

Interpretation and Development of Scientific Articles - Search for Scientific Articles

Interpretação e Desenvolvimento de Artigos Científicos - Busca de Artigos Científicos

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Bras. J. Video-Sur, 2010, v. 3, n. 1: 005-011

Accepted after revision: November, 13, 2009.

Aiming to review important concepts about the interpretation and preparation of scientific articles, we decided to write a series of six articles on the subject covering: the search for scientific articles, case reports and case series, case-control and cohort studies, clinical trials, basic biostatistics concepts, and systematic reviews and meta-analyses. This is the first article in the series and introduces issues about how to conduct an electronic search for scientific articles.

In order to keep up to date, a physician must access the scientific literature. This can be done by consulting renowned colleagues or professionals, but we should keep in mind that – even with the best of intentions – this information may be incorrect or outdated.¹ Therefore, the best way to obtain access to quality scientific information is through well-conducted scientific studies.²

Information extracted from scientific journals deserves more credibility. There are, however, hundreds of journals in the biomedical literature, and nearly two million articles are published each year. It is impossible to capture all this information. With the demands of modern life, time is precious and cannot be lost in vain; therefore, it is essential that the physician or surgeon knows how to select and interpret reports that are methodologically rigorous, not wasting time with publications of inferior quality. One measure of quality is the journal's impact factor, the higher the factor, the better the article, although this is not an infallible rule. An example of this fallibility is the case of a South Korean scientist who published an article on assisted reproduction in a magazine of high-impact;

it was later shown that the data was fabricated. In relation to electronic databases, those which have a clear scientific connotation – as will be seen with several examples below – those published by respected medical societies should be valued, and we should always question those that are generated by companies with commercial interests or by lay writers.

The first relevant issue relates to the purpose of reading the material that is sought with a search. The most common day-to-day practice is the reading out of curiosity. The reader leafs through several medical journals until he finds an article of interest. After reading the article quickly (and sometimes only the abstract), the reader moves to another topic or simply stops reading. Knowledge obtained in this way is usually too little and too disperses to lead us to alter out medical practice. Despite the shortcomings of this approach, it is certainly better than be kept up to date exclusively by the reports provided by the pharmaceutical industry.

The acquisition of knowledge will be much more fruitful if the physician knew exactly what he was looking for,³ directing all efforts to respond to an initial question, such as: Does the use of local anesthesia in the ports of a laparoscopic surgery reduce postoperative pain? Thus, the first step for interpreting the medical literature is to formulate a question and proceed in search of an answer. For this task to be carried out in a way that delivers the best results there is a sequence to be followed. The first step is to correctly formulate a question of interest. Avoid themes that are too broad and lack a defined focus.

The question should be specific with a well-defined focus of interest. With the subject clearly defined, begin the process of selecting the best studies.

There are various sites from which to search for scientific articles. We offer an example using PubMed (www.pubmed.com) which is site most frequently used by health professionals. PubMed has more than 19 million articles in its database.⁴ More than 800 million searches are conducted each year on more than 5,300 scientific journals. More than 12,500 articles are added each week.⁵

In order to obtain the articles in a faster and more thorough way, there are some basic steps that should be followed. The first is to use MeSH (Medical Subjects Headings) terms. This tool is important to direct our search so that it encompasses the scope we want with a specific term, and is based on its meanings and on previously indexed terms. For example, with the word “endometrial” we have 41 options (put “Mesh” in search option and click on “search” without putting any term - Figure 1. On the other screen, just type “endometrium” - Figure 2) – which would make our search yield an excessive number of articles if what we wanted to search for was only “endometrial hyperplasia.” Conducting this search (certainly this number increases with time) using only the term “endometrial,” 37,033 articles were found (Figure 3); 4,610 are found when we associate “endometrial” with “hyperplasia” and 2,629 using the

MeSH term (just put “*endometrial hyperplasia*” [Mesh] in PubMed database - Figure 4). We can also limit more by using “*Endometrial Hyperplasia*” [MeSH Major Topic] and retrieve the most relevant manuscripts - here we found 1603 articles (Figure 5).

