically translates common medical phrases used in any search to appropriate MeSH terms before it conducts the search.
  - After each search, always use the “advanced” link and arrow tab (>) to determine whether PubMed has properly translated common medical phrases to appropriate MeSH terms.
  - If this translation process does not seem to have worked properly, use a different common medical phrase or use the MeSH database to find more appropriate search terms.

MEDLINE database. The recent 2021 update has enhanced PubMed's built-in functions and added new features that facilitate identification of COVID-19 articles and preprints. With a 3-step search process, these PubMed updates could help clinicians conduct efficient literature searches to answer clinical questions regarding therapy, diagnosis, etiology, or prognosis for almost any specific disease. However, the retrieved research evidence must always be critically appraised with formal rules of evidence to identify clinically sound studies. After critical appraisal, clinically sound studies should be used in a conscientious, explicit, and judicious fashion to guide clinical decisions that are aligned with clinician judgment and patient values and preferences.

### ARTICLE INFORMATION

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