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Using PubMed in radiology: Ten useful tips for radiologists

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Abstract

PubMed contains a bibliography of articles published in around 4800 journals. It combines MEDLINE and OLDMEDLINE (articles from 1960, going back till the 1940s). PubMed is updated on a daily basis; to include both published and ahead of print references. As a radiologist, one can use PubMed to track several journals, track topics, search for specific topics, verify incomplete or incorrect references, store one's own publications, and save selected references; one can also create filters depending on one's own search needs for some regular topics. This article provides some key background knowledge on searching PubMed and also describes some features that are often left unexplored. The PubMed site has undergone many changes in the last few years and this article will update users on the current features.

Key words: Information retrieval; literature search; PubMed

Introduction

PubMed, at http://www.pubmed.gov, is a bibliographic database compiled by the National Library of Medicine, USA. A bibliographic database is one that incorporates only the bibliographic details of articles of journals (usually a set of journals chosen by set criteria) and not the full articles. PubMed indexes around 4800 journals in medicine and the health sciences.[1]

One can search PubMed for a list of articles by topic, by author or by journal. One can also search for combinations of these and limit searches in several ways. PubMed itself does not provide the full articles, but will link each article to the publisher's website and to the article itself, if it is available. Whether the article is available for free or for a price is decided by the publisher.

PubMed is usually searched for information based on research or studies published in journal articles. In the context of patient care, one may search for systematic reviews, meta-analyses, guidelines, and randomized controlled trials, so that one gets evidence-based information. With internet access being available almost anywhere, PubMed can be now accessed from clinics, wards, radiology centers, or homes; it can even be accessed through mobiles, using 'PubMed Mobile.'

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Using PubMed – Common Errors

PubMed is a very large database and so the search process works more efficiently if a structured approach is used. Here are the two most common errors that inexperienced/novice searchers commit:

1. Using only key words/phrases to search: A key word search yields far too many references and includes lots of irrelevant hits. Searching PubMed with key words (or phrases) like 'HRCT in bronchiectasis,' 'fetal ultrasound' or 'MRI spine in lymphoma' will result in a search for references that *contain* these words/phrases even though the articles may or may not be *about* these topics.
2. Looking only for full articles: PubMed can point to the most relevant articles on the search topic. If one looks only for articles available free online one may miss very important articles with valuable information. Do remember that many "paid" articles may be available in local libraries.

Personalize PubMed Before Starting to Search

Personalizing PubMed is an investment that will take only a couple of minutes. Follow these simple steps to create a 'MyNCBI' account [Table 1]:

Ten Useful Tips for Searching PubMed

1. Searching using 'fields'

Every bibliographic record has fields. These are like column headings in tables. One can search for a word or phrase only in one or more specific fields. Commonly searched fields are 'Author,' 'Title,' 'Title/Abstract,' and 'Journal Name.'[2,3]

Table 1: Steps in personalizing PubMed

1	Go to the PubMed home page – www.pubmed.gov
2	Click 'My NCBI' (at the top right-hand corner of the PubMed page)
3	Click 'Register for an account' and follow the simple instructions
4	In the 'My NCBI' page, click 'NCBI site preferences' (top right-hand corner) under 'Common preferences', click 'Highlighting'
5	Choose a color and click 'Save' (now when you search PubMed, your search terms will be highlighted with this color)
6	Every time you use PubMed, start by logging into your account

A few examples and contexts for field searches are illustrated below:

a. If a quick reading list of articles on 'perfusion MRI for brain tumors' is needed, search by typing:
   brain[ti] tumors[ti] perfusion[ti] MRI[ti]
   The references obtained will have all four words in the title [Figure 1]. Furthermore, one can choose one or more relevant articles and click 'Related citations' to find more articles.
b. For a list of articles by an author, search by using the field [au].
   Wilson [au]
   If a search is made without [au] after 'Wilson,' additional articles on Wilson disease, Wilson's test, etc. will be retrieved.