The difference of approximately 2000 articles between a search using a paired terms and using a MeSH term is due to the fact that with the first, the endometrial hyperplasia need only be cited, but may not be the principal focus. On the other hand, when you use the MeSH term, hyperplasia is always one of the principal foci of the article, which greatly facilitates our search. We should always have in mind two concepts when performing a search: sensitivity (we are able to obtain all the articles we want) and specificity (we avoid those that we don’t want in order to not loose time reading articles that are not relevant). Besides the use of MeSH terms, there are various strategies to achieve this. The first of these is the use of Boolean operators: AND, OR, NOT. AND is used to link words. Using the same example, in using AND between “endometrial” and “hyperplasia,” you would only have access to articles that use these two words in their titles and/or abstracts or key words (4596 articles). By using OR between the two terms one will obtain the articles that use one or the other, obviously then we have a larger number (116,627). In using NOT one must pay attention to the fact that the articles that *have* the word after the NOT will be excluded. Thus

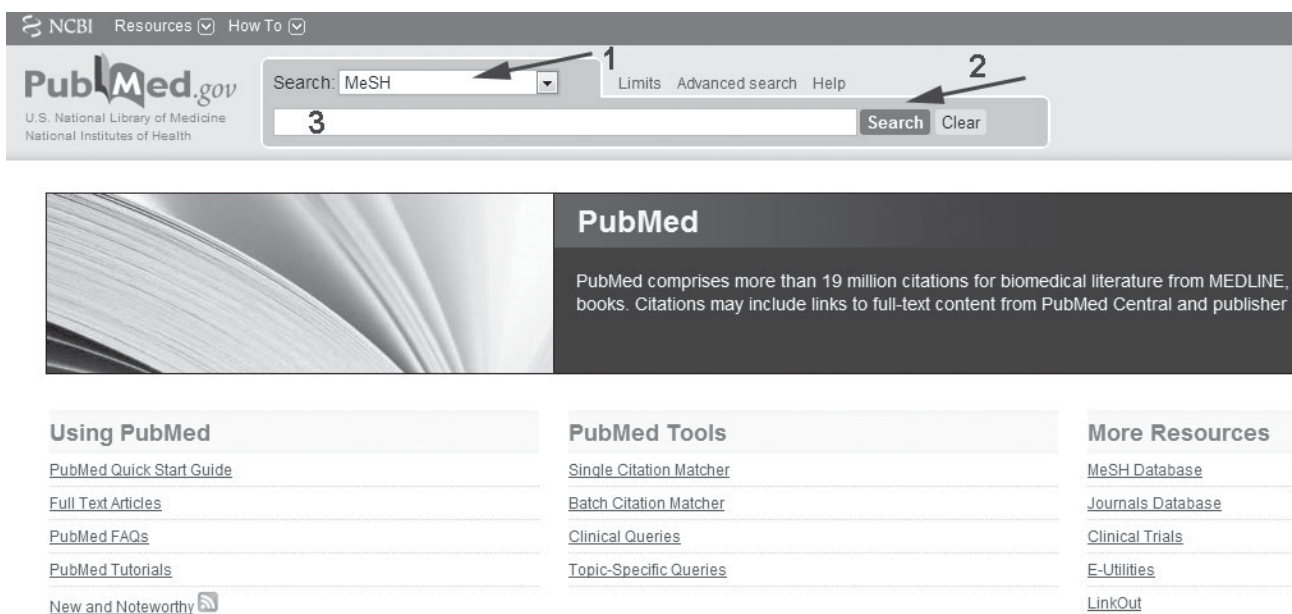


Figure 1 – Pubmed screenshot .1- MeSH selected in search box; 2- Search button; 3- click the search button without any term.