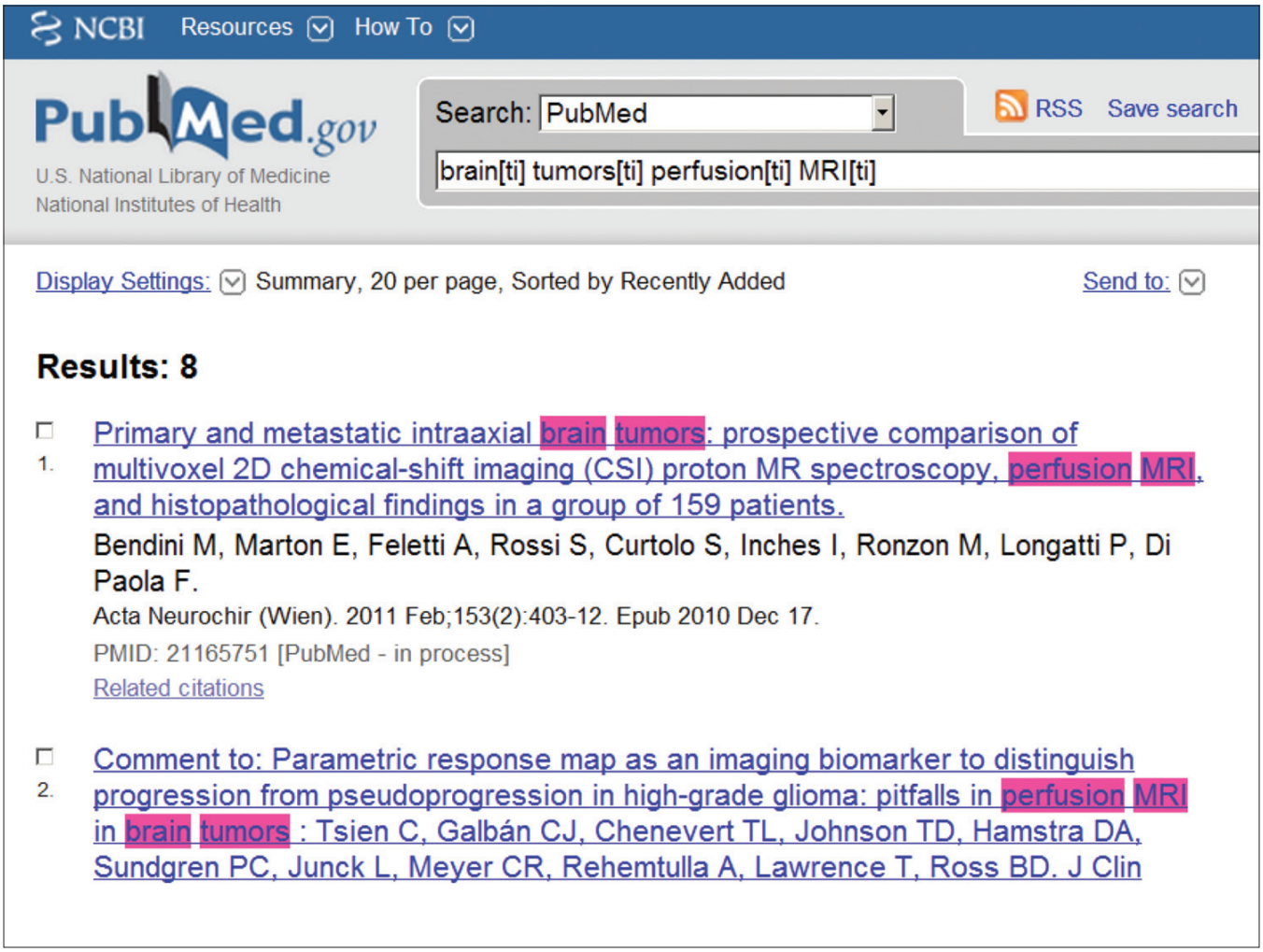

Figure 1: A Title Search gets you articles with your search terms in the title. Add [ti] after each term. This is good for a quick reading list of articles on a topic

c. For a list of articles in a journal, use [jour]
Radiologic Clinics of North America [jour]
The other fields that can be used for efficient searching are: [TIAB] for title and/or abstract, [DP] for date (year) of publication, and [PL] for place (country) of publication.

2. Combining concepts

If one wishes to search for more than one concept, the words 'AND,' 'OR,' and 'NOT' can be used. These words must be in upper case.

AND means the resulting references must have all of your search terms.

OR means the resulting references may have one or more of your search terms.

NOT is used to eliminate a term from the results.

Some examples and contexts for combining concepts are given below:

a. **Magnetic resonance imaging[tiab] AND ultrasound[tiab]:** This will retrieve articles that contain both terms in the title and/or in the abstract.
b. **Magnetic resonance imaging[tiab] OR ultrasound[tiab]:** This will retrieve articles that contain the terms 'magnetic resonance imaging' or 'ultrasound,' or both, in the title and/or in the abstract.
c. **Magnetic resonance imaging[tiab] NOT ultrasound[tiab]:** This will get articles that contain only 'magnetic resonance imaging' and will eliminate articles containing 'ultrasound.' When NOT is used, articles that contain both 'magnetic resonance imaging' and 'ultrasound' will be eliminated. Thus, a search is also performed with AND in order to select important references from that list. The terms AND, OR, and NOT are known as Boolean operators.