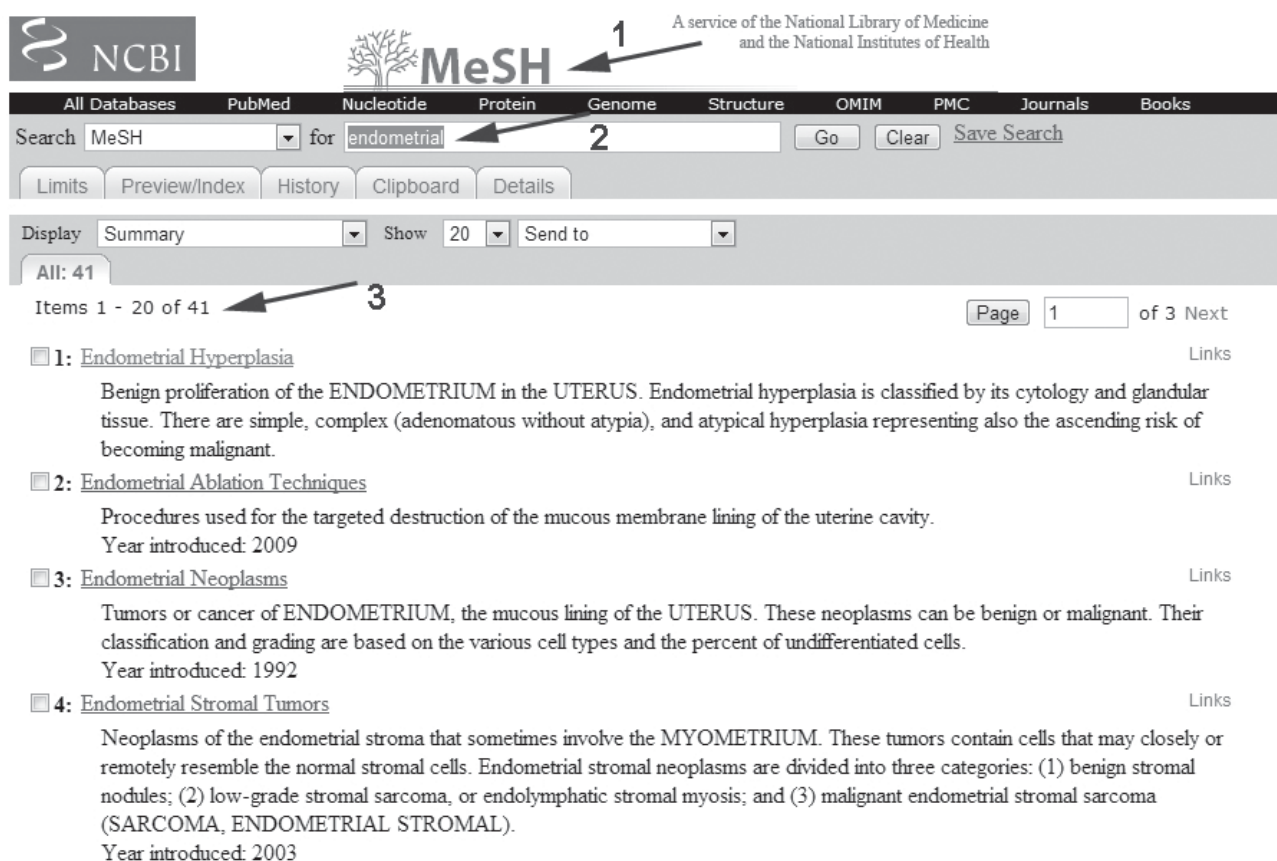


Figure 2 – Mesh screenshot .1- MeSH in the title; 2- look for “endometrial” term; 3- 41 articles were retrieved.

if one searches “endometrial” NOT “hyperplasia” 32,275 articles will be obtained (slightly fewer than the initial 37,033). This function serves, for example, when one wants to obtain some information, but which does not affect a group or specific disease. For example, the use of antidepressants to treat urinary incontinence in patients without depression.

There are situations in which a search should be done with various terms in order to not run the risk of missing any articles. For example, the words “cancer” and “neoplasm” can mean the same thing, but the articles may have been indexed with only one of them. Another very common situation occurs when you want to find articles with a term whose terminus (or beginning) can be written various ways such as, for example, in myomectomy via laparoscopy. The word can be written as the noun “laparoscopy” or adjective “laparoscopic”. In such cases one can use a character “*” which denotes truncation after the last letter that the two terms have in common, in this example: “laparoscop*”. There are situations in which the same word is spelled two or more ways. We can

spell the abdominal surgical approach to the interruption of gestation as “cesarean” or “caesarean” delivery. In these situations, the search should be performed using both spellings.

One way to refine the search is to search for the term only in the title of the article making use of [ti] immediately following the word. An option to search the title, MeSH terms, and abstract (all together) is by using [tw] immediately following the term. If you want only articles of a certain author, all one has to do is use [au] after the author’s name using the format: surname and initials (without periods) - ex: Smith JA[au]. Searches can also be done according to date of publication by using [dp]; ex. 2001[dp].

A very useful tool is the use of “limits” (Figure 3) which permits one to focus the search according to type of study (clinical trial, metanalysis, case report, etc.), gender (male, female), humans or animals, language (English, Spanish, French, Portuguese, etc.), age of the groups studied, and by a range of dates which define a period of publication. The use of all these

NCBI Resources How To

PubMed.gov
U.S. National Library of Medicine
National Institutes of Health

Search: PubMed
endometrial
RSS Save search Limits Advanced search Help
Search Clear

Display Settings: Summary, 20 per page, Sorted by Recently Added Send to:

Results: 1 to 20 of 37033

1. [Genomic profile of endometrial tumors depends on morphological subtype, not on tamoxifen exposure.](#)
Fles R, Hoogendoorn WE, Platteel I, Scheerman CE, de Leeuw-Mantel G, Mourits MJ, Hollema H, van Leeuwen FE, van Boven HH, Nederlof PM.
Genes Chromosomes Cancer. 2010 Aug;49(8):699-710.
PMID: 20544844 [PubMed - in process]
[Related citations](#)

2. [DNA methylation in endometrial cancer.](#)
Tao MH, Freudenheim JL.
Epigenetics. 2010 Aug 21;5(6). [Epub ahead of print]
PMID: 20543579 [PubMed - as supplied by publisher]
[Related citations](#)

3. [Effect of GnRH II and GnRH I on secretion of VEGF by eutopic and ectopic endometrial stromal cells of endometriosis patients.](#)
Huang F, Liu Q, Wang H, Zou Y.
Zhong Nan Da Xue Xue Bao Yi Xue Ban. 2010 May;35(5):409-18.
PMID: 20543462 [PubMed - in process]
[Related citations](#)

4. [Hormonal contraception and risk of cancer.](#)
Cibula D, Gompel A, Mueck AO, La Vecchia C, Hannaford PC, Skouby SO, Zikan M, Dusek L.
Hum Reprod Update. 2010 Jun 12. [Epub ahead of print]
PMID: 20543200 [PubMed - as supplied by publisher]
[Related citations](#)

Figure 3 – Pubmed screenshot .1- look for “endometrial” term in Pubmed (not in MeSH as before); 2- 37,033 articles were retrieved; 3- “Limits” option.

NCBI Resources How To

PubMed.gov
U.S. National Library of Medicine
National Institutes of Health

Search: PubMed
Endometrial Hyperplasia[Mesh]
RSS Save search Limits Advanced search Help
Search Clear

Display Settings: Summary, 20 per page, Sorted by Recently Added Send to:

Results: 1 to 20 of 2629

1. [Risk of unanticipated abnormal gynecologic pathology at the time of hysterectomy for uterovaginal prolapse.](#)
Frick AC, Walters MD, Larkin KS, Barber MD.
Am J Obstet Gynecol. 2010 May;202(5):507.e1-4.
PMID: 20452498 [PubMed - indexed for MEDLINE]
[Related citations](#)

2. [Digital morphometry of cytologic aspirate endometrial samples.](#)
Mahovlić V, Ovanin-Rakić A, Skopljanac-Macina L, Barisić A, Rajhvajn S, Juric D, Projić IS, Ilić-Forko J, Babić D, Skrabin-Kucić S, Bozikov J.
Coll Antropol. 2010 Mar;34(1):45-51.
PMID: 20437635 [PubMed - indexed for MEDLINE]
[Related citations](#)