3. Searching for references using [tiab] alone is inadequate

Searching for a topic that is available only in the title and/or abstract is inadequate because of two possible scenarios. Examples highlighting this inadequacy are given below:

a. The topic 'words' may be present in the title and/or abstract, but the article may not be about them. To illustrate, a search for 'acute traumatic lesions' may fetch an inappropriate article titled '*Bone marrow edema pattern around the knee on magnetic resonance imaging, excluding acute traumatic lesions.*'
b. The title of an article may not be explanatory and the reference may not have an abstract. As an example, let us examine the following reference: Tudorica A, Thomas CR Jr, Huang W. Invited commentary. Radiographics. 2010; 30:716-9; The full text of this journal is available at http://radiographics.rsna.org/content/30/3/716.full and tells us that the article is about MRI for tumors. But if a [tiab] search for either of these terms is performed, PubMed will not fetch this reference as neither of the words appears in the title and as there is no abstract.

4. Searching topics using MeSH terms

In order to search for articles about terms or phrases, the search should be performed using MeSH terms. MeSH stands for 'medical subject headings.' These are very specific and standardized terms used to describe every article in PubMed. Searching using MeSH terms will fetch highly relevant references. MeSH terms are added to every bibliographic record by indexers who read the full article and use MeSH terms to 'describe the article.' Searching with MeSH terms will fetch articles about the specific term, whether the term appears in the title/abstract or not. An example of a search without using MeSH term is shown here to highlight the inherent inconvenience of that approach. An article titled '*Sonographic evaluation and pregnancy complicated by diabetes*' does not have the words 'gestational diabetes' in the title or abstract although it is about ultrasonography in gestational diabetes. Nevertheless, if a search is performed for **gestational diabetes [MeSH],** the above quoted article will appear within the retrieved list in the search results.

Searches using MeSH term are more focused and meaningful. Table 2 illustrates this point while searching for two random topics: 'ultrasound diagnosis of brain tumors' and 'MRI spectroscopy for hepatic steatosis.' MeSH terms are stored in the MeSH database. MeSH terms are standardized, and choosing the best and correct MeSH terms for every search is the single most important step. On the PubMed home page, the link to the MeSH database is on the lower right-hand corner.

Two additional options are available for advanced MeSH searches. These are located below the subheadings for a MeSH term, namely 'Restrict to MeSH major topic' and 'Do not include MeSH terms found below this term in the MeSH hierarchy.' Checking either of these will narrow down a search result. The first option gets articles where the search term has very major coverage and is not just a small part of the article. The second excludes the lower 'specific terms;' for example, when the searching for MR spectroscopy, terms like electron spin resonance spectroscopy and nuclear magnetic resonance will be excluded.

5. Limiting the searches

After running any search you can see a link just above the search box – 'Limits.' Clicking this, one finds several options to limit the searches.

Table 2: Searching PubMed using MeSH [Figure 2]

Ultrasound diagnosis of brain tumors	MR spectroscopy for hepatic steatosis
In the MeSH search box, type 'brain tumors' and click 'Search'	In the MeSH search box, type 'brain hepatic steatosis' and click 'Search'
The first term that shows up is 'Brain neoplasms'	The first term that shows up is 'Fatty liver,' which is a synonym
Click this term. This displays a list of subheadings.	Click this term. This displays a list of subheadings. This time there is no subheading for MR spectroscopy. So do the following steps: Click 'Add to search builder' The search box will show: Fatty Liver [MeSH] In the MeSH search box, now search for 'MR spectroscopy'
Find the subheading 'ultrasonography' and click the check box [Figure 2]	The only term that comes up is 'magnetic resonance spectroscopy'
On the right side of the page, click 'Add to search builder'	Click 'Add to search builder'
The search builder box above shows 'Brain Neoplasms/Ultrasonography'[Mesh]	The search builder box shows: ('Fatty Liver'[Mesh]) AND 'Magnetic Resonance Spectroscopy'[Mesh]
Click 'Search PubMed'	Click 'Search PubMed'
The page will refresh and references about 'ultrasound diagnosis of brain tumors' is displayed	The page will refresh and references on 'MR spectroscopy for fatty liver' is displayed