3. [Uterine disorders and pregnancy complications: insights from mouse models.](#)
Lim HJ, Wang H.
J Clin Invest. 2010 Apr 1;120(4):1004-15. doi: 10.1172/JCI41210. Epub 2010 Apr 1. Review.
PMID: 20364098 [PubMed - indexed for MEDLINE]
[Related citations](#)

4. [Nomegestrol acetate: pharmacology, safety profile and therapeutic efficacy.](#)
Lello S.
Drugs. 2010 Mar 26;70(5):541-59. doi: 10.2165/11532130-000000000-00000. Review.
PMID: 20329803 [PubMed - indexed for MEDLINE]
[Related citations](#)

Figure 4 – Pubmed screenshot .1- Pubmed selected in search box ; 2- look for “endometrial hyperplasia [MeSH]” term in Pubmed; 3- 2,629 articles were retrieved.

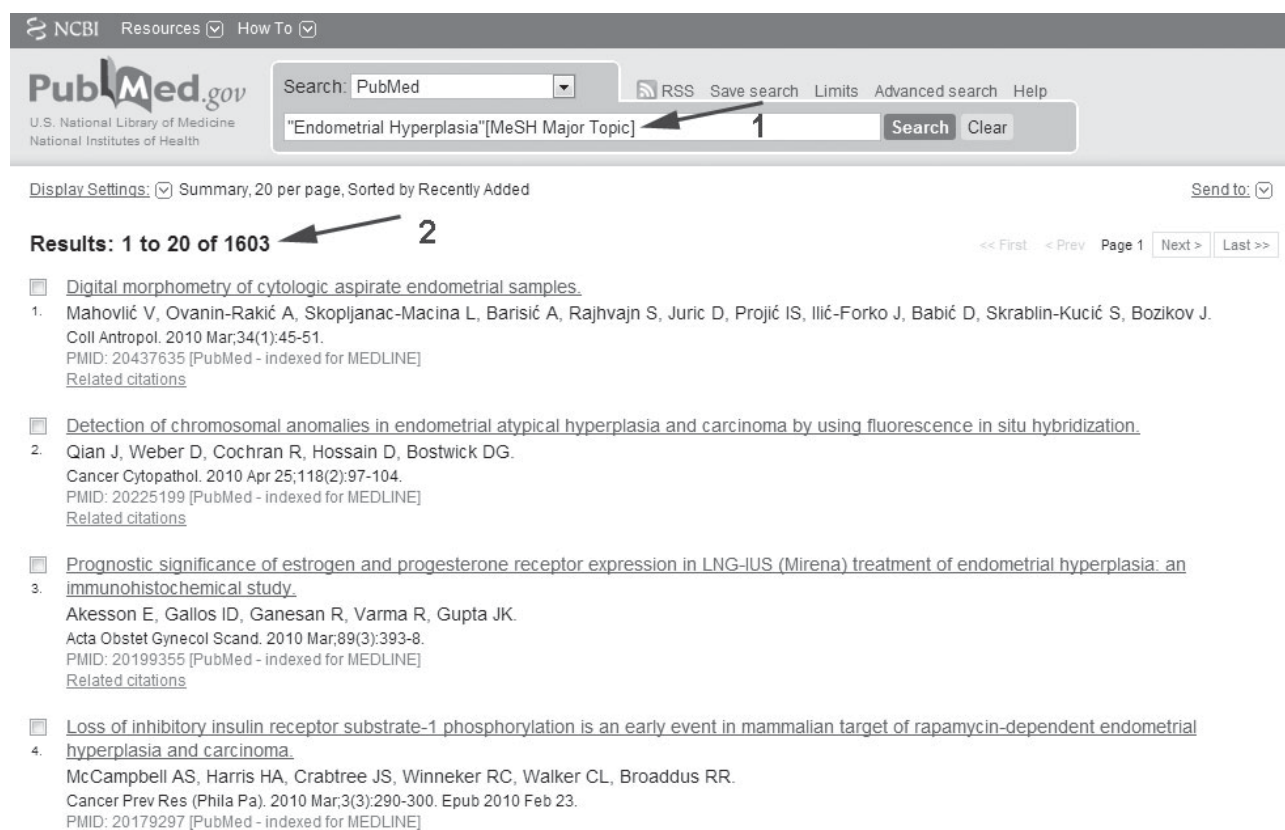


Figure 5 – Pubmed screenshot .1- look for “endometrial hyperplasia [MeSH Major Topic]” term in Pubmed; 2- 1,603 articles were retrieved.

tools can save considerable time. Several menu options (after clicking on “advanced search” – beside “limits”):

- Preview/Index: useful to preview how many references were found before actually displaying the articles. You may elect to can increase or decrease the breadth of the search according to the number encountered.

- History: useful to combine previous searches, i.e. building one search on prior searches. The limit is 100; after this number, the newest search substitutes the oldest. There is a button to clear the history (to erase the previous searches).

After the appearance of the articles, one of the ways of recording the abstracts is the following (Figures 6 and 7):

1. check the boxes of the articles/abstracts of interest;

2. beside “Display settings” (in the upper left corner next) one can select the abstracts (it shows de summary) and in “sort” one can choose the order according to author, by date of publication, or by journal;

3. One may click on the “send to” button (in the upper right corner) and choose the save format

(copy to clipboard or save in “txt” format that can be saved in Microsoft Word by copying and pasting).

For each article (usually after the summary) there is a “linkOut” button (links to a site with a complete version of the article, usually in HTML or pdf formats). In the majority of cases, the link is to a site maintained by the journal’s publisher, where access to the full article is permitted only by those who have a subscription, or when the search is conducted from universities and research facilities which have an institutional superscription. If one cannot access the complete article, it can be ordered from a subscribing library. Charges vary depending on whether the journal is available in libraries in the same city, in Brazil, or abroad. Currently, this charge is R\$ 0.10 per page for journals available in libraries in Rio de Janeiro, R\$ 5.00 for those available in Brazil, and close to R\$ 30 for those only available abroad. Sending e-mails to the author is an efficient way to obtain the complete article. We have done this successfully several times.

Other sites that provide scientific texts are the sites of BIREME (<http://regional.bvsalud.org/php/>)