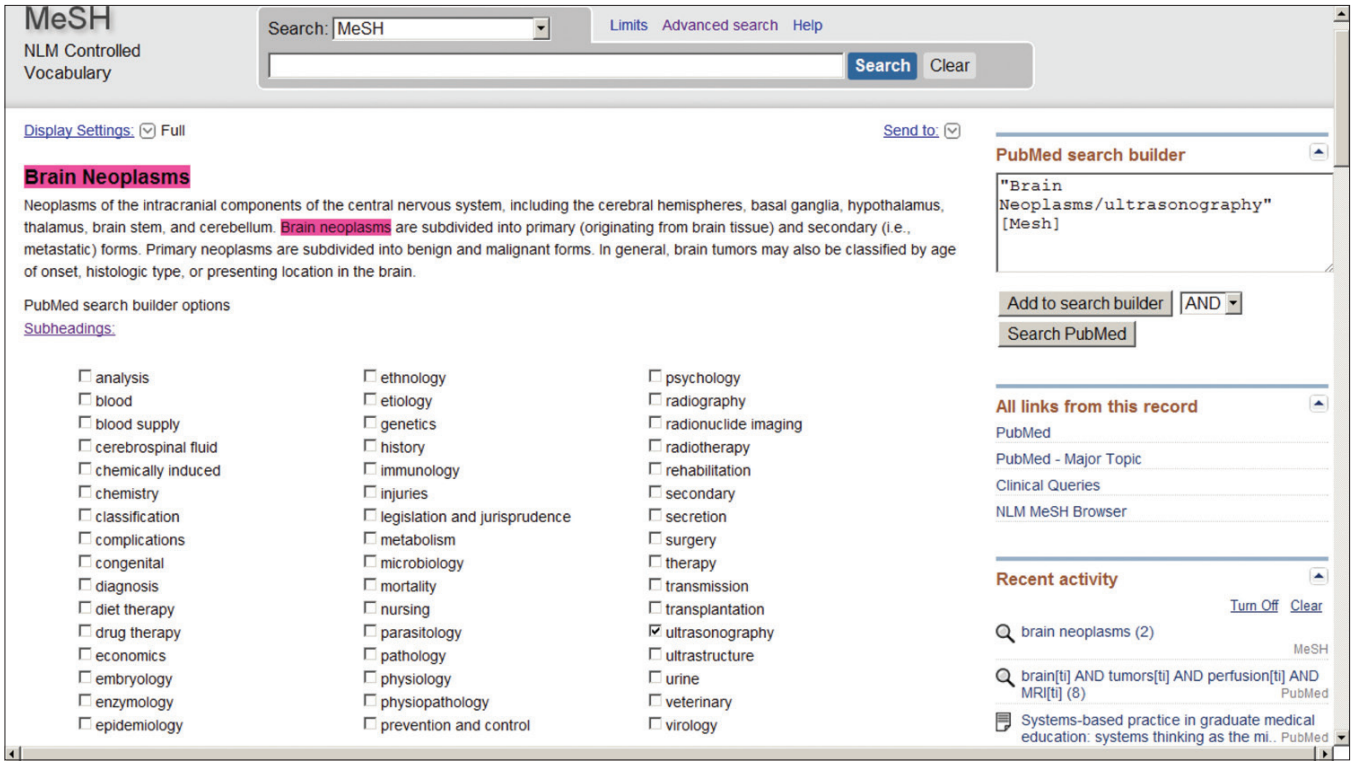

Figure 2: A MeSH Search uses terms that are standardized. A search is done by choosing the correct MeSH term for every search. In the example shown, the ensuing search will pinpoint and display several references about 'ultrasound diagnosis of brain tumors'

6. Finding review articles

There are two kinds of review articles: regular and systematic. Regular review articles are overviews on a topic and are written by experts. They are obtained in any search by clicking the filter 'Review' on the right side of the results page. Systematic reviews are usually written by a group of experts after identifying large studies and analyzing them. These maybe found in the Cochrane Database of Systematic Reviews (www.thecochranelibrary.com) or in journal articles through PubMed.

To search for systematic reviews of a topic (e.g., diagnosis of stroke by MRI), use the following strategy: **Stroke/diagnosis[major] AND magnetic resonance imaging[mesh] AND (Cochrane Database Syst Rev[jour] OR systematic review[ti])**

This retrieves either Cochrane reviews or systematic reviews in journals on the topic.

7. Saving your searches and tracking them

After performing any search, one can save the strategy and get updates on that topic. Logging into MyNCBI is mandatory for this. The 'Save search' button is just above the search box. One can set up email alerts to automatically receive new articles whenever they are added to PubMed. Significantly, one can set up an alert for more than one journal by creating the strategy described below and running a search

AJNR[jour] OR Radiologic Clinics of North America[jour] OR Indian journal of Radiology and Imaging[jour]

After running the search, clicking the 'Save search' button enables one to choose various options to receive email alerts as and when new issues are added to PubMed [Figure 3].

Searches can also be saved for topics like the ones described earlier. Setting up alerts is an option; it is not compulsory for every saved search. One can change settings for 'Saved searches' by clicking the My NCBI link.

8. Saving specific article references

After performing a search or receiving an email alert, you may wish to save one or more of these references for use in the future. Saving is possible by selecting and clicking the check box/es of the reference/s. Clicking the 'Send to' link (below the search box) shows various options. Choosing the option 'Collections,' allows one to create a new collection or add references to an existing collection on the topic [Figure 4]. The collections can be shared by choosing to make them 'Public' and storing the URL.

Other value-added features include the options of a) saving bibliographies of articles one has written by choosing 'Send to My bibliography'; b) adding non-PubMed citations by going to My NCBI and then clicking 'My bibliography' followed by 'Add citation', and finally, choosing the appropriate type of citation and adding the details.