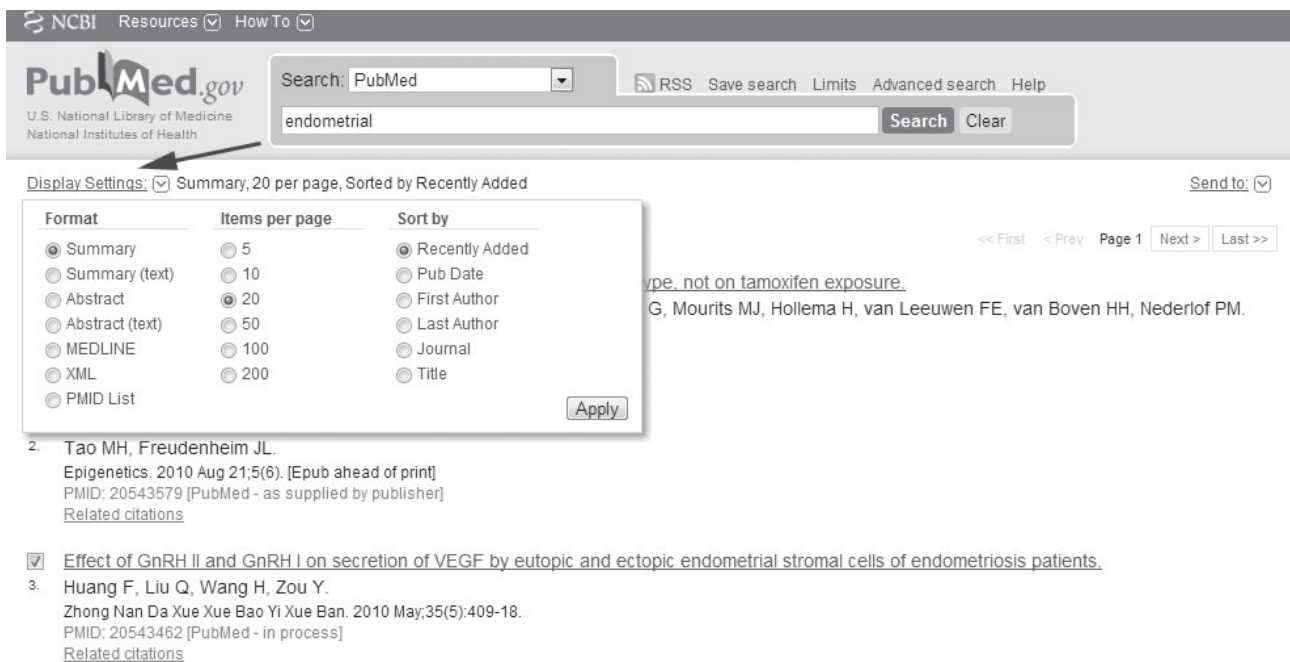


Figure 6 – Pubmed screenshot . Arrow – “Display settings” options.

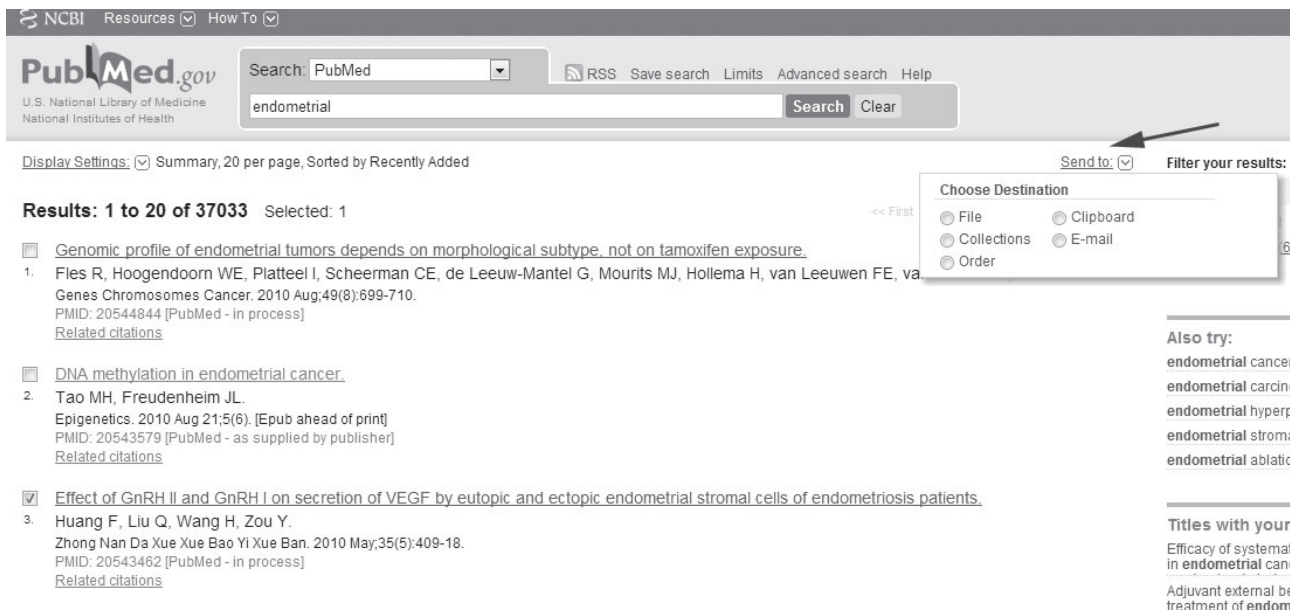


Figure 7 – Pubmed screenshot . Arrow – “Send to” options.

index.php) where there are links for SCIELO (www.scielo.org) and the Cochrane Collaboration (www.cochrane.org). Cochrane provides the full meta-analyses of clinical trials, and is considered the leading source of systematic reviews in terms of the quality of scientific evidence. More than 400,000 clinical trials are part of its collection of studies analyzed in the metanalyses carried out by collaborators organized according to thematic areas.