9. Free articles

When a search is performed, a link 'Free full text' is seen at the right side of screen. Clicking this link gives a list of free articles on a topic.

In addition, there are a few hidden sources of free articles. One of the main such sources is 'author manuscript' in PubMed Central, an archive of journal articles. In PubMed, type in the following PMID – 19521011 and search. PMID is the unique number for every article/citation in PubMed. In the result page, there are two icons: 'IOP' and 'Free author manuscript' in the bibliographic record. By clicking IOP, which is the publisher's icon, payment for the article will be required.

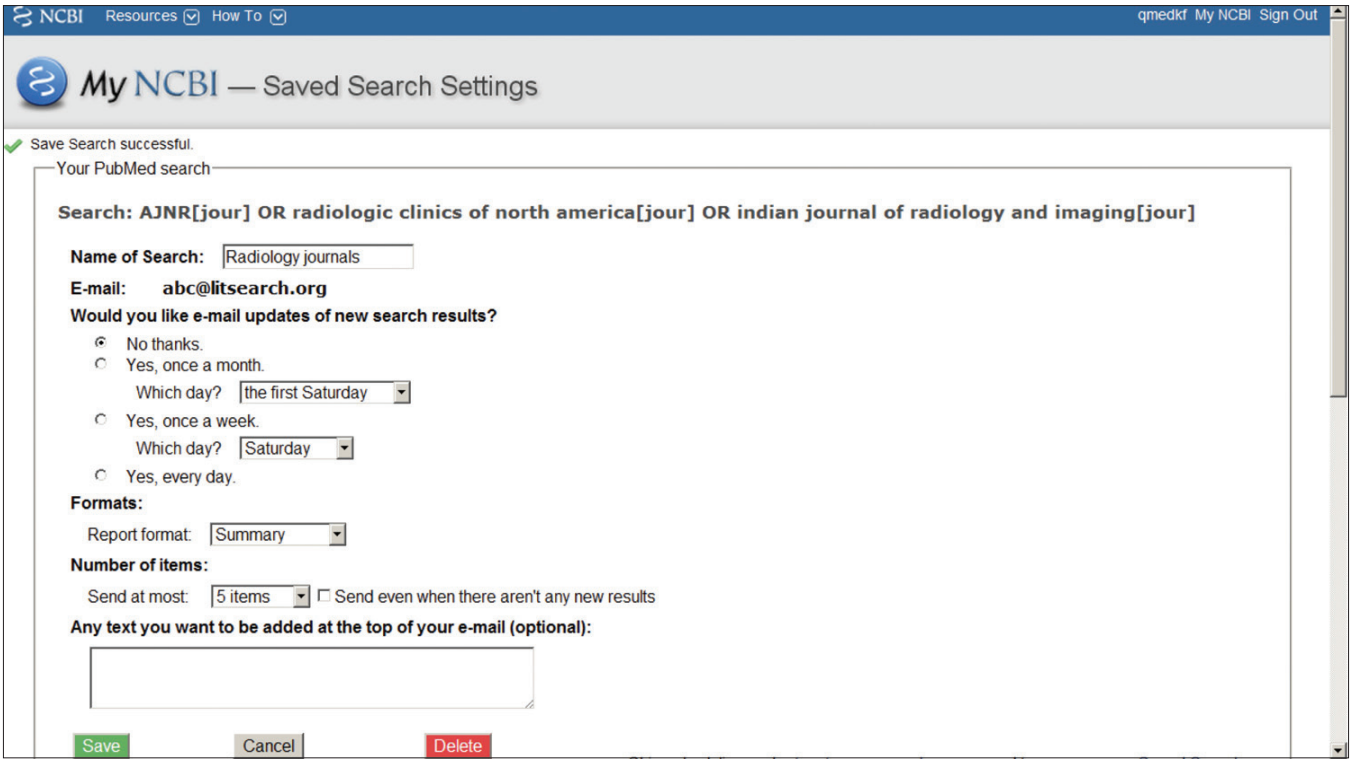

Figure 3: Journal Alert. Logging into My NCBI is mandatory for saving a search and setting up email alerts to automatically receive new articles from one or many journals whenever they are added to PubMed