Scielo provided full texts of periodicals from Latin America and Spain and Portugal. Scielo's search commands for finding abstracts in these databases are similar to those of PubMed, but not necessarily equivalent, details of which are beyond the scope of this article.

EMBASE (www.embase.com) offers studies in the areas of biomedicine and pharmacology with emphasis in clinical drug trials.

UpToDate Online (www.uptodate.com) is a database of evidence-based reviews prepared by more than 3800 experts on various subjects. Reviews are updated frequently and the online version permits rapid searches for answers on the most diverse topics. Its function is to synthesize the information from studies for clinicians and scholars who do not have time to read the body of literature about a given topic.

PERIODICOS-CAPES (www.periodicos.capes.gov.br) is available in various Brazilian educational institutions and is a very useful tool. This site permits access to innumerable high quality articles. It offers access to the complete texts of more than 11,000 domestic and international publications of the most varied topics (not just health, but engineering, astronomy, etc.). After accessing one of the journals, there is a search field on the top of the screen that can be used to find the term of interest in all of the available journals (included in this specific database) of the same publisher (p.ex. Elsevier). It is usually available without cost at university libraries.

The dominance force in the market for internet search, Google provides a resource for scientific articles, Google Scholar (www.scholar.google.com). It has the advantage of being accessible to anyone, although the articles shown in the results are not necessarily available as complete texts. It has the disadvantage of finding enormous quantities of information, not all of them totally reliable.

After the initial selection of articles, the professional should have the ability to select the best that deserve a more detailed reading. One should begin with the section on materials (or patients) and methods. Here the reader should evaluate the quality of the study and verify if the article is worth reading in full. There's no point in familiarizing oneself with the results and conclusions of the study if the scientific method is grossly flawed; in other words, if you're going to decide to disregard an article you might as well do so before reading the results.

There are four fundamental attributes of a good scientific study, namely: 1 - adequate design of the study; 2 - quality in obtaining the data; 3 - correct statistical analysis of the data; and 4 - conclusions which are derived from the analysis of the data. Any flaw in the first two items (systematic errors) is fatal

for a good study. One can always re-analyzing data and come to different conclusions, but one cannot reassemble a study that was poorly designed from the outset or in which the data was precariously collected. The first step that one should undertake is to analyze the type of study that was carried out. Studies can be divided into four large groups, in increasing order of better scientific evidence: 1 - case reports and case series; 2 - observational studies (prospective longitudinal "cohort"; retrospective longitudinal "case-control"; transverse (ex.: census surveys, questionnaires); 3 - experimental studies (randomized controlled clinical trials); 4 - systematic reviews and meta-analyses (which seek to collect the studies with the highest quality methodology and generate a synthesis of the best available evidence). In the next article in this series, case reports and case reports will be analyzed.

As we can note in this text, the dissemination of scientific knowledge depends not only on the availability of good journals and articles, but also a lot of practice to obtain it.

ADDITIONAL READING

- 1) Kelly A. Evidence-based radiology: Step 2 – Searching the literature (search). *Seminars in Roentgenology* 2009; 44(3):147-52.
- 2) Greenhalgh T – How to read a paper. BMJ Publishing Group, London, 1997. *BMJ* 1997; 315:180-183.
- 3) Vincent B, Vincent M, Ferreira C. Making PubMed searching simple: learning to retrieve medical literature through interactive problem solving. *The Oncologist* 2006; 11:243-51.
- 4) Graham L. Searching for health information: Web sites and tips for finding science-based sources. *Journal of the American Dietetic Association* 2010; 110(4):513-4.
- 5) Garg A, Iansavichus A, Wilczynski N, Kastner M, Baier L, Shariff S, Rehmann F ET al. Filtering Medline for a clinical discipline: diagnostic test assessment framework. *BMJ* 2009; 339:b3435.

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