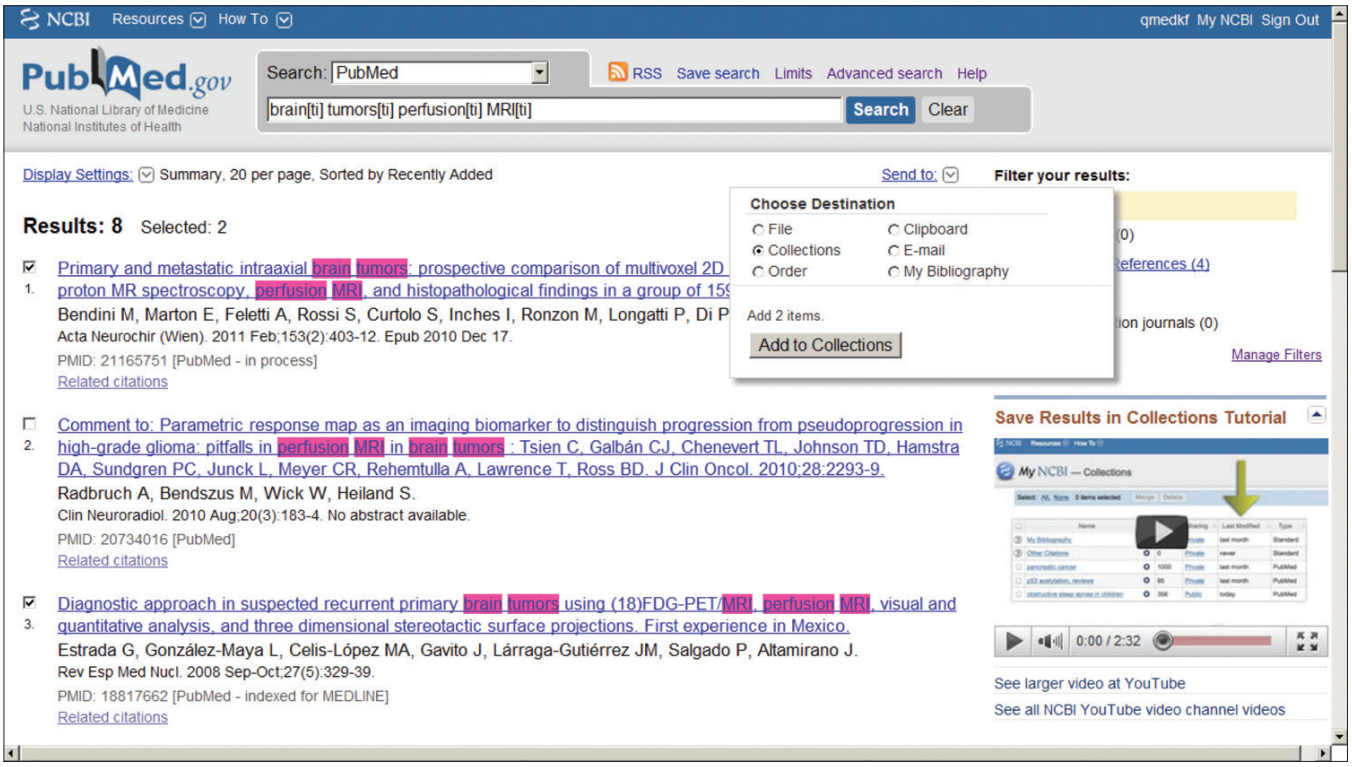

Figure 4: Send to Collections. Saving specific article references is possible by selecting and clicking the check box/es of the reference/s. Clicking the 'Send to' link displays the options. Choosing the option 'Collections' allows one to create a new collection or add references to an existing collection on the topic

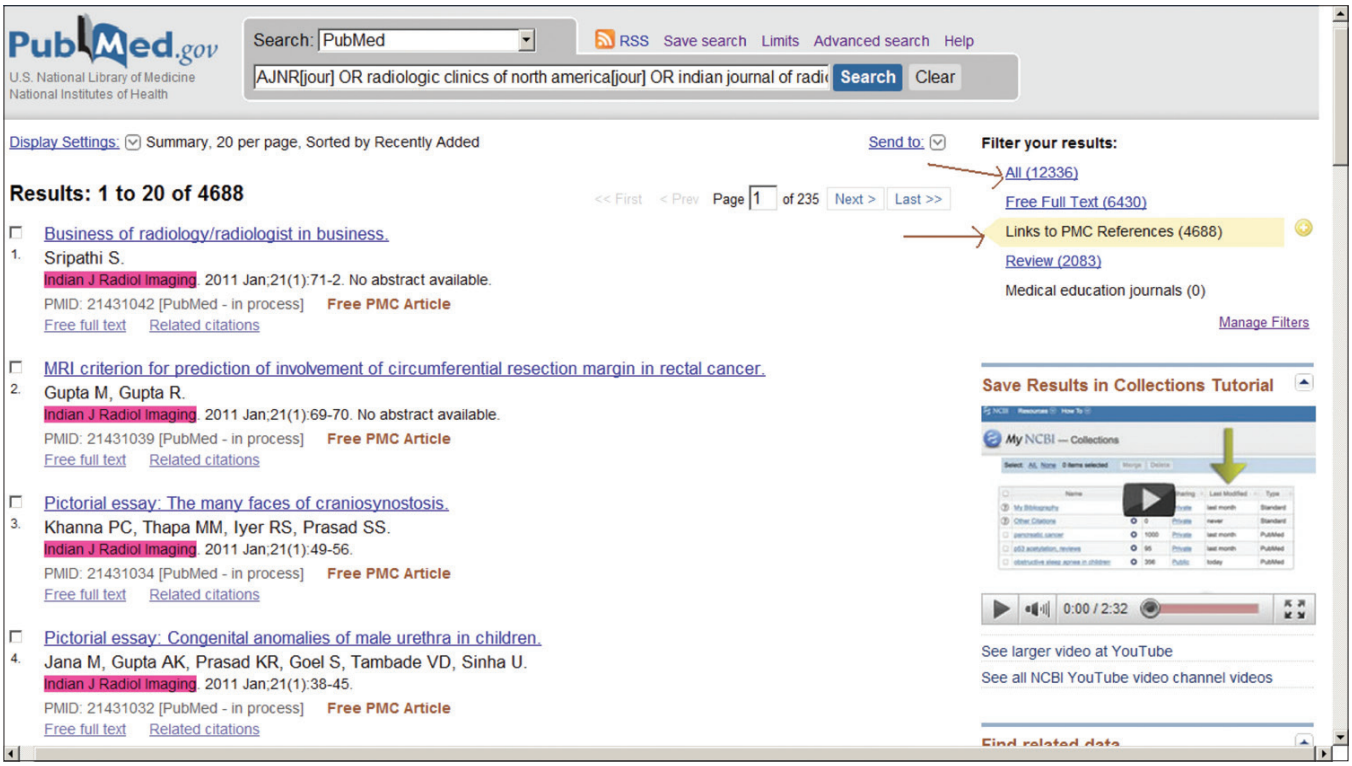

Figure 5: Filters. There are several filter options through 'Links' which permit linking to other databases. The 'Links to PMC' option will create a filter to select articles available free through PubMed Central

Figure 6: Filters. The 'Links to PMC references' filter chooses a subset of articles. For each article in the subset filter, if one clicks the title it shows which PubMed Central article has cited that particular article

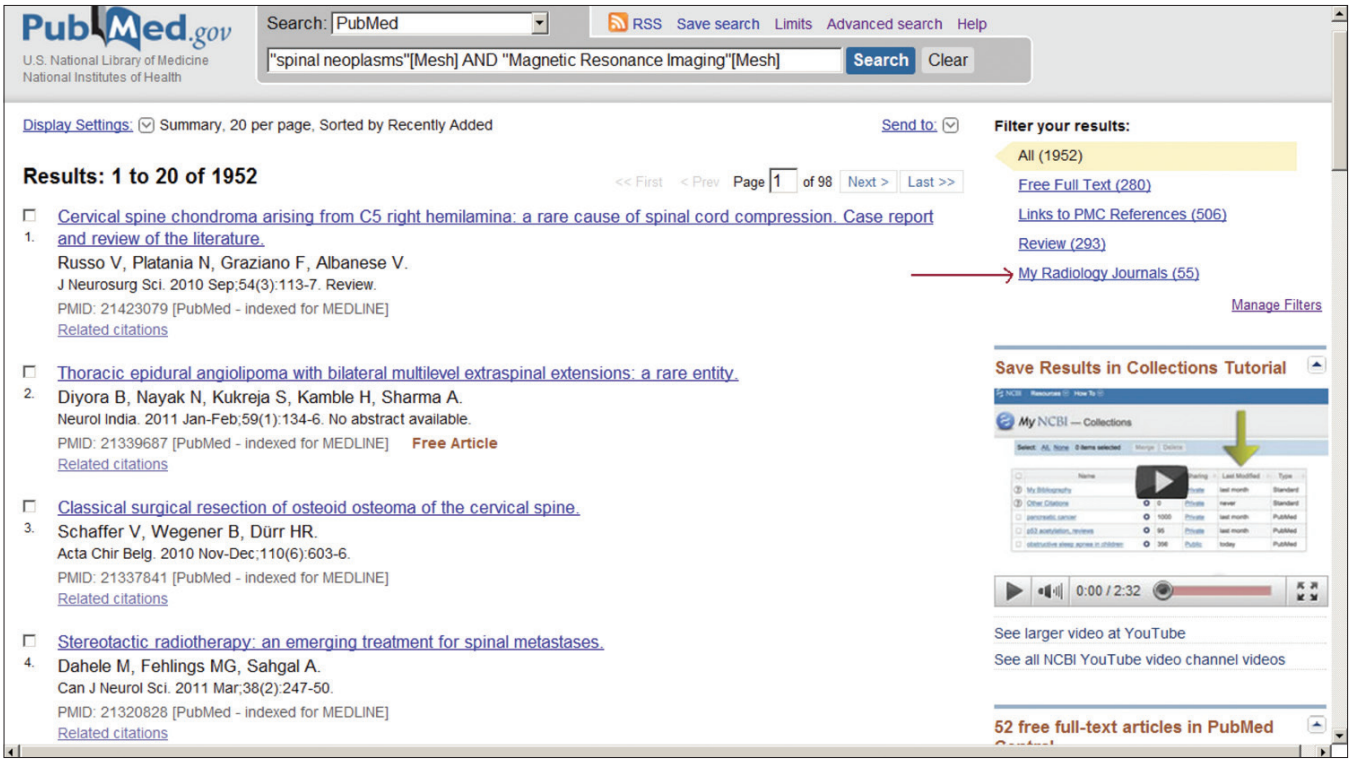

Figure 7: Radiology journals. Creating a custom filter for radiology journals: From the 'Manage filters page,' clicking 'Create custom filter,' a folder 'My Radiology Journals' and then by running and saving a search strategy, the custom filter is listed under 'Your PubMed filter list.' Selecting the filter allows the filter to be visible in PubMed

The other icon will give the author's final manuscript which very often serves the purpose.

Besides, there are journals that are freely accessible in India due to assistance given to many developing

countries. These will not be marked free, but clicking the publisher's icon works nevertheless. An example is the journal *Annals of Internal Medicine*.

A few Indian journals have not been provided icons in PubMed. The *Journal of Association of Physicians of India*, *National Medical Journal of India*, *Indian Journal of Medical Ethics*, and many others have full articles on their respective websites, but have not requested PubMed to provide the free icon links. If one finds an important article in any Indian journal, it would be wise to go to the journal website and check if the article is available online

10. Filters in PubMed

A typical search results page shows two filters on the right side: All, Review, and Free full text. One can create up to 15 filters by clicking 'Manage filters' located just below the three above-mentioned filters. To do this one needs to be signed into MyNCBI.

On the right side of the 'Manage filters' page, one can see four 'categories.' The first is 'Popular,' for selecting any filter one may want to use. The second, 'Linkout,' allows one to select various linked resources as filters. One useful option is to search for 'India' using the search box. A list of libraries show up; selecting the check boxes under the 'Filter', and 'Link' icon allows one to check the availability of articles from the listed libraries.

The third category, 'Properties,' allows creation of filters for articles, for example, describing certain age-group populations, language of publication, etc. The fourth category – 'Links,' permits linking to other databases and certain select citations. Of special interest are the two given below (these can be retrieved by searching for 'PMC' in the search box)

a. The 'Links to PMC' option will create a filter to select articles available free through PubMed Central [Figure 5].
b. The 'Links to PMC references,' option creates a filter that will choose a subset of articles. For each article in the subset filter, if one clicks the title it shows which PubMed Central article has cited the particular article [Figure 6].

A custom filter for radiology journals can also be easily created. In the 'Manage filters' page, there is a link 'Create custom filter' (in the upper half, towards the center). On clicking this link, one is asked to enter a name (e.g., 'My radiology journals'). In the 'Search' box, the strategy needs to be entered (e,g., **AJNR[jour] OR Radiologic Clinics of North America[jour] OR Indian journal of Radiology and Imaging[jour]**). Then if one clicks 'Run filter,' the number of results is displayed. The 'Save filter' button saves the filter and lists it under 'Your PubMed filter list' [Figure 7]. Ensuring that the check box next to the filter is selected is important if it is to show up as a filter when one uses PubMed.

Conclusion

PubMed is updated every day with new records and is thus a goldmine for medical literature. This article has covered some of the most important tips and features for using PubMed. With constant use one can keep discovering more features and tips.

The MeSH database and indexing of each article with these terms is the unique feature of PubMed and makes a world of a difference in searching for relevant articles. The libraries filter is another unique feature that needs to be incorporated by all medical and radiology libraries. As of the moment it is lamentable that only about eight libraries in India have uploaded their journal holdings (list of journals, with years of coverage) to enable the library filters to be efficiently used. It is important that every library uploads its holdings so that filters of libraries can be created.

References

1. PubMed. Available from: http://www.pubmed.gov/. [Last accessed on 2011 Jun 14].
2. Sriganesh V. Searching PubMed and other databases. Indian J Dermatol Venereol Leprol 2005;71:139-42.
3. Sriganesh V. PubMed -a beginner's guide to searching biomedical literature effectively. J Postgrad Med Educ Train Res 2008;3:9-13.

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Announcement

iPhone App

A free application to browse and search the journal's content is now available for iPhone/iPad. The application provides "Table of Contents" of the latest issues, which are stored on the device for future offline browsing. Internet connection is required to access the back issues and search facility. The application is Compatible with iPhone, iPod touch, and iPad and Requires iOS 3.1 or later. The application can be downloaded from http://itunes.apple.com/us/app/medknow-journals/id458064375?ls=1&mt=8. For suggestions and comments do write back to us.